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Einstein's Brain: As Evidence of (a) Existence of Tachyon and (b) Dual Activities of Human Brain: A Possibility

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Abstract: ***In Hindu (Indian) mythology Goddess "Kali" (dark-skinned goddess adorned with a necklace of skulls) symbolizes the beauty of "Darkness" and relates the primordial darkness associated with the origin of Universe and the similar one that also exists inside the human brain. Human brain is a black box in which no light enters. The trajectories of change in brain structure and functions across the human life span (i.e. from birth to till death) offers to develop 5 epochs of structural topology of human brain i.e. epoch-"childhood brain" (0 – 9 yrs old), epoch 2-"Adolescence brain" (9- 32yrs old), epoch3- "Adult brain" (32- 66yrs old), epoch4-"Early aging brain (66 – 83yrs old), and epoch5—"Late aging brain" (83 – 90yrs old) with barriers between epochs such as First Barrier (i.e. between epoch 1 and 2) at 9yrs, Second Barrier at 32yrs, Third Barrier at 66yrs and Forth Barrier at 83yrs. As the topology is a complex with neural connection, organized and developed with age as well as is associated with key cognitive behavioral and mental outcomes, it has been identified that the human brain goes through "Five Nonlinear" stages of development as mentioned above. During brain development over time the cortical surface area, its thickness and the curvature of the cortical surface are changed i.e. its thickness and the curvature of the cortical surface are changed i.e. the outer cortical surface lies between the gray matter (GM) and white matter (WM) changes or deformed. In the gyrification phase the gyrification starts with the deformation of gray matter (GM), i.e. the major structures like the central sulcus. This gyrification of the cortex is an evitable phase in most mammals, particularly in human that occurs during the second and third trimester of pregnancy, and appears most likely bu local tangential growth of GM tissue at the end of the first trimester such that brain folding patterns depend on WM stiffness, GM thickness and growing speed that actually allow the creation of a naturally 3D folding patterns. Hierarchical Modular Model of human brain indicates that (i) the brain network can be parsed in several physiologically and equally meaningful ways such that the number of modules increases with age while their size decreases, (ii) the modularity of partitioned reaches the highest values in two phases i.e. once in the early and the other one in late life span, and (iii)the brain modular structure exhibits both "linear" and :nonlinear" age related trends. Modular network model of brain provides a reduced anterior-posterior functional correlation with age indicating two separate regions- one at (10-30) yrs and the other one at (60-90) yrs. Investigation of genius personalities , including Ramanujan, Einstein, Nobel Laureates about their age associated noteworthy seminal works shows that scientific activities achieving peak at age ~ 26 yrs while art activities that of at ~ 66yrs. Comparison of superluminal photons, Tachyons with brain associated activities and Tachyon's Double Image Effects clearly indicates- Tachyon exhibits peak image at ~ 26 yrs (i.e. appearing image) and that of another one at ~ 66yrs (departing image). It is concluded that Tachyons are produced and active in human brain, and take a crucial role for making a genius although GM deformations have a significant role in brain's genius. Using quantum tunneling, and correlating between gray matter volume (GMV) and scientific creativity it is suggested that a) based on Hartman's effect, and dual activeness of brain, tachyon like (faster than light speed) behavior is possible in human brain; b) based on voxel-based morphometry (VBM) and Executive Attention Network (EAN) a non-linear EAN had active in Einstein' brain leading him to become "Genius" through the discovery of General Theory of Relativity at the age of 26yrs. The author encourges the Brain Research Community to search (1) tachyon-like behviour, and (2) the existence of 5th order non-linear oscillation in human brain network counterpart during their investigations.***

Keywords : Quantum tunneling, brian activities, tachyons, gray matter, brain development

1. Introduction

To quest the answer of the puzzling question- " Human Brain and Origin of Human Intelligence"- the European and Russian scientists [1, 2] began their studies in the early of 1836, which as based on the systematic collection of deceased elite scientists and artists and then meticulous study with the help of collected samples. Particularly, in 1811 the study of human brain was transitioning from purely anatomical observation to experimental physiology. The significant ground work, which can be considered as the landmark of the beginning of modern neuroscience, in particular regarding the functional localization of the brain and the differentiation of nerves began in Europe during 1811 by Cesar Julien Jean Lagallois in France, Charles Bell in Britain, and Franz Joseph Gall in Germany. However, historically it was known from Greek contributions (e.g. Alcmaeon, Hippocrates, Heophilus) that the human brain was the seat of intelligence. So, the "searching for intelligence" means to find a correlation of the mental faculties with brain anatomy through the pseudoscience of Phrenolgy.

In the mid-late 19th Century the above focus shifted from skull bumps to (i) reaction times (ii) sensory ability and (iii) the impact of evolution on mental powers. In these evolutionary scenario the significant contributions had come from different directions such as :

- Alexander Bain (in 1855)- the landmark in the development of modern psychology through his work "The senses and the Intelect".
- Charles Darwin (in 1859)- Influencial viewing of mental powers as continuous from animal to human as well as a fostering research into individual differences in intelligence (through his book "On the origin of Species")

- Paul Broca (in 1861)- Demonstration of a specific centre in the brain that validated the concept of functional localization.
- Francis Galton (in 1869)- an attempt to measure statistically the innate intelligence i.e. the ability to gain reputation / success (in his book- "Hereditary Genius)
- G. Fritsch and E. Hitzing (in 1870)- Demonstration of first electric stimulation of the brain that provides the improving knowledge of human brain's cortical function.
- Wilhelm Wundt (in 1879)- Separation of Psychology from philosophy through experimental measurements of mental processes.
- Camillo Golgi (in 1890) —Using silver chromate staining capable to see the individual neurons.
- Santiago Ramon Y Cajal — first showed the functional unit of the brain is the neuron
- John Newport Langley — first classify the connections of the nerve fibres to peripheral nerve cells i.e. the origin of the concept of "receptive substance or receptor"
- Francis Gotch (in 1899) — by conducting several experiments on nervous system function first describe "nerve impulses" i.e. how nerve interactions affect the muscles and eyes.

In this flow of understanding the physics of human brain "quantum tunneling" offers the scientists a new probe to look into neural processing, synaptic communications, and consciousness.

Quantum Tunneling, Black Box and Quantum Human Brain

What is Quantum Tunneling

Quantum tunneling is a phenomenon in which a particle is capable of passing through an energy barrier such that , according to classical physics it is not possible to overcome. In the lense of classical physics a particle with energy lower than a barrier's potential energy can not pass through the barrier. But in the view of quantum mechanics, the probabilistic interpretation of the wave function shows an effect in the wave function of a particle extends it capability of finding that particle on the otherside of the barrier.The significance of this quantum tunneling phenomena is that it iseffective almost in all fields of science including physics, chemistry, biology, etc. In the case of biology, particularly in the human brain's functioning this quantum tunneling offers a new probe to the scientists for understanding the physics of faster than light (i.e."tachyon"), human brain as a black box, origin consciousness and finally the origin of Genius.

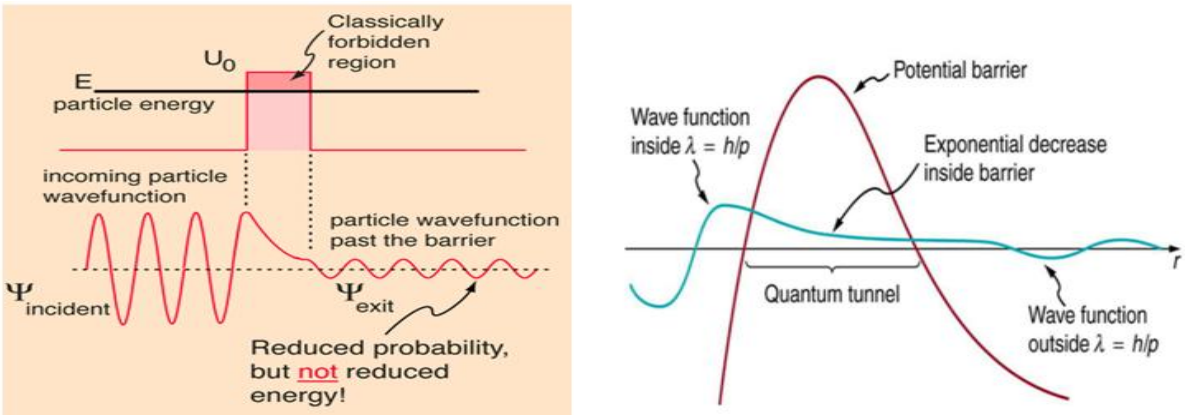

Figure 1: Schematic diagram showing quantum tunneling scenario (from Wikipedia)

Quantum Tunneling, Faster than Light and Hartman Effect

In quantum tunneling phenomenona the tunneling time creates a controversial paradox. This controversy stems the fact that many tunneling time predicts the superluminal tunneling velocities. According to Hartman effect — the tunneling time becomes independent of barrier length for thich enough barrriers such that ultimate resulting in unbounded tunneling velocities. In other words, the Hartman effect is a quantum tunneling phenomenon where the time it takes for a particle or wave (like a photon) to pass through a thick barrier becomes constant, independent of the barrier's width so that it leads to seemingly faster than light (superluminal) travel. The importance of this paradox is that this effect highlights :

a) The tunneling is a complex wave phenomenon, not a simple particle crossing ;
b) It does not violate causality, though it challenges the classical speed.

The significant aspects of the Hartman Effect [3] are :

1) The time spent inside the barrier(group delay) , while crossing very wide barriers, stops increasing with barrier's thickness, finally reaching a saturation point (i.e. a constant) and ultimately resulting in unbounded tunneling velocities.
2) The main question → how long it takes a particle to tunnel through a potential barrier ?. Although no definite answer is available but experimental reports and theoretical studies suggest that the tunneling process is superluminal i.e. occurrence of the velocity faster than the speed of light [4,5].
3) Not actual superluminal travel → As the tunneling time is a measure of the wave packets "life time" or energy storage within the barrier, not a true or real transit time for the entire pockets

Einstein, Special Theory of Relativity and Tachyon

Einstein [6] , in his special theory of relativity, did not not support the existence of particles that travel with the speed in excess of 'c', the speed of light in vacuo. But Sommerfeld

[7],and Sudarshan [8] and his collaborators [9 – 11] re-examined and concluded that " special theory of relativity permits those particles with the speed in excess of the speed of light provided only that they are are created following by that way of relativity i.e. the speed of light barrier may not be breached either from below or from above. For example, primordial Tachyon. In a study Sudarshan and Narlikar [12], by considering the Tachyons in the context of cosmological origin, showed that any primordial Tachyons that might have been created at the beginning of the Universe are unlikely to have survived to the present era [13].

Our present knowledge hints that the Universe is a very minute fashion revealing a plethora of particles that make up atoms with the subatomic particles like neutrinos, bosons, quarks, leptons, etc. The main difference of Tachyons with the rest of others is that :

a) Tachyon is one such hypothetical subatomic particle that always travels faster than the speed of light "c";
b) Tachyons exhibit unusual property i.e. an increase of the speed of this particle, the energy decreases which is opposite in the case of subatomic particles wherewith the energy increases with an increase in the speed;
c) An infinite amount of energy would require to slow down a Tachyon to the speed of light;
d) As the energy of the Tachyon has to be real implying that its mass must be imaginary ;
e) ***Double immage effect*** — As the Tachyons move at the speeds greater than the speed of light it is, thus, not possible to observe them in real time. This means that after the Tachyons have passed through a point in space, the observers would see two images of it —one, on appearing and the other one at departing image in the opposite direction. This is called the double image effect which is normally observed in the light field of a superluminal object.

Hindu (Indian) Mythology, Beauty of Darkness and Human Brain

Figure 2 : *The portrait of Goddess Kali*

Kali, one of the most enigmatic and powerful deities in Hindu mythology, embodies a spectrum of themes, including darkness, destruction, and death. Revered as a fierce protector, she is also seen as a loving mother figure to her devotees. This Goddess Kali is often portrayed as a dark-skinned goddess adorned with a necklace of skulls, a tongue sticking out, and wielding weapons such as a sword or a trident. Her fierce appearance is meant to symbolize her ability to conquer evil forces, protect her devotees, and represent the cyclical nature of life and death.

Kali, the "Dark Mother" of Hinduism, is the fierce goddess of time, creation, preservation, and destruction, embodying intense, transformative power. Associated with the primordial darkness, she represents the liberation from ego, the destruction of evil, and the ultimate reality, guiding devotees through the fear of death towards spiritual enlightenment. The significances of darkness over human brain are:

a) in a feminine form → she represents such a rare power that existed before light and time, encompassing all-pervasive, untamed energy (Shakti / energy).
b) In the view of Destruction of Ego → She represents the destruction of illusions and false consciousness, often depicted cutting off heads with a sword to symbolize the slaying of the ego to achieve liberation.
c) In the view of Fertile Darkness → darkness is not despair but a "fertile ground" for spiritual growth, where the transformation takes place for purifying, and burning away all the past karma and attachments.
d) Darkness is enable for the consumption of all worldly "flavors".
e) Darkness exhibits such a significant dynamic, active, and creative power (*Shakti/ energy*) under the static consciousness.
f) Impact of darkness as natural force → darkness represents the absolute destructive force necessary for regeneration and new beginnings. i.e. the ultimate, untamed force of nature is essential for destroying the old to make way for the new.
g) Impact of Darkness on the human brain → (i) by reducing visual stimuli, "***forcing a shift to heightened sensory, imaginative, and cognitive processing"***. It triggers melatonin production via the pineal gland, essential for sleep, while profound, long-term darkness can distort perception of time and alter emotional regulation, intensifying feelings and reducing inhibitions.
h) Impact on sensory → Without light, the brain increases focus on auditory, tactile, and olfactory senses to map the environment.
i) Impact on "Mind After Midnight" → Research shows that being awake during deep night hours causes the prefrontal cortex (i.e. responsible for logic and inhibition) to weaken, while emotional centers "**intensify"**. This can lead to increased risk-taking, emotional instability, and a tendency to fixate on negative thoughts.
j) Perceptual Shifts**:** the brain continues to function, using memory and imagination to predict and interpret surroundings, sometimes resulting in illusory perceptions.
k) Distortion of Time**:** The observed fact is that the prolonged, extreme darkness (like in caves) can cause a severe breakdown in the perception of time, causing individuals to lose track of days and hours.
l) Dark energy of the Brain → According to neuroscientists the term "dark energy" is used to describe the 60%to 80%of energy the brain consumes

for internal, spontaneous activity unrelated to external sensory inputs.

m) Neural Plasticity → Darkness promotes brain cell regeneration and helps in memory consolidation, contributing to better cognitive health.

n) Sleep Regulation: Darkness is crucial for the secretion of melatonin, which regulates circadian rhythms.

o) Sensory Deprivation & Therapy**:** Controlled environments of darkness can reduce stress and allow the nervous system to recover from the overstimulation of modern light pollution.

p) Symbolism → in the view of historically and psychologically, darkness has been associated with fear, the unknown, and, in some traditions, an "undesirable" state that challenges cognitive and emotional stability.

q) Reflective State →Conversely, darkness is also seen as a time for deep thought, spiritual reflection, and creativity

r) Scientists believe that the “True Darkness” enables to ‘Reshuffles’ our Consciousness, even “Resetting” our Inner Self.

Human Brain Development, Gray Matter Folding, Intelligent Power and Dual Activeness

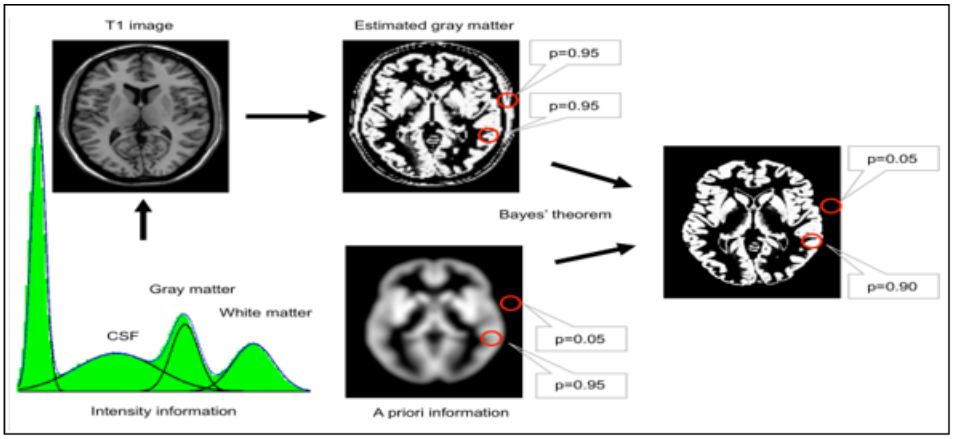

Figure 3: Representation of the image analysis, using a priori information, indicates the Gray Matter (GM) contribution. Note that based solely on a similar image intensity the cerebral and the extra-cranial spot exhibit similar probability for belonging to Gray Matter (adopted from ref. [14])

Human brain, like any living tissue, is constantly changes that leads to changes in brain functions and structures. Two major classes of tissue is arranged in human brains — gray matter (GM) and white matter (WM) which are surrounded by cerebro spinal fluid (CSF) and the whole are packed within the skull (figure 4). The GM is basically the processing region with a large number of neurons that are connected with the white matter (WM). The CSF serves as a physical buffer which allows geometrical changes in brain development and aging. The folded ribbon of the GM that surrounds the WM are increased during development. Note that the cortex which is an organized surface where folding allows a large surface area to fit compactly within the cranium [16-18]. In this context the gyrification process, i.e. outward (gyri) and inward (sulci) folding arise during embryogenesis, is not yet fully known. But scientist believed a closer connectivity within the “gyri” [19,20], even with the organized six layers with their in thickness and different functional processing [21].

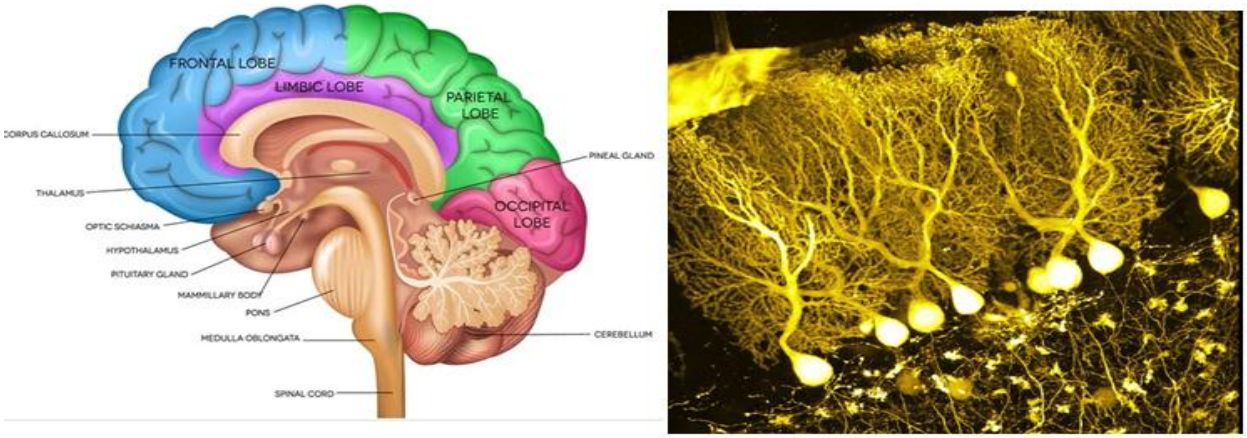

Figure 4: (Left) Schematic diagram showing general view of a human brain (**Right)** structure of Cerebellum with Purkinje cells (adopted from ref. Cuffari. 2020 [22])

Analysis of magnetic resonance imaging (MRI) of brain through automatic preprocessing techniques hints that deformation / change in the volume of GM, in particular the cortical thickness may provide the required information for understanding the development [23], aging [24], plasticity [25] as well as a number of different diseases [26]. It is to be

noted that the shape of the brain [27,28], dissection of GM volume into thickness and areas [29], improved registration and partitioning i.e. region alignment [30], correct anatomical smoothing [31,32] combining different MRI modalities [33], etc are helpful to analyze the tissue specific properties such as myelination [34] , white matter hyperintersities in multiple sclerosis [34]. In the automatic whole brain measurement techniques like voxel based (VBM) [35], region based (RBM) [36,37], deformation based (DBM) [38], and surface based (SBM) morphometry [39,40] offer the scientists to detect even subtle changes in the brain structure. Among these VBM is very sensitive to subtle GM changes in brain plasticity lacking which complex folding patter and its development arise, while DRM covers (i) partially folding differences and (ii) volume changes [41].

Deformation of Gray Matter, Brain Devvelopment

As the brain develops over time, the cortical surface area, its thickness and the curvature of the cortical surface are changed. Studies of normal brain development shows that the growth pattern in developing normal child is non-uniform over the whole brain volume [42]. In particular, between ages 12 and 16, the most rapid growth has been observed in the corpus callosum, and the temporal and parietal lobes and also some tissue degeneration in the sub-cortical region of the left hemisphere implying that the age-related change with respect to the cortical surface are not uniform. So, the modeling of surface deformation with proper mathematical fame work will provide the required geometry and fluid dynamics.

Figure 5 shows the result of recent study by Chang et al [48] on gray mater (GM) deformation. The cortical surface which is consisting of two parts- the outer cortical surface lies between the gray matter (GM) and WM. Using the stochastic model on the displacement velocity $\mathbf{V}= \partial u / \partial t$ where $\mathbf{u}\ (\mathbf{x},t) = (U_1, U_2, U_3)$ be the 3D displace vector required to deform the structure at $\mathbf{x} = (x_1, x_2, x_3)$ in gray matter Ω_o to the homologous structure after time t, i.e. the whole gray matter volume Ω_o will deform continuously and smoothly to Ω_t.

Although it is not yet fully known whether this deformation i.e. brain folding follows the same biomechanical rules in all mammals but investigational study suggests that the development of the cerebrum can be divided into three major periods- (i) the ballooning phase, (ii) the gyrification phase, and (iii) the subsequent scaling phase covering the childhood and adolescence stages. While further

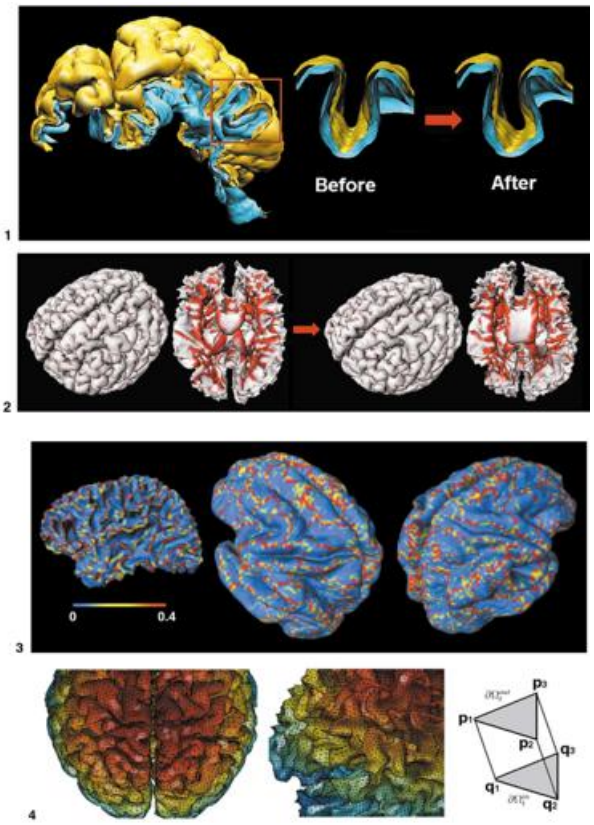

Figure 5: Shows schematically **(1)-** the effect of Gray matter deformation on the geometry of both the outer and inner cortical surfaces to change. Yellow, outer cortical surface; blue, inner cortical surface the deformation of the surfaces can be written as x 3 x U(x, t), where U is the surface displacement vector field**. (2)—** The outer and the inner cortical surfaces of a single subject at age 14 (left) and at age 19 (right) showing globally similar cortical patterns. The top of the inner cortical surface has been removed to show predominant ventricle enlargement. The red color is the region where the mean curvature is greater than 0.01**. (3)-** shows mapping of individual gyral patterns onto the surface atlas atlas. The gyral patterns (yellow and red lines) are extracted by computing the bending metric on the inner cortical surface (left). The middle and right figures show the mapping of the gyral pattern of a single subject (left) onto the atlas surface. The gyri of the subject match the gyri of the atlas illustrating a close homology between the surface of an individual subject and the surface atlas. Note that n if there is no homology between the corresponding vertices, then arise of no complete misalignment. **(4)-** shows the outer (left) and inner (middle) triangular meshes. Triangle (p1, p2, p3) t out on the outer surface will have corresponding triangle (q1, q2, q3) t in on the inner surface. A convex-hull from 6 points {p1, p2, p3, q1, q2, q3} will then form a triangular prism and the collection of 81,920 triangular prisms becomes the whole gray matter. (For details see the text of Chung et al 2003 and adopted from the same reference Chung et al 2003 [41]).

changes in the healthy adult brain are known as plasticity (short time) phase and aging (long time) phase. In fact the early ballooning phase follows an enlargement by radial and tangential tissue growth (figure 11) whereas gyrification is species specific and exhibits higher tangential than radial

growth resulting which folding arises with more individual patterns in larger brains [42,43].

In Balooning phase- This phase covers the human gestation week (HGW) from 0- 15 week and during this period an intensive radial enlargement arise in ventricle that compensates- (a) the simultaneous tangential growth of the intermediate zone, (b) increase in the brain surface without significant folding,

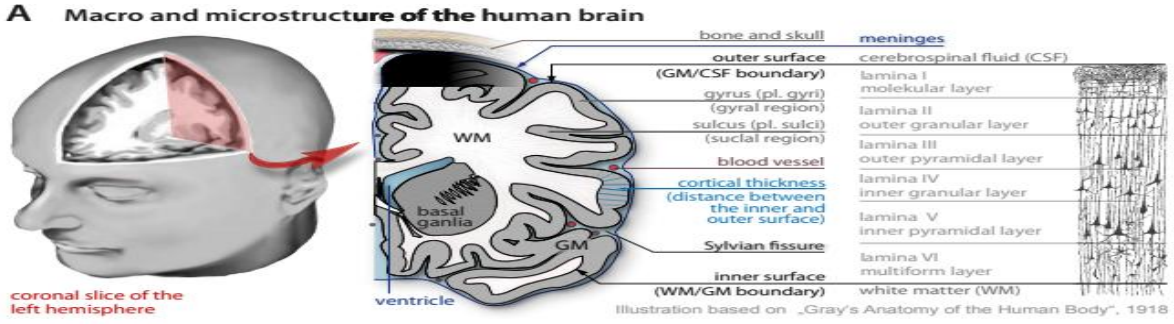

Figure 6: Schmatic representation of the human cerebrum **(A)** with highly folded structure which can be described as like a ribbon of gray matter (GM) that surrounds a core of white matter (WM). Note that is GM ribbon (neocortex) is ~ 2 – 4 mm thick and organized into six regions- and function-specific layers that connected between different brain regions. **(**adopted from ref. Dahnke and Gaser 2018 [38]).

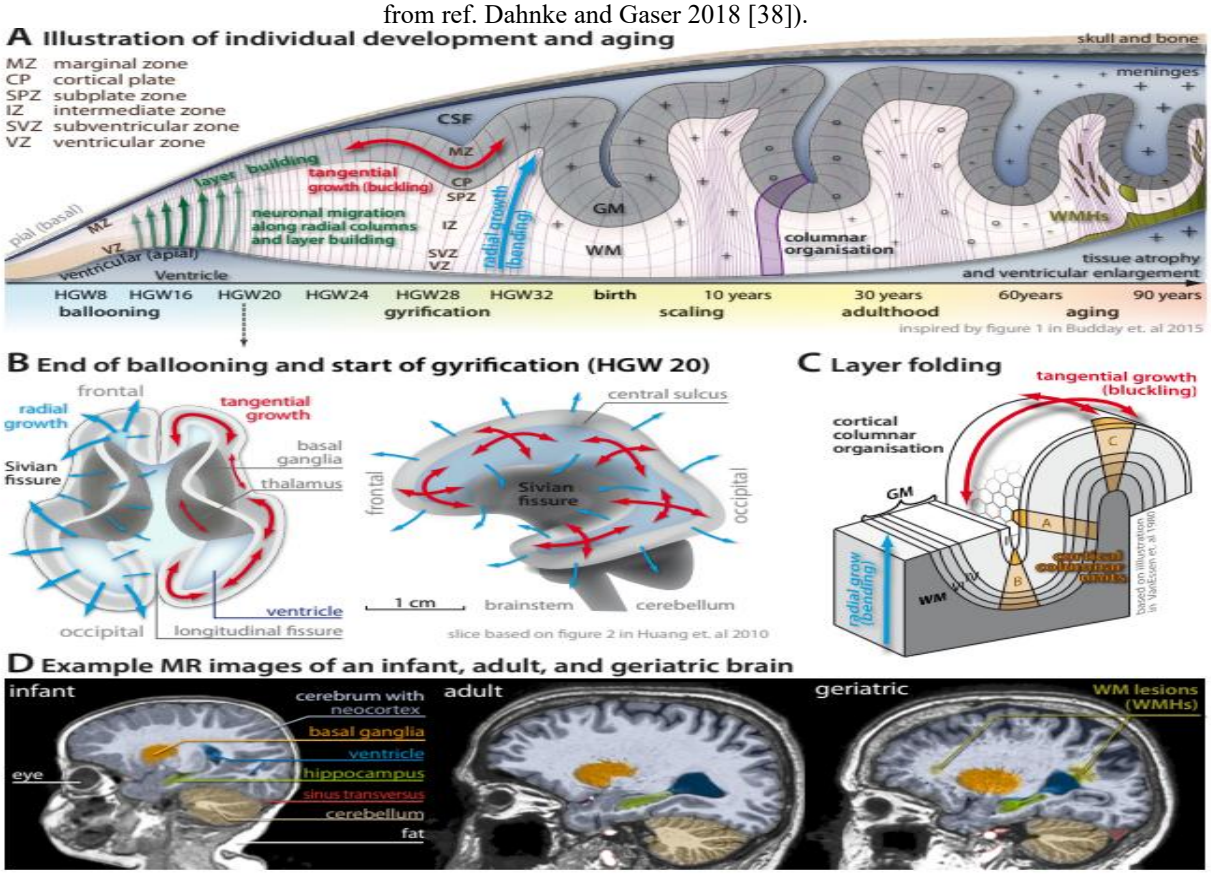

Figure 7: Illustrates **(A)** the development of human brain with aging. The ballooning phase starts and then strong increase in the area of the ventricular zone by both radial and tangential growth so that neuroepithelial cells are produced by cell division and migrate to marginal zone following the formation of a columnar migration and cortical layer patter [53,54] such that the ongoing migration and initiation of the cortical connection finally capable to increase the tangential growth by about HGW 20. **(B)** Gyration becomes active for shaping the major structures like the central sulcus and finally overgrown by the surrounding brain region due to Sylvian fissure (i.e. basal ganglia, thalamus, etc). This gyrification in human brain has nearly finished around birth but radial and tangential growth is balanced again, leading to a scaling of brain size with tissue growth and surface area enlargement. Note: Over a life-time, the WM continues it growing up phase upto age 40 yrs, whereas the cortex shrinks slightly every year. Due to this WM shrinks and shows tissue degradation indicating WM hyperintensities (WMHs) with GM-like intensities. The overall effect is: the shape of the brain remain relatively constant although the enlargement of the ventricle appears through accompanying the tissue atrophy. **(C)** The local folding (i.e. bending and buckling) which appears then compresses and stretches the cortical layers for maintaining the volumes of each layer. **(D)** The realistic images as observed through MRI. (For details see the text of Dahnke and Gaser 2018 and adopted from the same reference [38])

Topologically identification of Five Turning Points in human brain over lifetime

The trajectories of change in the brain structure and functions across the human life span (i.e. from birth to till death) offer the scientists to develop a structural topology of human brain over a life time [44]. This topology is a complex with neural connection, organized and developed with age as well as is associated with key cognitive behavioral and mental outcomes. The main key points in our life span is involved in brain's transitions into a different phases of developmental change. Scientists have identified the fact that the human brain goes through "Five Non-linear" stages of development [45]. These are (see figure 7):

- Epoch 1: 0 – 9 years old-"Infancy into childhood"→ "Childhood brain"
  Barrier between epoch 1 and epoch 2 → First barrier (called Barrier of 9yrs)
- Epoch 2: 9 – 32 years old- "Adolescence "→Adolescence brain"
  Barrier between epoch 2 and epoch 3 → Second Barrier (called Barrier of 32 yrs)
- Epoch 3: 32 – 66 years old- "Adulthood" → "Adult brain"
  Barrier between epoch 3 and epoch 4 → Third Barrier (called Barrier of 66 yrs)
- Epoch 4: 66 – 83 years old- " Early aging" → "Early aging brain"
- Barrier between epoch 4 and epoch 5 →Fourth Barrier (called Barrier of 83 yrs)
- Epoch 5: 83 – 90 years old- " Late Aging " → "Late Aging brain".

Checking of the brain functioning at around different barriers

As mentioned earlier the four major topological turning points across the human life span [45] are- 9, 32, 66, and 83 yrs old. These turning points we consider as quantum tunneling barriers. So, the first tunneling barrier at around 9 yrs between end of childhood and beginning of adolescence;

2nd tunneling barrier at around 32 yrs between end of adolescence and beginning of adulthood;

3rd tunneling barrier at around 66 yrs between end of adulthood and beginning of early aging;

4th tunneling barrier at around 83 yrs between end of "early aging" and beginning of "late aging".

As it is not possible to measure the exact mapping of human brain functioning at the barriers in quantum levels, we consider "Genius" and "exceptional intelligent" persons (**Table 1**), their activeness (i.e. through invaluable contributions) in respective fields in order to obtain a rough reflection on brain function at the concerned barriers.

(A) For "Genius"- Our known genius in mathematics, physics are Srinivas Ramanujan, Albert Einstein, and recently known Suborno Issac Bari and Sabrina Gonzalez Pasterski. In the case of Ramanujan it is known that he believed Goddess Namagiri and felt Namagiri's blessings / influence on each step of his every mathematical works, papers which are recorded in his famous "Note Book". Without any degree he went to Cambridge, UK and under Professor Hardy's care Ramanujan turns into "Genius". But "Note Book" records indicated that his geniuses were reflected at the time of his childhood.

In the case of Albert Einstein, he believed in God and sang devoted songs from his childhood, even at the age of 12. Later his geniousness was known through his published papers on General Theory of Relativity in the year 1905 when he was 26 years old.

For Suborno Issac Bari, he is a child prodigy, without any formal degree he becomes Professors in a number of universities in USA, India when he is at the age of 9 – 13 years.

Regarding Sabrina Pasterski, she built a single engine aeroplane at the age of 13 years.

From the above it is clear that the "Genius" exhibit their highly exceptional intelligence in their childhood with ages around 9 – 12 years i.e. around the first barrier of age 9 years. The basic fact is their internal energy levels are so high that they easily cross the first quantum tunneling barrier and capable to imagine beyond that of the common people.

(B) For highly extraordinary intelligent personalities- their contributions have changed the world due to the effect of various discoveries, inventions, ideas. They have made their discoveries, and remarkable contributions at the ages of 26–40 yrs, i.e. around the second barrier of 32yrs.

(C) In the case of artist Leonardo da Vinci he became famous for Portrait "Monalisa" at the age of 65yrs.

Table 1: List of Genius and Exceptional Intelligent Personalities including Nobel Lauriates * (basic parameters taken from available data in Wikipedia and others)

Name	Nature	Date of Birth	Indication of achieving higher level	Age	Around the Barrier point, Epoch range
Genius					
Srinivasan Ramanujan	Mathematician India	22/12/1887	At childhood did many mathematical formula as noted in his famous "Note Book". Without any degree admitted to Cambridge University under Prof. Hardy and gave unimaginable mathematical formulae that are relevant at present day.	9–26 yrs.	B.P.= 9 yrs (0 – 9) yrs and Around 26 yrs. Ep. (9 – 32) yrs
Albert Einstein	Scientist, America	14/3/1879	Upto the age of 12yrs he devoted on God. Theory of General Relativity paper published in 1905	9– 26 yrs	BP= 9yrs, 32yrs Around ~12yrs, ~ 32 yrs. EP. (9 – 32)yrs
Suborno Issac Bari		09/04/2012	A child prodigy, becomes professor without any formal degree,	9 – 12 yrs	B.P. ~ 9 yrs, Around 9 – 12 yrs

					EP. (0 – 9) yrs
Sabrina Gonzalez Pasterski		03/06/1993	At the age of 13, she builds a single engine aeroplane	13 years	B.P. ~ 9 yrs. Around 9-13 yrs EP (9-32)yrs
Highly Exceptional Intelligent					
Lord Buddha	Indian Saint	563 BCE	Achieved higher level spirituality, Mahanirvana	35yrs	B.P. ~ 32yrs. Around 32 -35 yrs Ep. (32 – 66) yrs
Ramkrishan Paramahansadev	Indian Saint	/ / 1836	At his childhood he was interested in spiritual matter. Became Priest of Dakshineswar Kali Bari at the age of 19 years and achieved higher level spirituality at the age of 28yrs	(05 – 28) yrs	B.P. ~ 9yrs, Around 9-28yrs EP. (9 – 32)yrs
Mahatma Gandhi	Social Reform India	02/10/1869	Adolescence, youthfulness was extraordinary, transgressions	(09 – till death)	BP = 9 yrs Around 09- …) EP (09-……)
St. Olav (Olav II Haraldsson)		995 AD	Legal code , Norway	29 yrs	B.P.=32yrs Around ~ 32yrs EP (09 – 32) yrs
St. Bridget	Catholic Mystic, Sweden	1304 AD	Holy of Savior, Sweden in 1346	43yrs	BP ~32yrs Around32 – 43yrs EP. (32-66)yrs
St. Augustine Zhao Rong	Chinese Priest	1746AD	Martyr , Chinese during 1785	39yrs	BP.=32yrs Around 32-39 yrs EP (32-66)yrs
Michel de Nostradame	Saint, France	14/12/1503	Les Propheties, France . Out of 12 predictions 10 have come true	52 yrs	BP ~ 66yrs Around 32-52 yrs EP (32-66)yrs
Mother Teresa	Social Serve to Humanity, India	26/8/1910	World famous for her service for humanity became famous in 1948	38 yrs	BP ~ 32yrs Around 32-38 yrs EP (32-66) yrs
Issac Newton	Scientist, UK	25/12/1642	Remarkable contribution in science, wrote “Principia” in 1687	22-44 yrs	BP = 32 yrs Around 22-44yrs EP (09-32)yrs
Satyendra Nath Bose	Statistical Physicist, Indian	01/01/1894	Discovery of Bose Einstein condensation in 1924-25	30 yrs	B.P. = 32yrs Around 30-32 yrs EP (09 – 32)yrs
Niels Bohr	Physicist, Denmark	07/10/1885	Discovery of Atomic structure model in 1913	28yrs	BP ~ 32yrs Around 28-32 yrs EP (09-32)yrs
Conrad Rontgen	Physicist, Germany	27/3/1845	Discovery of X-ray in Nov 1895	50yrs	BP ~ 66yrs Around 50-66 yrs EP (32-66) yrs
Subramaniam Chandrasekhar	Physicist India/America	19/10/1910	Estimation of white dwarf max. mass in 1930	20yrs	BP ~ 9 yrs Around 9-20 yrs EP (09 - 32) yrs
S W Hawking	Physicist, UK	08/01/1942	Proposed the idea of Blackhole radiation 1n 1963	21yrs	BP ~ 32yrs Around 21– 32yrs EP (09 – 32)yrs
P. M. Dirac	Physicist, UK	08/08/1902	Prediction on the Existence of Positron in 1932	30yrs	BP ~ 30yrs Around 30– 32yrs EP (09-32)yrs
John O,Keefe	Biologist	18/11/1939	Discovery of human brain cognitive mapping in 1978	49 yrs	BP =66yrs Around 49-66 yrs EP (32-66)yrs
Edvard Moser	Biologist	27/4/1962	Discovery of human brain grid cells in 2005	43yrs	BP= 32 yrs Around 32-43 yrs EP (32-66)yrs
May Britt Moser	Biologist	1963	Discovery of human brain grid cells in 2005	42 yrs	BP= 32yrs Around 32-42 yrs EP (32-66)yrs
D H Hubel	Biologist	27/2/1926	Discovery of how human brain works in 1959/1960	33/34 yrs	BP=32yrs Around 32-33 yrs EP (32-66)yrs
T Wiesel	Biologist	03/6/1924	Discovery of human brain function in 1959	35yrs	BP = 32 yrs Around 32-35 yrs EP (32-35)yrs
Roger Sperry	Biologist	20/8/1913	Discovery of human split brain in 1940	27 yrs	BP = 32yrs Around 27-32 yrs EP (09-32) yrs

Jean Christophe Yoccoz	Mathematician, France	03/06/1957	Development in Dynamical system published in 1984	27 yrs	BP = 32yrs Around 27-32 yrs EP (09-32)yrs
John Charles Fields	Mathematician, Canada	14/05/1863	Development in Symbolic Finite solution in 1986	23 yrs	BP = 32yrs Around 23-32yrs EP (09-32)yrs
Ricardo Perez Marco	Mathematician, Spain	1967	Development in Dynamical System in 1990	23yrs	BP = 32yrs Around 23-32 yrs EP (09-32)yrs
Stefano Marmi	Mathematician	1963	Dynamical system and Ergotic theory in 1990	27yrs	BP = 32yrs Around 27-32yrs EP (09-32)yrs
Charles Darwin	Biologist, UK	12/2/1809	Theory of Natural Selection published in 1837	28yrs	BP= 32yrs Around 28-32yrs EP (09-32)yrs
James Watson	Biologist, UK	06/4/1928	Molecular Structure of DNA discovered in 1953	25yrs	BP = 32yrs Around25– 32yrs EP (09-32)yrs
Francis Crick	Biologist	08/06/1916	Discovery of DNA Structure in 1953	37yrs	BP =32yrs Around 32-37yrs EP (32-66)yrs
Robert Kock	Father of Microbiologyt	11/12/1843	Discovery of Anthrax bacteria in 1876	33yrs	BP = 32yrs Around 32-33yrs EP (32-66)yrs
Robert Hooke	Father of Cytology	18/06/1635	Living theory of microscopic organism in 1665	30yrs	BP = 32yrs Around 30-32yrs EP (09-32)yrs
G. E. Hutchinson	Father of Ecology	30/01/1903	Theory of n-dimensional hypervolume in 1957	54yrs	BP = 66yrs Around 54-66yrs EP (32-66)yrs
Leonardo da Vinci	Artist/ Painter	06/04/1452	Famous Monalisa , Final form was completed in 1517	65yrs	BP = 66yrs Around 65-66yrs EP (32-66)yrs

Although we consider a few of such persons yet the realistic fact is the maximum number of contributions arise from the age of around 32 yrs. This means for genius the first tunneling barrier ~ 9yrs and for other exceptional intelligent cased the second tunneling barrier are very crucial.

For 3rd and 4th barriers—the contributions are less than that of 2nd barrier. This does not mean that the contributions of exceptional personalities are negligible. This is just for estimation of the brain function at the barriers. Although the number of world famous intelligent personalities are less yet the real fact is human brain can show its maximal efficient results around barrier point (BP) = 32 years, i.e. around the 2nd barrier of age 32years in comparison with that of other barriers 9, 66,83 yrs.

In the frame of brain network on the basis of modular community structure, a module is topologically seen as a subset of highly interconnected “modes” which are relatively sparsely connected to nodes in the other modules (see fig. 8). In the realistic scenario of human brain networks, the topological modules are often made up of anatomically neighboring and /or functionally related cortical regions, while the inter-modular connections tend to be relatively long distance.

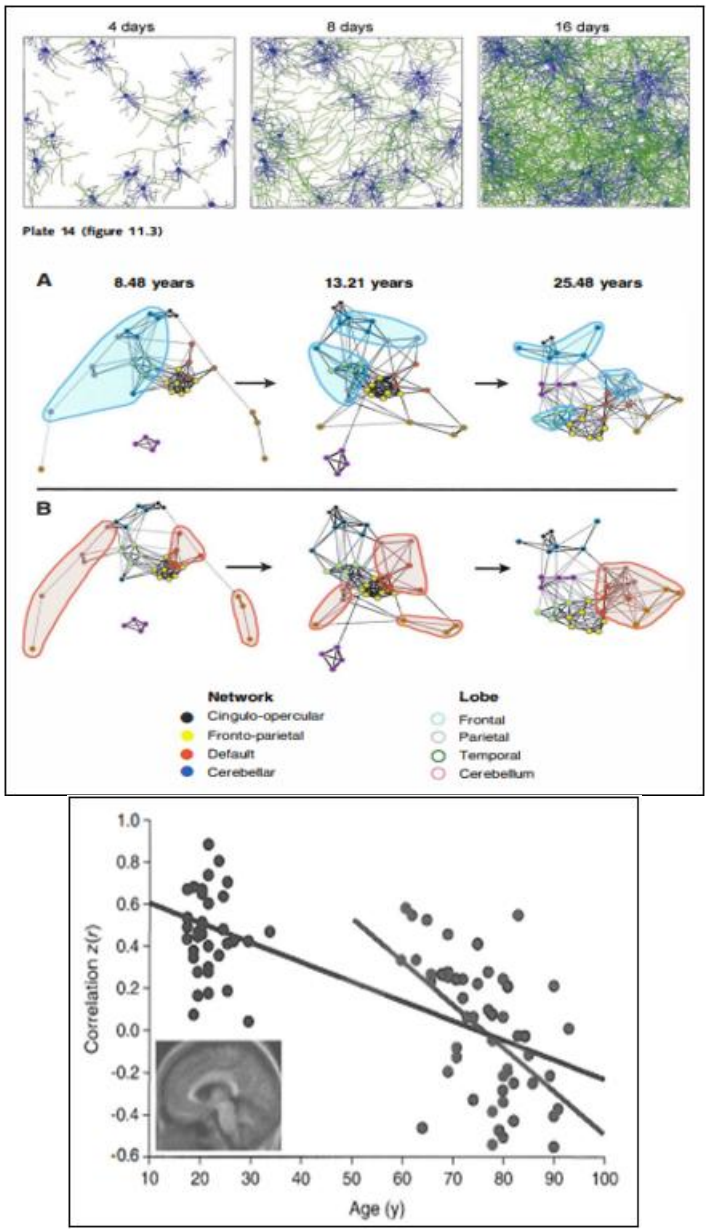

Figure 8: Schematic diagram showing **(Left)** the development of default and task-control networks from children to young adults. (**top row**) shows the plot of coherent cluster of frontal regions (light blue) whose members are anatomically close with functionally coupled ("segregation") while members (bottom row, red) member regions of the default network are functionally strongly coupled in the adult ("integration") are more widely dispersed and uncoupled in children. (adopted from ref. Fair et al [46]). **(Right)** Represents the reduced anterior-posterior functional correlations in aging indicating the relationship between the age of the participants and the strength of the functional connection between the medial prefrontal cortex and the posterior cingulated /retrosplenial cortex. Black dots→ young adult and gray dots→ older adults participants, respectively. (adopted from ref.[46], Courtesy and Copyright Andrews-Hanna et al 2007)

Based on the research (brain imaging, graph theory) in neuro-informatics, the human brain functions through a hierarchical modular organization (fig.8). Although human brain networks consists of thousands of nodes. The studies identify five key modules at the highest level of this hierarchy that govern brain activity which include: (I) Medial Occipital Module →associated with primary visual processing, (II) Lateral Occipital Module → associated with secondary visual processing, (III) Central Module →controls sensorimotor functions, (IV) Parieto-frontal Module → associated with the default mode / attention network (AN), and (V) Fronto-temporal Module →limited to symbolic processing and high-order cognition.

In brain modular system, each module executes a discrete cognitive function mostly autonomously or informationally encapsuled from the other modules [47] so that the computational load in one module is not heavily influenced by processing in other modules. In this context, in the brain function connector modes in a modular network keep a balance between modular and integrative processing [48]. So, the connector modes are potentially integrating information across the modules and coordinating connectivity between the modules i.e. modulations, direct connection between modules, that are not routed through connector modes. For example, evidence supports this idea that integration across modules occurs via brain region with strong connectivity across many modules. This implies that

connector mode regions are engaged in a diverse range of tasks [49,50].

Figure 8 shows individual frame-wise development of resting state functional connectivity as measured with functional magnetic resonance (fMRI) imaging at approx. ages of 8, 13, and 25 years. Note that the modulars have four connecting nodes. The members of this cluster become more widely dispersed across the network that developed later.

Functional Brain network and Partition

During the development functional brain networks continue to change throughout the adult time period and into senescence. In a study to examine the cortical activations using fMRI in the brains of young, middle aged, and older adults under rest and across a variety of encoding and recognition tasks Grady et al [51] found commonly deactivated areas exhibited an age-related increase during activation while task-related processing as well as accounting the observed age-related cognitive change. In another investigation Andrews-Hanna et al [52] found a reduced functional connectivity between anterior and posterior components of the default network, in particular the posterior cingulated and the medial frontal cortex (see fig.**8 (right)**). In order to explain this observed result Damoiseaux et al [53] suggested that it is possibly be a reduction in stimulus-independent mental activity with age when both anterior and posterior components of the default mode network exhibits reduced activity levels in elderly age. While others, i.e. Colizza and Vespignani 2008 [54], Balcan et al 2009 [55], proposed that heterogeneity of these networks can be solved through numerical simulations of multi-scale and /or agent- based models. Because (a) the ubiquitous features of human brain are involved in heterogeneous coupling and multiscale dynamics, and (b) brain connectivity which is organized on a hierarchy of scales from local circuits of neurons to modules of functional brain systems.

Multi-scale Newtork Artichetecture

In one side brain dynamics is inherently variable, consisting of sequences of transient spatiotemporal patterns i.e. a hallmark of dynamics of the above sequences of transients that are neither entirely stable nor completely unstable but instead may be called metastable. Significance is that these metastable dynamics unfold on an attractor in the form of a complex manifold with many mutually joined "pockets". While activity unfolds on multiple time scale from fast synaptic processes ranging from millisecond dynamics status to longtime (several seconds) changes in neural interactions. This means neural activity and behavior display variability over time indicate the cause of a variety of sources.

Using the network of multi-level architecture in the anatomically interconnected brain region Puxeddu et al [56] explored through simulation the connectome's architecture at multipole spatial and temporal scales

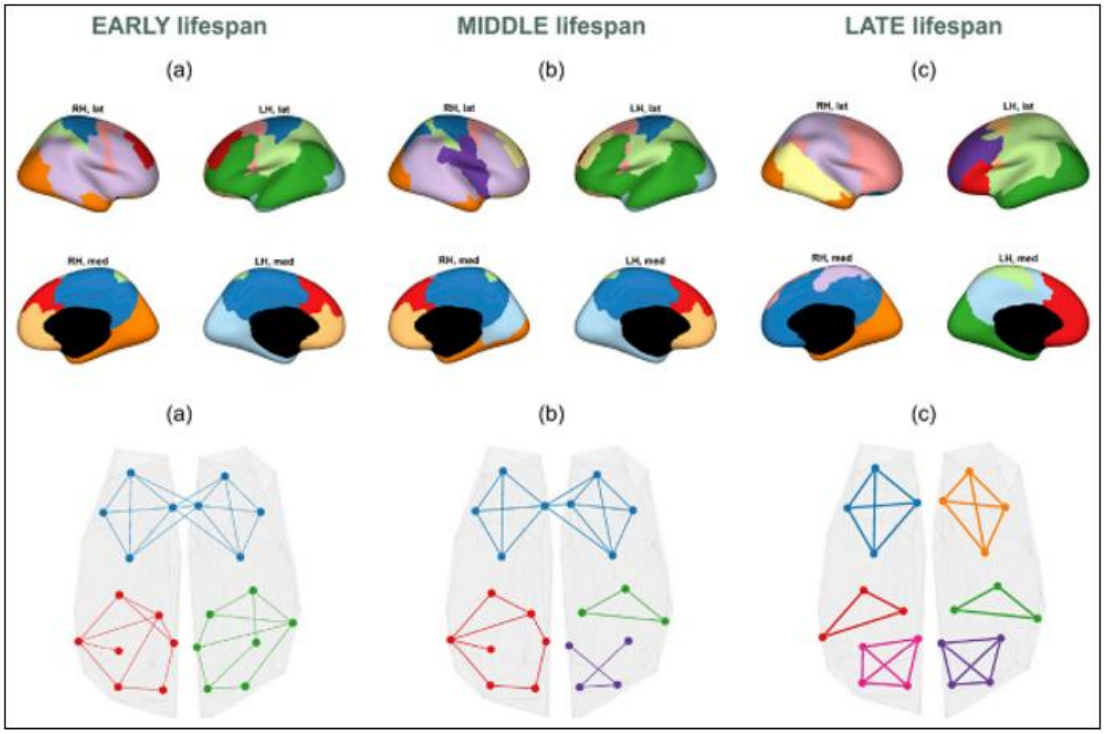

Figure 9: Shows the representative partitions (first row, panels a to c) and the corresponding toy model (second row) of the modular structure of the brain connectome in three phases: early, middle and late lifespan. Different colors indicate different clusters. In the toy model the thickness of the edges is proportional to their weights. (adopted from ref. [56])

(Figure 9) and found that

1) The human brain network can be parsed in several-physiologically and equally meaningful ways;
2) Observed modules with different sizes and degrees of variability across layer;
3) Their observed modules were on a specific subset so that the configured modules be in an intermediate time scale neither too fast nor too slow;
4) This results provide evidence that human brain exhibits age dependent modular organization in which (v) the

number of modules increased with age while their size decreases;

a) The modularity of the partitions reaches the highest values in two phases i.e. once in the early and the other one in the late life span;
b) The rate of the module's configuration increases with age and as a result,
c) The number of modules are more restricted to single cortical hemispheres.

The overall facts in the view of an ensemble-based multi-layer network approach about brain functioning are : (a) the existed link changes of structural connectivity pattern to development and aging, (b) the brain modular structure exhibits both "**linear"** and "**non-linear"** age related trends; (c) The communities in the early phase and late development phase are more modular. (d) Aging ultimately leads to a progressive and increasing configuration of modules and a redistribution across the hemispheres for remaining more stable throughout the lifespan.

This means that brain works in a unified frame-work rather than working independently to exhibit more stable age-related modules variation. In addition, consensus clustering produces a set of "partitions" or selecting a near-optimal representative partition so that the ensemble of output partitions can be described statistically or focusing on statistical consistency for important role of brain hubs (centrally embedded) for enabling efficient neuronal signaling and communication.

Correlation between Gray Matter Volume (GMV) and Scientific Creativity

Based on the assessment through creative achievement questionnaire Shi et al [57] studied (in 356 healthy young and using structural MRI) the brain structure responsible for scientific creativity (i.e. ability to produce original and valuable ideas) and found significant results (fig. 10) which are:

a) As per neuroimaging data analysis gray matter volume (GMV) of brain regions significantly correlated with scientific activities, in particular a "**Positive**" correlation with the regional GMV of the left middle frontal gyrus (MFG) and left inferior occipital gyrus (IOG).
b) Scientific creativity is associated with the executive attention network (EAN) and semantic processing;
c) No statistically significant differences between males and females in terms of age;
d) The global GMV is significantly related with scientific activity having covariation with the whole brain GMV and creativity.
e) Scientific creative achievement is "Positively" connected with GMV in left middle frontal gyrus (MFG) and left IOG implying that more in GMV deformation more active in scientific activity.

Gray matter volume (GMV), Networks and Genius

Studies of Einstein's brain showed that (i) his gray matter, in particular in the parietal lobe was 15% wider, and (ii) lacked of a common sulcus resulting a potentially allowing for more neural connections which is vital for mathematical and other spatial thinking, (iii) prefrontal cortex and motor / somatosensory areas had a higher density and (iv) unique organization of neuron in compare to that of in common people brain. In view of total volume, organization, density and connectivity of neurons, particularly in the specialized regions like parietal and prefrontal areas i.e. "**enhanced gray matter structure and connectivity in the key cognitive areas".**

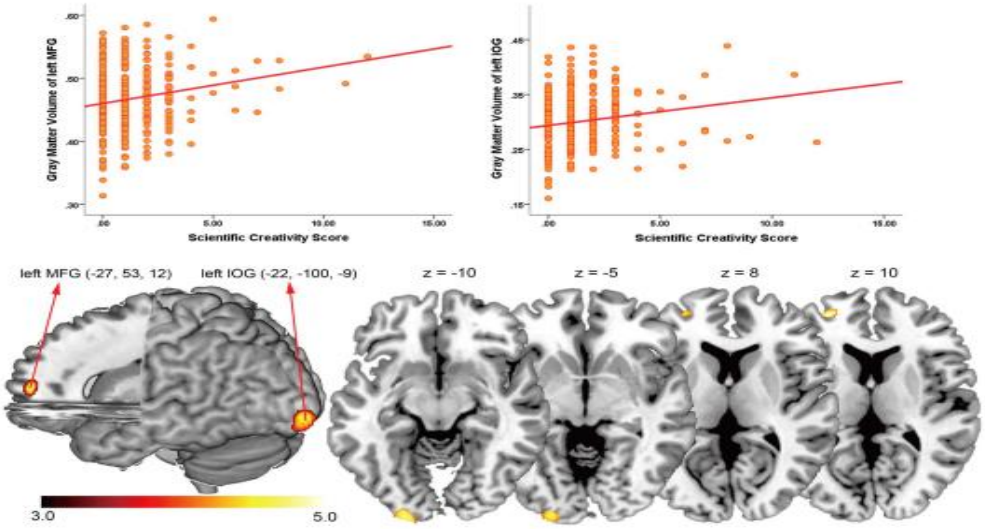

Figure 10: Shows the regions of correlation between GMV and scientific creativity score (adopted from ref. [57])

Searching of Genius through Einstein's Stolen Brain

Albert Einstein was one of the history's greatest geniuses. He was born in 1879 in the kingdom of Wurttemberg in the German Empire. He died on 18th April 1955 after a blood vessel burst near his heart. He had strict wishes for his body after his death with a specific instruction that his body to be cremated and scattered in such a way that the scattering of his ashes remain a secret so that those who idolized him wouldn't know where his remains were located. It is so unfortunate that Einstein wishes were not fully followed. Thomas Harvey, a pathologist who handled his body, went against Einstein's wishes and removed his brain for study purpose although he admitted to Einstein's family that he had stolen the brain and asked for permission to keep that stolen brain for investigational study

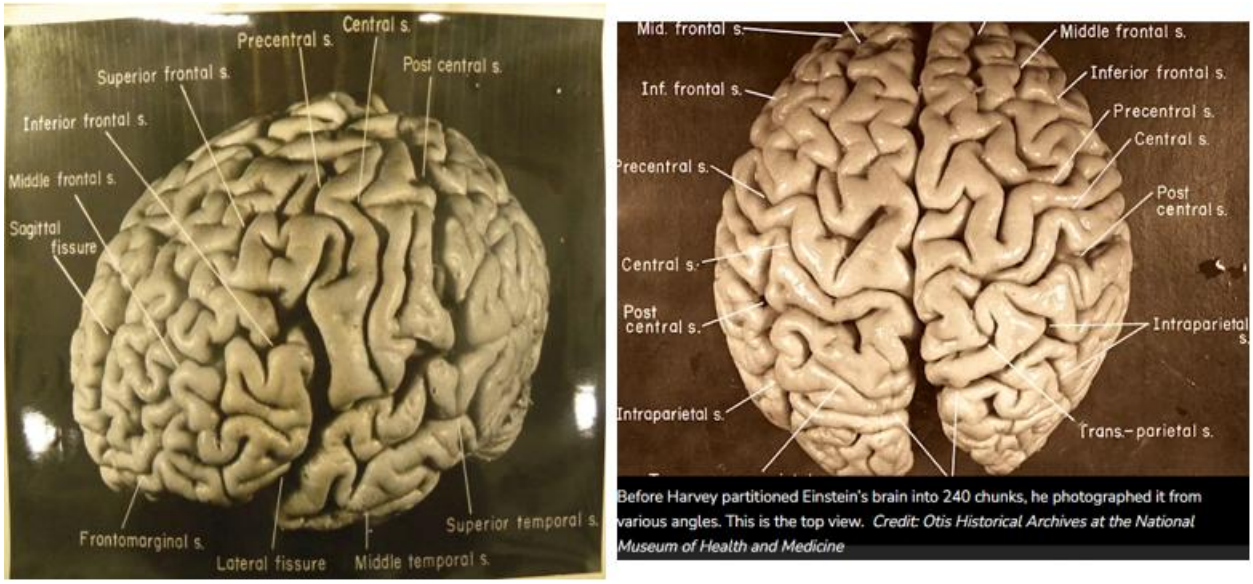

Figure 11: Photograph of Einstein's brain with labeling **(left)** top view before slicing (Courtesy & Copyright © National Museum of Health and Medicine) and **(right)** side view (Image credit: Evi Numen, 2011, Courtesy & Copy right © Mütter Museum of The College of Physicians of Philadelphia.)

purpose. During the course of investigational study Harvey cut Einstein's brain into 240 pieces (slices) and kept pieces housed in two jars of **celloiden to preserve them.**

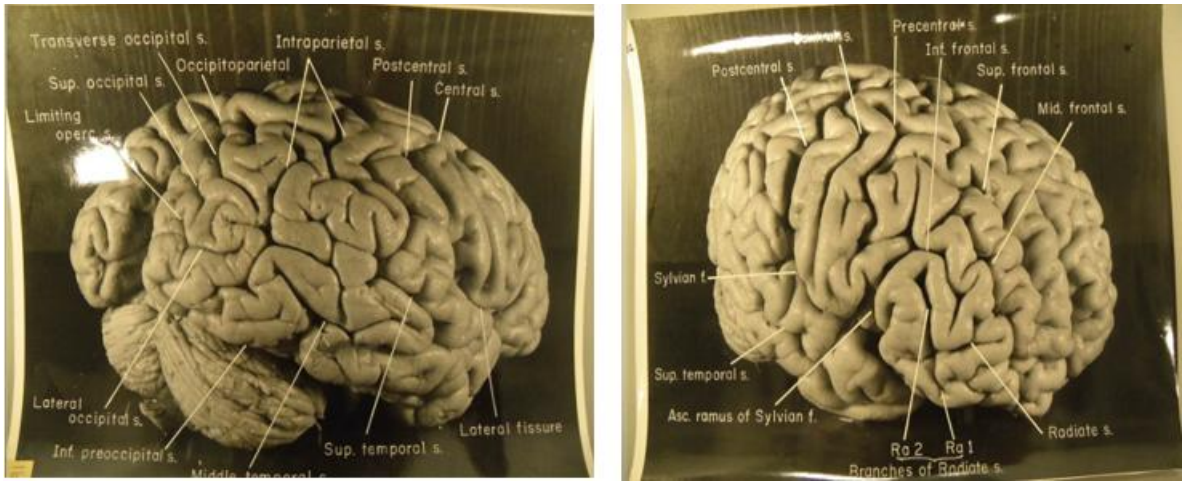

Figure 12: Photograph of Einstein's brain (left) indicating **Extraordinary Gray Matter with more Folds, Beautiful Asymmetry but (Right) Naturally Brainy (**Image credit: From Falk, Lepore, and Noe, 2012, Courtesy & Copy© National Museum of Health and Medicine)

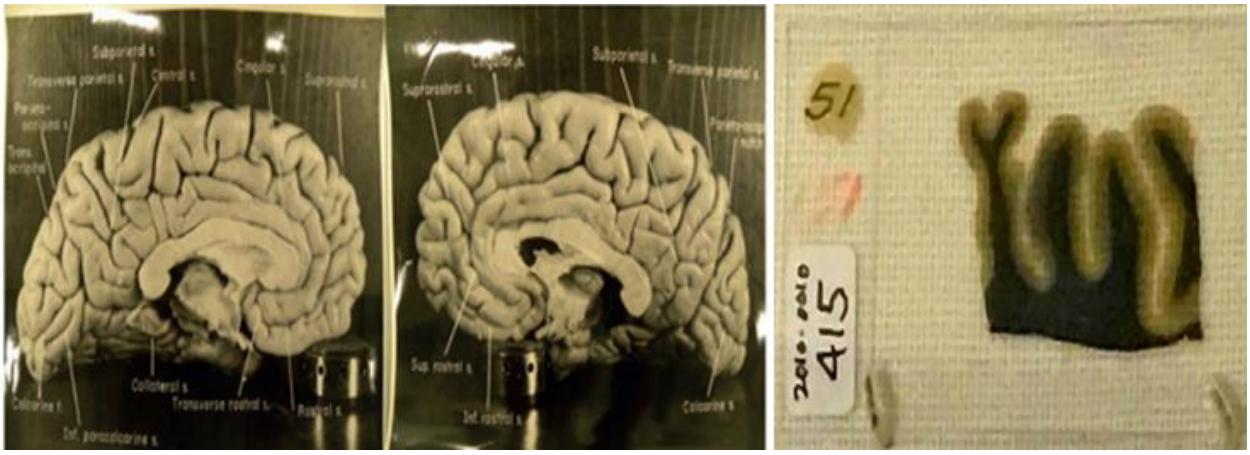

Figure 13: (Left) shows the photograph of the left (L) and right (R) medial surfaces of Einstein's brain with original levels (adopted from ref. Falk et al [58], Courtesy and copyright © National Museum of Health and Medicine). **(Right)** photograph of slices of the same brain. Gray matters (Courtesy and copyright © National Museum of Health and Medicine)

A lot of investigations have been made on Einstein's brain through the preserved sliced brain. The significant findings about Einstein's brain as reported are:

(a)***According to Harvey's grand conclusion-*** "Einstein's brain looked "different" from most brains, ergo it must have functioned differently".
(b) ***More Foldings (Gyrifications)-*** Einstein's cerebral cortex, the gray matter (GM), surface (which is responsible for consciousness thought) exhibited much more complicated and elaborate folding than that of in average brain.
●Inference → This increased surface area implies, as speculated by scientists, that it allowed for more connection between distant brain cells resulting which potentially enabling the "mental leaps" necessary for complex problem solving.
(c)**Atypical Sulci (Grooves) —** Absence of groove i.e. the Sylvian fissure (normally this separates parts of the parietal lobe).
●Inference → This, as a unique feature that scientists believe, has created an "extraordinary large expanse of highly integrated cortex" i.e. formation of special region which is capable to allow neurons to work together more easily as if within a functional network.
(d) ***Enlarge Parietal lobes***—The inferior parietal region was upto 15% wider than average due to the lack of a typical sulcus.
● Inference → Scientists speculate this area is strongly linked to the visuo-spatial cognition, mathematical though and imaginary of movement that can provide very very crucial skillness that were required for developing the "Theory of Relativity".
(5) ***Thinner but denser cortex in some areas-*** By analysis of slices of Einstein's brain it was found that the cortex, in some regions like Broadmann Area 9, was actually thinner, nut the density of nerve cells was higher.
● Inference → This situation may be related to that capabilities which needed enhanced processing.

However, analysis based on the photos of 240 separate slices indicates the function of the locations of some of the brain segments, according new researches, are unknown.

Summary of importance differences of Einstein's brain compared to ordinary or general brain:

1) The extensive development of the inferior parietal region on both sides of Einstein's brain was 15% wider. This 15% wider in the size of brain matter in the crucial area which are responsible for mathematical thought.
2) Einstein's brain was unique as it did not have a groove, called a sulcus, that normally runs through the part of this area. Researchers speculate that the absence of the groove may have allowed more neurons in this area to establish connection each other and to work together more easily so that possibly creating an "extraordinary large expanse of highly integrated cortex within a functional network ".
3) As the anatomical study of Einstein's brain from the preserved after his death at the age of 76yers represents a venture on the sensitive terrain only.
4) The weight of Einstein's brain was not different from that of centrals which clearly indicates a large (or heavy) brain is not required or a necessary condition for exceptional intellect or genius.
5) The structure of gray matter (GM) i.e. its volume and folding patterns in the key region associated with intelligence of Einstein was complex indicating an involvement of efficient connectivity through which white matter (WM) and environmental factors.
6) A positive correlation has generally been found between overall gray matter volume and general intelligence. But in the case of Einstein a larger gray matter volumes found in specific areas, particularly in the prefrontal, parietal and temporal cortices.
7) Researchers found in Einstein's brain a revealing fact of unique folding pattern and also an "extra fold in his right parietal lobe in the crucial region responsible for spatial and mathematical reasoning i.e. unique structural feature is essential for extraordinary intelligence.
8) White matter (WM) generally acts as a communication network by connecting different gray matter regions as well as by enabling rapid, efficient signal transmission across widespread brain area. In Einstein's brain an enhanced connectivity has been observed indicating that this is crucial for highly intelligent individuals or genius for quicker and more complex thinking.
9) Our current understanding is that genius- an extraordinary intelligence follow the efficient use of specific brain structure, not just in size.
10) Although increased gray matter volume (GMV) and complex folding are enable to exhibit higher intelligence but their interaction with white matter connectivity and life long experience ultimately leads to manifest as "Genius" intelligent power.
11) Regarding human brain development and plasticity — gray matter volume (GMV) generally increases until around age 8 and after which its density increases into early adulthood such that the involved process maintains a link to further mental development. This means the brain's ability to adapt (neuro plasticity) leading to change in gray matter structure towards learning and experience remains unclear.
12) White matter constitute 60% and gray matter makes up about 40% of the brain but white matter forms the required connections (i.e. like highways) by allowing different gray matter regions to communicate efficiently. Although gray matter (GM) contains the majority of the brain's neuronal cell bodies but for "highly gifted individuals or genius" the fact is more active white matter have been found responsible for quicker, more complex thinking by enhancing communication speed between neurons.
13) Some research findings suggest that highly intelligent individuals are more efficient "at using their neurons, possibly through the selective elimination of unused synapses (i.e. only using particularly networks bypassing the others) leading to better, overall brain circuitry rather than just more gray matter. This means extraordinary individuals are capable to select that particular network, not using the rest of other networks, during their thinking period.

14) Prefrontal cortex of Einstein's brain was an extraordinary that may lead to responsible for his remarkable cognitive abilities.
15) The overall size and asymmetrical shape of Einstein's brain were normal, (size was slightly smaller and lighter than average), but the prefrontal, somatosensory, primary motor, parietal, temporal and occipital cortices were extraordinary.
16) Witelson et al [59], on the basis of theoretical investigation, suggested that "the parietal lobe was responsible for the generation and manipulation of 3-Dimensional spatial images and the mathematical representation of concepts" which were essential for thought experiment in the theory of relativity.

Brain Connectivity, Microgravity, Tachyon's role on Genius

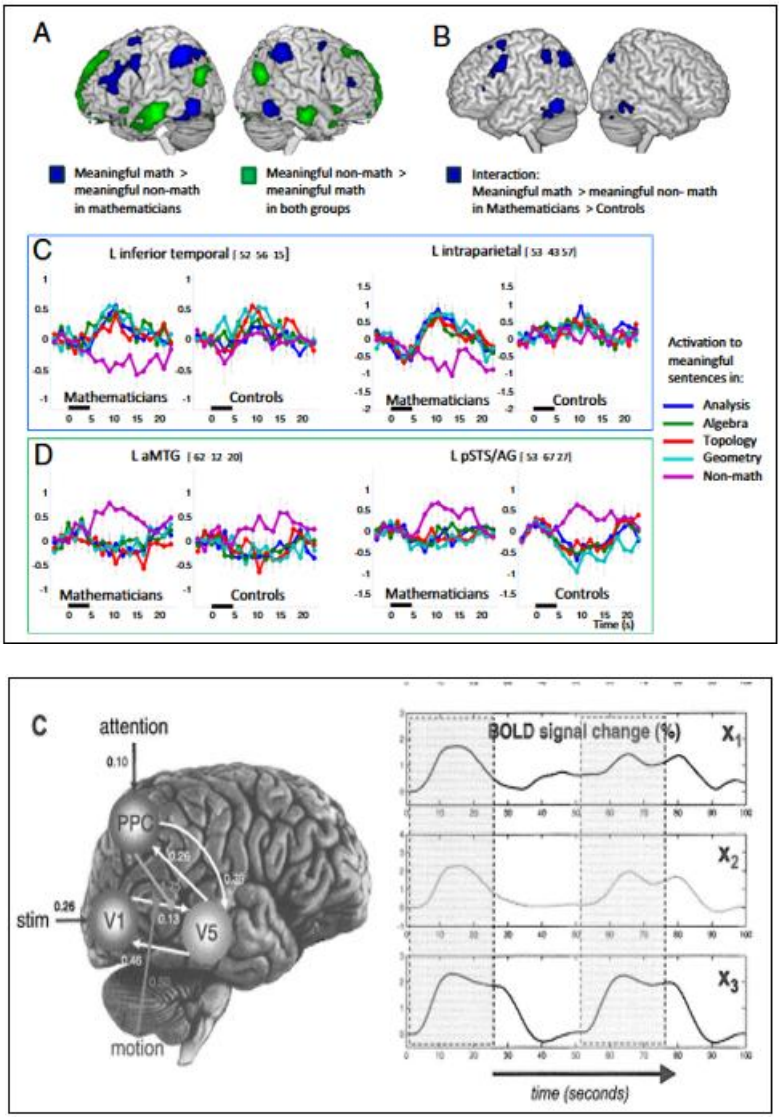

Figure 14 : (Left) shows distinct brain areas for mathematical expertise and for general semantic knowledge with (A) for whole brain view of areas activated, (B) for Mathematical expertise effect, (C) for Mathematics and (D) for non-Math activities.(adopted from ref. [59]) **(Right)** A representation of effective connectivity of a nonlinear neural model involving three neural regions (XI-X3) and their interconnections. Regions XI and X3 receive external inputs and the output of region X3 modulates the (C). Activity in the posterior parietal cortex (ppe = X3) was found to modulate the efficacy of the connection from visual area VI (XI) to V5 (X2) and thus the effect of sensory stimulation (stirn). (Adapted from ref. [60]; Courtesy and copyright Stephan et al. 2008 [61])

Computer simulation approach provides rich information on spatiotemporal structure of complex systems, explore complex physical processes occurring in human brain, in particular extraordinary variety and complexity of neural activity pattern. For example, (as shown in figure 9) the possible developmental scenario of default and task-controlled network active from childhood to young adult phases in human brain. Figure 14 shows the distinct areas of human brain that are associated with mathematical works for mathematical expertise and scientific knowledge. Note that an effective connectivity of nonlinear neural network is involved.

Tachyon, Superluminal photons in Brain Microtubules and Metamaterials

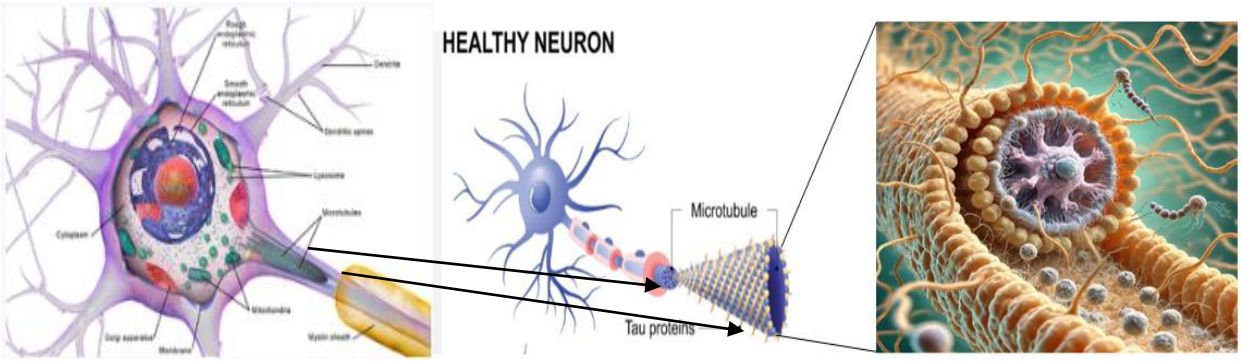

Figure 15: Schematic diagram showing human brain cell (**left**), neurons and microtubules (**right**) (adopted from Dougherty [62])

It is suggested from several studies [63,64] that theoretically human brain can be considered as supercomputer in which superluminal evanescent photons are generated inside its microtubules (satisfying the time scale ~ 10^{-13} sec, associated with consciousness as per Tegmark [65]) and the tunneling photons at room temperature can also be assumed as superluminous particles i.e. Tachyons. Significance is that on the basis of non-local property of Tachyons they are capable to exert an influence around the space outside the brain.

Checking the Brain-Computer Interface BCI) effect through applicable for the Paralyzed Patient

In human brain, neurons are the main constituents of the brain and microtubules associated with these neurons play important role for human consciousness in the form of resultant of quantum gravity effect. Note that Jibu et al [66] proposed the conscious process in human brain is associated with "***macroscopic*** "condensates of massive evanescent photons which are generated from the general biological cell function due to dynamical effects of electromagnetic interaction among electric dipoles in biological systems. According to Haneroff [67]- these microtubules in the brain were acting as waveguides for the evanescent photons and quantum tunneling of these photons, acting as Tachyons, through theses microtubules finally exhibit holographic effect. In order to explaining these phenomenon Ricami [68] claimed that

a) Tunneling photons gained superluminal group speed (like groupvelocity) when the tunneling photons travels in an evanescent mode (similar to elementary particles);
b) It reveals a highly plausible situation that it is not the microscopic quantum mechanical system of electrons rather a "***macroscopic quantum ordered dynamical system of evanescent photons in the brain*** ".
c) This system plays an essential role in realizing long range biological order in living system.
d) Here, the significance is that this superluminal pulse propagations allow consequent superluminal exchange without a violation of causality in the electromagnetic metamaterials [69].

In this context another important correlation, suggested by Laszlo [70], with all other parts are:

a) The mind of one person appears able to act on the brain and body of another;
b) Based on the observation that madness people are capable to display a capacity showing spontaneous transference of impression and images under that situation when they are emotionally closer to each other.

This indicates that human brain functions like a conventional computer system with quantum type processing such that it appears in living organisms like a macroscopic quantum system in some respect. This situation can explained only when the superluminal particles or Tachyons are functionable in the brain [69].

Regarding the change in the functional brain network throughout the adult life span Andrews-Hanna et al [52] found a reduced functional connectivity between anterior and posterior components of the default network, specially the posterior cingulate and the medial frontal cortex as shown in figure 8. They found both anterior and posterior components of the default mode network exhibited a "reduced activity levels in the elderly phase, "possibly reflecting a reduction in stimulus independent mental activity with age. This means that small world attributes of brain functional networks were also affected by age with an indication of decrease in global efficiency. This means the heterogeneity of these networks through heterogeneous coupling and multiscale dynamics are the ubiquitous feature of human brain. Thus, brain connectivity is nothing but an organized on a hierarchy of scales extending from local circuits of neurons to modules of functional brain system. Neural dynamics at each scale, therefore, is determined not only by processes with scale but also by the dynamics at smaller and larger scales such that the dynamics of a large neural population depending on the interactions among individual neurons that is upholding at smaller scales, as well as on the collective behavior of large- scale brain system including brain-body-environment interactions.

Based on the above mentioned two important properties- (i) the evanescent photons generated inside microtubules are superluminal, and (ii) superluminal pulse propagation is possible in electromagnetic metamaterials without violating causality, Musha and Calgiuri [70] made a thought experiment (applicable for paralyzed patient) and found that if the inner medium of microtubule possesses the characteristic of a metmaterial with negative refractive index then tunneling photons will propagate "loss-lessly" inside the neuron's microtubules. In other words, human brain follows the hypothesis quantum computation by utilizing superluminous photons created inside microtubules [71] and memory within the brain could be due to a holographic mechanism of storing and retrieving superluminal photons

(figure 16). They also suggested that brain functions could be the result of superluminal photons which are capable to perform, both quantum computation as well as manipulate the storage and retrieval of stored data in the brain (figure 17). In other words, superluminal coherent photons perform two functions by allowing brain (a) one for recording, and (b) another one in retrieving the stored quibit memory holographically. We consider these two functions (figure 18) as two images of Tachyons i.e.

(A) Recording as generation of superluminal photons or Tachyons inside the brain and its flow within the brain (i.e. first incoming image of Tachyons), and (B) retrieving the stored quibit data / memory as second image of leaving photons or Tachyons (i.e. late- stage performance as departing image).

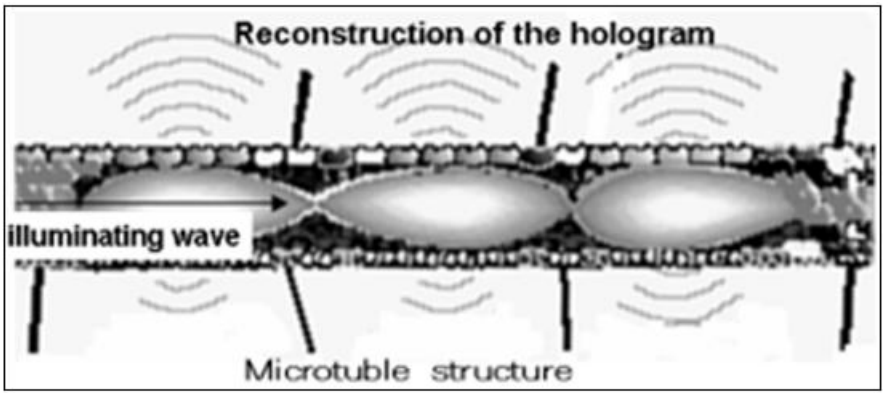

Figure 16: Shows schematically the Microtubule structure and the reconstruction of the hologram image as obtained by Musha and Caligiuri 2015 [70]

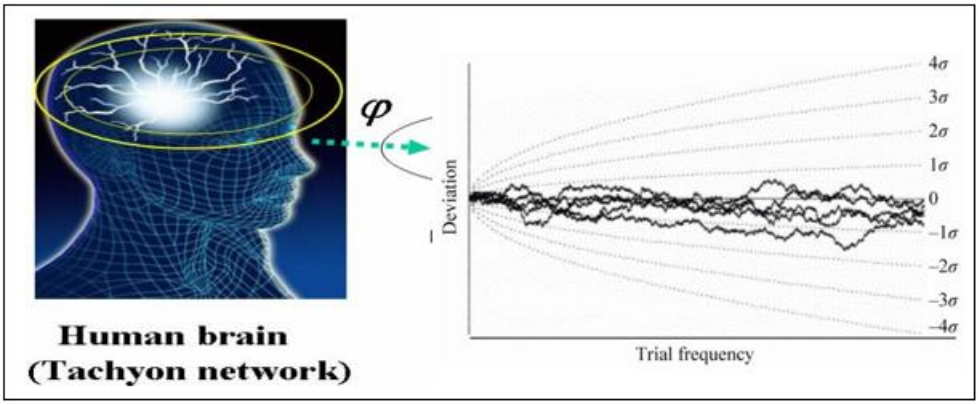

Figure 17 : Schematic diagram showing (**left**) Tachyonic field in the brain, and (**right**) experimental results of Brain-Computer-Interrface (BCI) indicating the possibility of human's thought as obtained by Musha and Sugiyama 2011 [71] (figures adopted from the same reference [71])

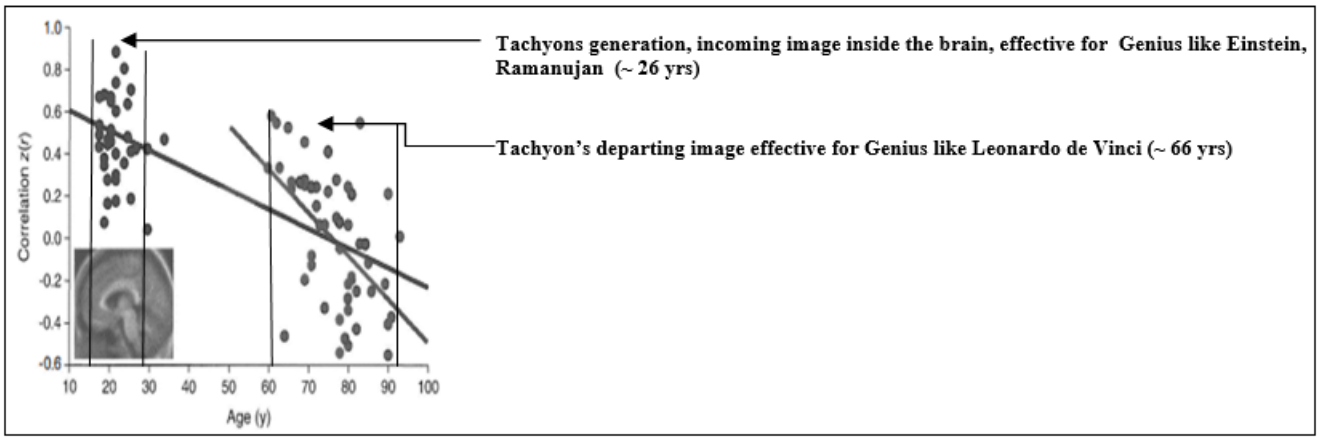

Figure 18: shows two distinct, separate regions as per anterior-posterior functional correlation in age which clearly indicates Tachyon's Double Image Effects — one at (10 – 30)yrs and other one at (60 – 90) yrs. that are responsible for Genius of Scientific activities (~ 26 yrs) and Artistic activities (~66yrs), respectively. (Modified figure (of the original figure 8) by this author)

2. Conclusion

HollographyView vs Tachyons, vs Einstein's Brain

Although Einstein did not support the fact- "The existence of particles that can travel with the excess of "c", the speed of light. But Sudarshan and his collaborators, particularly Sudarshan and Narlikar [12] first proposed that superluminal particles like Tachyons that (a) can travel at a speed more than the speed of light, (b) their existence is possible, (c) in respect of cosmological origin these Tachyons are still exist as present time. Till date Tachyons are not yet detected. As these possess special characteristic – the double image effect i.e. when Tachyons pass through a point in space, two images would be seen by the observer — one on appearing and the other one at departing images. Mythological view hints that darkness inside the human brain as a "black box" offers the scientists a suitable place where Tachyons can be detected in the form of its functional effects that is quite different from the general or common. Anatomical studies correlating with human brain-computer-interface (BCI) suggest that superluminal photons, created inside the microtubules, are capable to produce superluminal photons inside the human brain and can be considered as Tachyons [69,70] on the basis of Holographic view of brain memory mechanism [71], using evanescent superluminal photons; superluminal coherent photons created in brain microtubules having metamaterials [72], superluminal tunneling in brain's constituents [73], superluminal boosts [74], complete darkness on brain neuroplasticity [75]. Modular network model of human brain shows a reduced anterior-posterrior functional correlation in aging indicating two separate regions- one between (10 – 30) yrs and the other one between (60 – 90) yrs. From the investigation of genius personalities like Ramanujan, Einstein, Newton, various Nobel Laureates it is found that scientific activities received its peak around the age ~ 26 yrs i.e. near the second barrier of age 32 yrs in the adolescence brain epoch, while art related activity peak arises at ages ~ 66yrs (i.e. the third barrier). I compare these results with the correlation of scientific brain activities and found

a) for Einstein's brain peak activeness were occurred at ~ 26 yrs. (when he published his seminal paper on Theory of General relativity.
b) Comparison of superluminal photons, tachyons, with brain associated activities with Tachyon's double image effects clearly indicates that Tachyon's peak image of appearing occurred at ~ 26 yrs (i.e. appearing image) and that of departed at ~ 66yrs (departing image);
c) The above facts undoubtedly show that Tachyons might be created inside the human brain i.e might be crucial and indispensable role for exhibiting these two images
d) Although gray matter (GM) deformations have significant role in brain's geniusness.
e) The similar type effects might occurred only for Genius Einstein but for Ramanujan also. Even, the living legend genius Suborno Issac Bari offers a chance to the scientists for investigation of the exact role of superluminus photons, Tachyons towards unraveling the secrets of the Genius.

The author encourges the Brain Research Community to search (1) tachyon-like behviour, and (2) the existence of 5th order non-linear oscillation in human brain network counterpart during their investigations towards understanding the realistic physics of "Genius".

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