

# Possibility of Quantum Computation in the Brain from the Standpoint of Superluminal Particles

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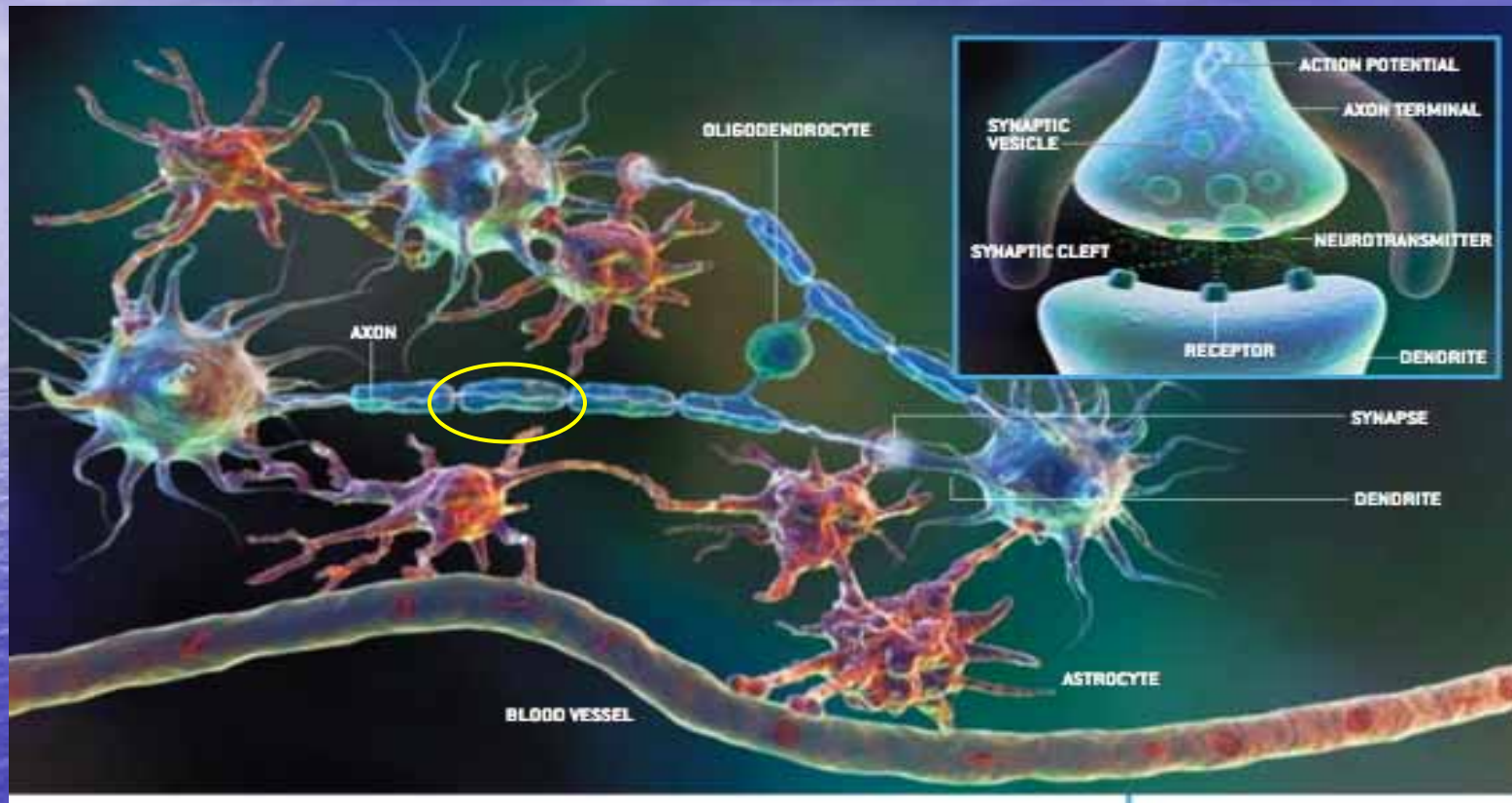
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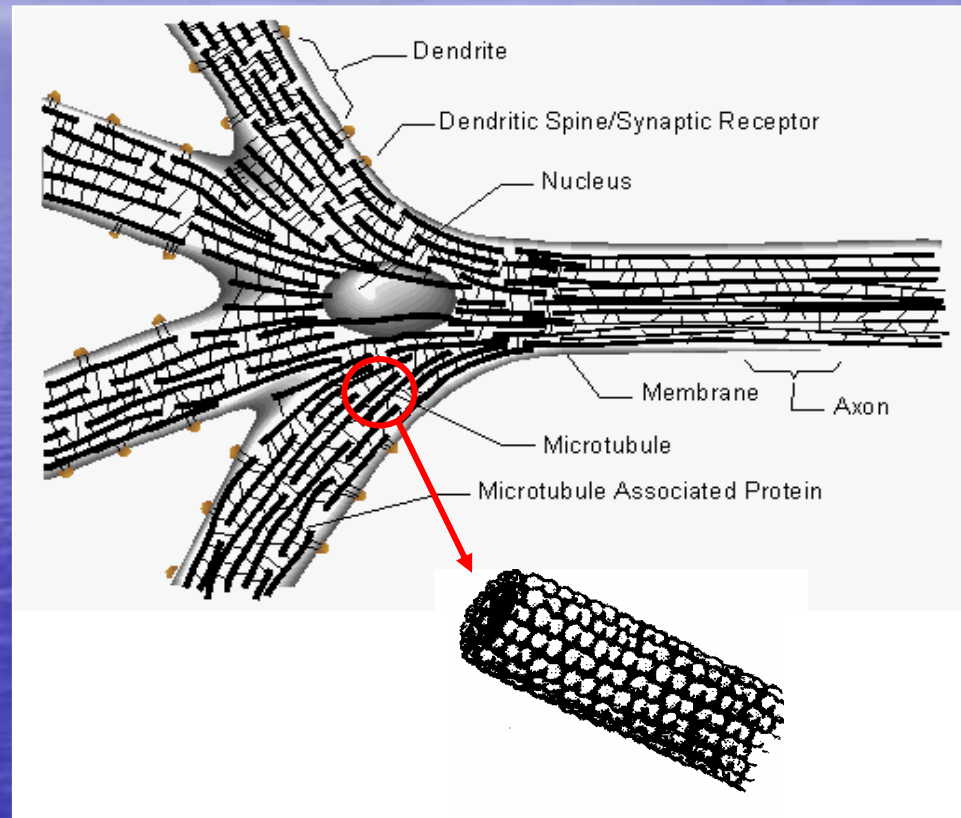
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# Structure of the human nerve system



Specific form of quantum computation is conducted at the level of synapses among brain neurons suggested by Hemeroff and Penrose.

# Structure of the microtubule



Microtubules in brain neurons function as quantum computers (Hameroff, Penrose)

## Quantum decoherence time of the human brain

Unruh (1995)

The time required in quantum computation must be less than the thermal time scale  $\hbar/k_B T$ , which yields  $2.6 \times 10^{-14}$  sec at the room temperature ( $20^\circ C$ ).

Tegmark(2000)

$$\tau \approx \frac{D^2 \sqrt{mk_B T}}{Ngq_e^2}$$



Microtubules would cause decoherence on the order of  $\tau \approx 10^{-13}$  sec, which is slower by a factor at least  $10^{10}$  than the time scale of neuron firing,  $\tau \approx 10^{-3} \sim 10^{-4}$  sec .

# Evanescent photon in a superluminal mode

(Klein-Fock-Gordon equation)

$$\left( -\frac{1}{c^2} \frac{\partial^2}{\partial t^2} + \nabla^2 - \frac{m_*^2 c^2}{\hbar^2} \right) A(x, t) = 0$$



$$A(x, t) = A_0 \exp\left[ -\frac{Et + px}{\hbar} \right]$$

Tunneling photons traveling in an evanescent mode can move at a superluminal speed.

# Minimum energy required to perform quantum computation

(Subluminal particle)

$$E_0 \approx \frac{\hbar \nu_G L}{T} 2^L$$

(Superluminal particle)

$$E'_0 \approx \frac{\hbar \nu_G L}{\beta(\beta - 1)T} 2^L$$

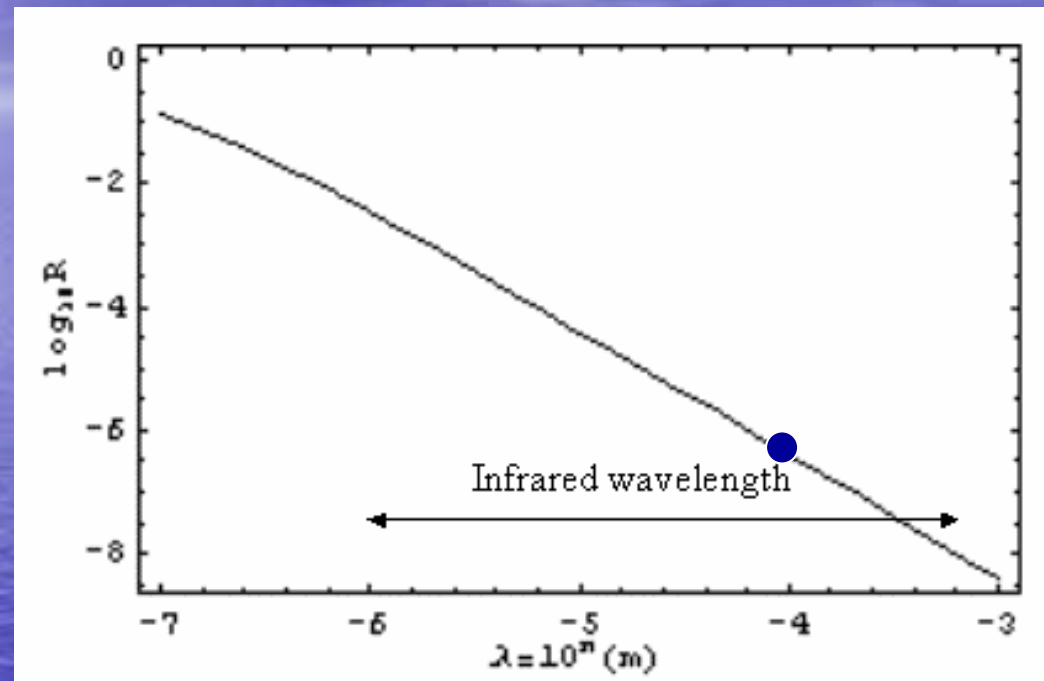
$$\beta \approx 1 + \frac{c}{2\omega d} + \sqrt{\frac{c}{\omega d} + \frac{c^2}{4\omega^2 d^2}}$$



(A) Energy ratio

$$R = \frac{\langle E_* \rangle}{\langle E \rangle} \approx \frac{1}{\beta(\beta - 1)}$$

## Ratio of the energy (human brain/silicon processor)



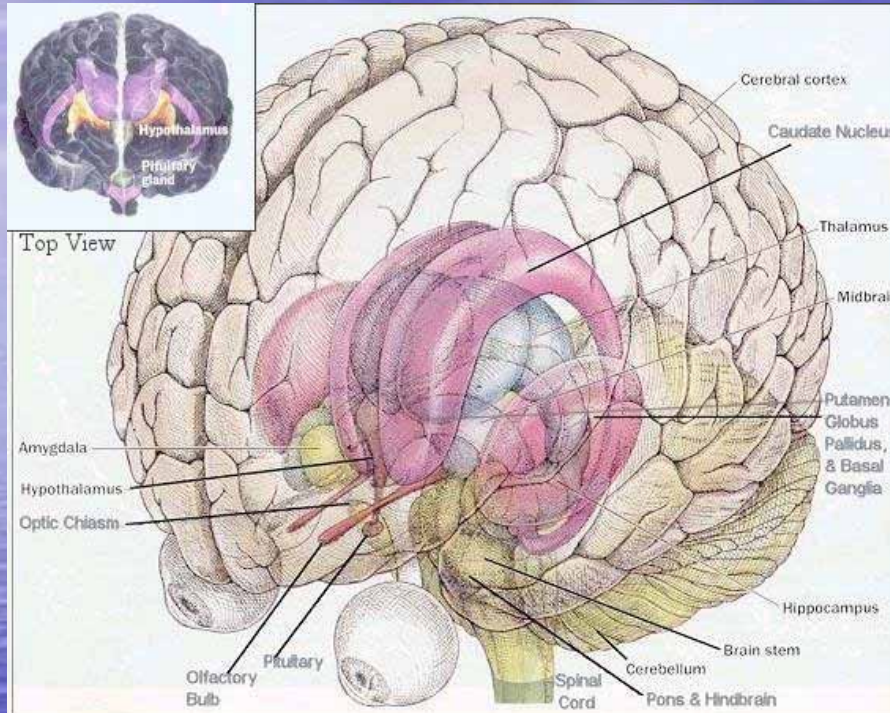
As human brains consume the energy 500kcal per day, the energy ratio of the human brain and the silicon processor becomes

$$R = 4.2 \times 10^{-7}$$

which is similar to the calculation result.



# Decoherence time obtained from the tachyon hypothesis



Decoherence time (L.Diosi, 2005):

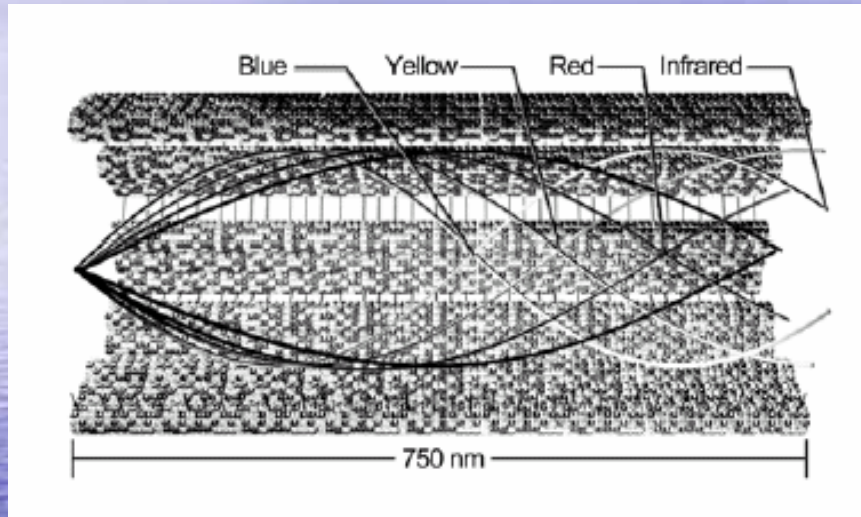
$$t_D = \frac{\hbar^2}{\tau} \frac{1}{(\Delta E)^2}$$

$$\tau'_D / \tau_D \approx (E_0 / E'_0)^2 = [\beta(\beta - 1)]^2$$

$$\tau'_D = \tau_D \times [\beta(\beta - 1)]^2 \approx 0.03 \text{ sec}$$

This satisfies the decoherence time,  $10^{-5} \sim 10^{-4}$  sec, which is required for conducting quantum computation estimated by Hagen, Hameroff and Tsuzynski, and that also satisfies the time scale of neuron firing given by  $\tau \approx 10^{-3} \sim 10^{-4}$  sec.

## Waveguide function hypothesis of the microtubule for evanescent photons



Consciousness can be result of quantum computation via applied by short laser pulses quantum gates within the brain cortex.

(D.D.Georgiev)



$$d \ll \lambda$$

This mechanism cannot be used for manipulation of qubits inside the microtubule because the wavelength of the emitted photons is two orders of magnitude longer than any average sized microtubule.

- The infrared waves can not be used for manupulation of the water qubits inside the microtubule.

# Hypothesis for the medium inside the microtube

Inner medium of the microtube possesses the characteristics of negative refractive index similar to the metamaterial.



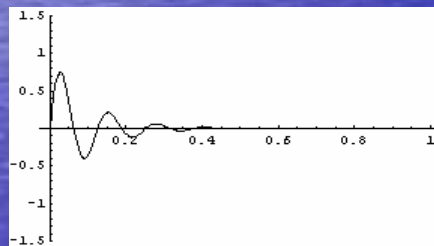
(Left-handed media)

Evanescent mode

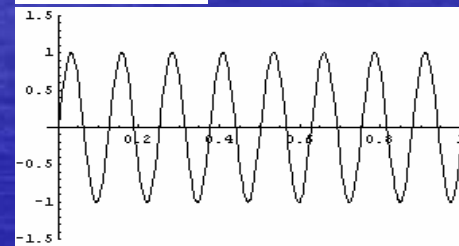


Propagation mode

$\epsilon < 0, \mu > 0$  or  $\epsilon > 0, \mu < 0$



$\epsilon < 0, \mu < 0$



$d \ll \lambda$

• In negative index materials, the evanescent waves are actually enhanced.

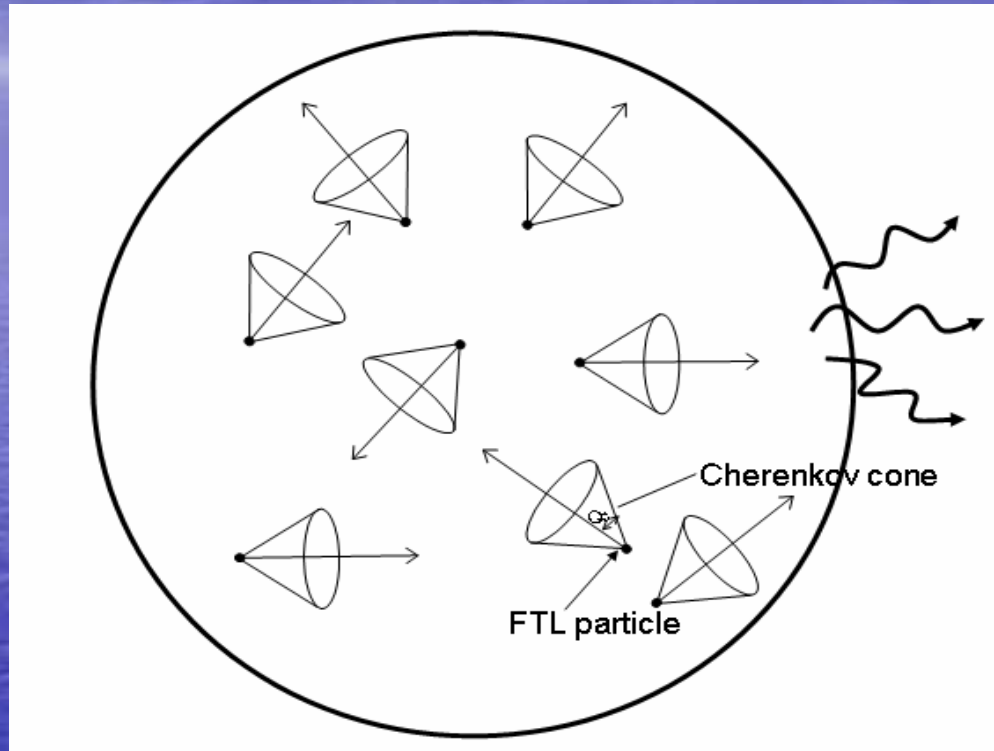
- Impairment of consciousness such as Alzheimer's disease might be due to the lack of negative refractive index material in a brain.

## **Biophotons radiated from living systems**

- **Biophotons(BPHs) are weak photons within or emitted from living organism.**
- **BPH emission exists not only in UV band but also in visual and may exist in infrared bands.**
- **Spectral distribution of BPHs strength is rather flat without special peaks.**

**Living systems are functioned by the superluminal information fields (tachyon field).**

# Chrenkov Radiation from superluminal particles in a vacuum



$$\langle \rho_E \rangle = \frac{\hbar \omega^3}{2\pi c^3} T_*(\omega) \frac{\sum_{k=0}^{\infty} k e^{-k\hbar\omega/k_B T}}{\sum_{k=0}^{\infty} e^{-k\hbar\omega/k_B T}} = \frac{\hbar \omega^3}{2\pi^2 c^3} \exp\left(-\frac{\gamma l_p}{c} \omega\right) \cdot \left[ \exp\left(\frac{\hbar\omega}{k_B T}\right) - 1 \right]^{-1}$$

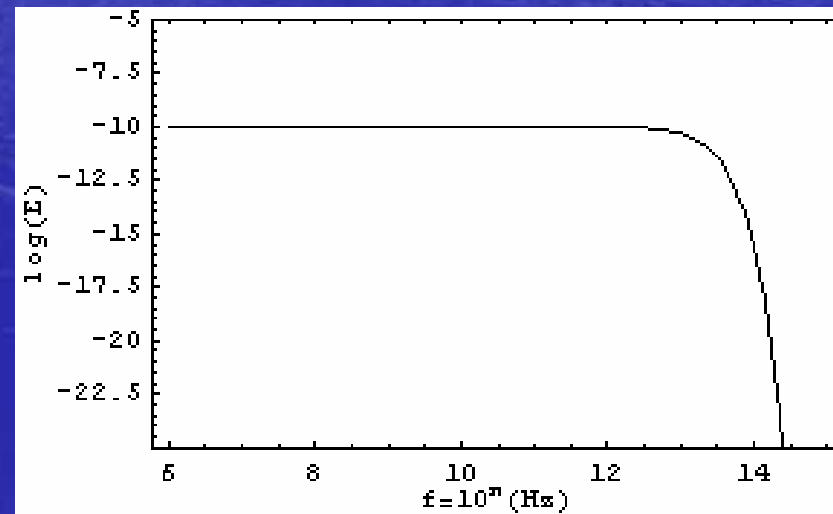
# Electromagnetic field from the human body



(Poisson distribution)      (Black-body radiation)

$$(\Delta n)^2 = \bar{n} + \bar{n}^2 / N_m \quad \rightarrow \quad \bar{n} = \frac{1}{\exp(\hbar\omega / k_B T) - 1}$$

$$\langle \rho_E \rangle = \frac{\hbar\omega^3}{2\pi c^3} T_*(\omega) \frac{\sum_{k=0}^{\infty} k e^{-k\hbar\omega / k_B T}}{\sum_{k=0}^{\infty} e^{-k\hbar\omega / k_B T}} = \frac{\hbar\omega^3}{2\pi^2 c^3} \exp\left(-\frac{\gamma l_p}{c} \omega\right) \cdot \left[ \exp\left(\frac{\hbar\omega}{k_B T}\right) - 1 \right]^{-1}$$



Spectral distribution of bio photons is flat without special peaks.

# Non-locality of the tachyon field

(Feinberg)

$$\left( \frac{\partial^2}{\partial t^2} - \nabla^2 - \mu^2 \right) \phi = 0$$

$$\phi_k(x) = \frac{1}{(2\pi)^{3/2}} \exp[i(\mathbf{k} \cdot \mathbf{x} - \omega t)] \equiv \frac{1}{(2\pi)^{3/2}} \exp(ikx)$$



$$\varphi(x) = \int \phi_k(x) f(k) d^3k \neq \delta^3(x)$$

**Non-locality of wavefunction**

# Non-locality of the Human Consciousness due to the Tachyon field created inside the brain



Human brain  
(Tachyon network)

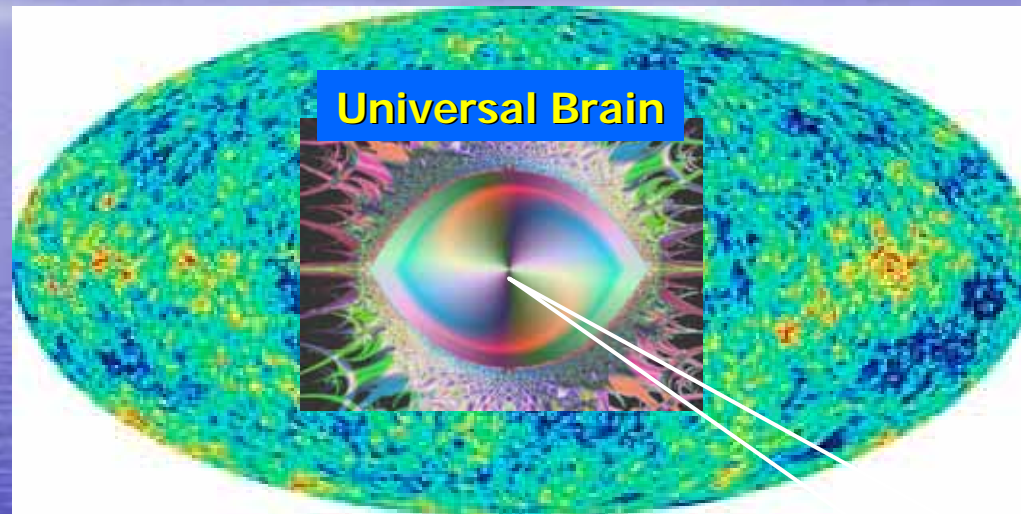
Non-locality of the  
tachyon field



One mind Model  
by Mark Germiné



# Interaction of the human brain with the Cosmic Consciousness via tachyon field



Human brain

Outer Tachyon Field of the Universe

According to the stochastic electrodynamics, there is a tachyon field created from the sea of omnipresent zero-point-energy.



Inner Tachyon Field

# Ramanujan: The man who can communicate with the universal mind



An equation for me has no meaning, unless it represents a thought of God.

## Mathematical Achievements of Ramanujan

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

$$\sum_{n=1}^{\infty} \frac{n^5}{e^{2\pi n} - 1} = \frac{1}{504}$$

$$p(n) = \frac{e^{\pi\sqrt{2/3}\lambda_n}}{4\sqrt{3}\lambda_n^2} \left(1 + O(1/\sqrt{n})\right)$$

$$\lambda_n = \sqrt{n - 1/24}$$

$$\zeta(3) = \frac{7\pi^3}{180} - 2 \sum_{k=1}^{\infty} \frac{1}{k^3 (e^{2\pi k} - 1)}$$

⋮  
⋮  
⋮

**The proposed theory of Quantum Computation in the Brain from the Standpoint of Superluminal Particles coincides with the Hypothesis based on superluminal consciousness by Prof.Dutheil**

**(Hypothesis by Prof.Dutheil )**

- The brain is nothing more than a simple computer that transmits information.**
- Consciousness, or the mind, is composed of a field of tachyons or superluminal matter, located on the other side of the light barrier in superluminal space-time.**

# Hypothesis based on superluminal consciousness by Dr. Dutheil

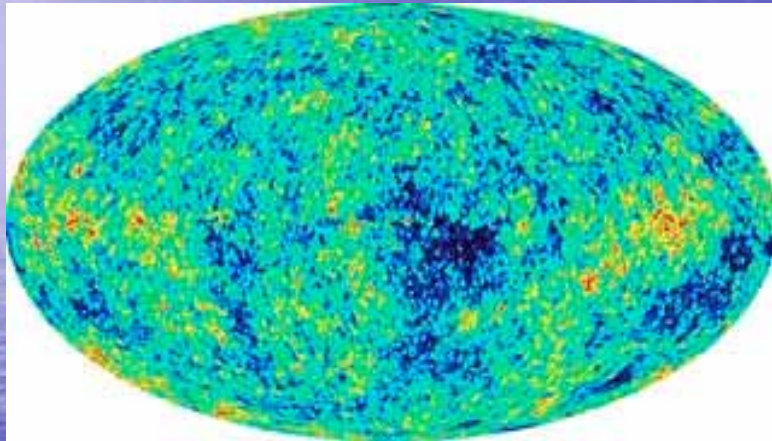


His hypothesis is based on a model in which consciousness is a field of tachyon or superluminal matter belonging to the true fundamental universe.

# Conclusions

- **On the basis of the theorem that the evanescent photon is a superluminal particle, it is shown that the biological brain has the possibility to achieve large quantum bits computation at the room temperature compared with the conventional processors.**
- **The microtubule has the sub-wavelength structure similar to the metamaterial.**
- **BPH emission may be due to the Chrenkov radiation from tachyon field created in a living organism.**
- **The tachyon field created inside the brain can exert an influence to living organism outside the brain and it has a possibility to behave as inseparable whole.**

**"As above, so below (Hermes Trismegistus)**



**Cosmic Background Radiation**

=



**Human electromagnetic field**

**Both of them are created by the Cherenkov radiation from superluminal particles?**