

# 26D Strings, Bohmions, and Quantum Consciousness

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James Lepowsky said in math.QA/0706.4072:

"... Bosonic 26-dimensional space-time ... string theory ...  
[is]... the smallest nontrivial string theory that nature allows ...  
[when] "compactified" on 24 dimensions ...[its]... automorphism group ...  
is the largest sporadic finite simple group: The Monster ...".

In **26-dimensional Bosonic String Theory**, interpret **Strings as Particle World-Lines** and formulate quantum events based on interactions among entire World-Line histories along the lines proposed by Andrew Gray in quant-ph/9712037 (v2 August 2004).

Green, Schwartz, and Witten say in their book "Superstring Theory" vol. 1 (Cambridge 1986)  
"... For the ... closed ... bosonic string .... The first excited level ... consists of ...  
**SO(24) ... little group** of a ...[26-dim]... massless particle ...  
**massless ... spin two state** ... and ...  
a scalar ... 'dilaton' ...  
the ground state is ... a **tachyon** ...".

The **SO(24) little group** is related to the Monster automorphism group.

As to the **massless spin two state**, although Green, Schwartz, and Witten say  
"... we might try to identify ... the massless ... spin two state ... as the graviton ..."  
**here I will identify the massless spin two state with what I call the Bohmion:**  
**the carrier of the Bohm Force of the Bohm-Sarfatti Quantum Potential.**

Peter R. Holland says in his book "The Quantum Theory of Motion" (Cambridge 1993) "... the total force ... from **the quantum potential ... does not necessarily fall off with distance** and indeed the forces between particles may become stronger ... This is because ...  
**the quantum potential ... depends on the form of ...[the quantum state]... rather than ... its ... magnitude ...".**

## **Quantum Consciousness and related phenomena are based on Resonant Connections among Quantum State Forms.**

Carver Mead says in his book "Collective Electrodynamics" (MIT 2000)

"... the energy shifts back and forth between ... two...coupled ... resonators ... despite an arbitrary separation between the resonators ...".



The **Quantum State Form of a Conscious Brain** is determined by the **configuration of a subset of its  $10^{18}$  Tubulin Dimers** with math description in terms of a large Real Clifford Algebra factorizable by 8-Periodicity into the tensor product of many copies of  $Cl(8)$ .  
( for details about Real Clifford Algebras see viXra 1304.0071 )

As to the **dilaton**, Green, Schwartz, and Witten say: "...

$$S_{26} = -\frac{1}{2\kappa^2} \int d^{26}x \sqrt{g} e^{-2\Phi} \left( R - 4D_\mu \Phi D^\mu \Phi + \frac{1}{12} H_{\mu\nu\rho} H^{\mu\nu\rho} \right)$$

describes the long-wavelength limit of the massless modes of the bosonic closed

string ... [the term]  $\int d^{26}x \sqrt{g} e^{-2\Phi} R$  ... can be put in the form  $\int d^{26}x \sqrt{g} R$  ...

by absorbing a suitable power of  $e^{-\Phi}$  in the definition of the spacetime metric  $g_{\mu\nu}$  ...".

Deformation by  $e^{-\Phi}$  causes the Einstein metric to differ from the string metric thus breaking scale invariance.

Joseph Polchinski says in his books "String Theory" (Vols. I and II Cambridge 1998): "... The massless dilaton appears in the tree-level spectrum of every string theory ...

At the classical level, the massless dilaton ... can be understood as a Goldstone boson of ... spontaneously broken scale invariance ...".

Like the massless Higgs goes to mass for 3 Weak Bosons and Higgs Scalar, the massless dilaton goes from mediating a long-range scalar gravity-type force to the nonlocality of the Bohm-Sarfatti Quantum Potential whereby the Quantum Force carried by Bohmions does not necessarily fall off with distance.

As to the **tachyon** Joseph Polchinski says: "... the negative mass-squared means that the no-string 'vacuum' is actually unstable ...". Closed string tachyons localized at orbifolds may be physically equivalent to what Schroer describes in hep-th/9908021 as "... any compactly localized operator applied to the vacuum generates clouds of pairs of particle/antiparticles, unless the system is free ...". Since orbifolds are identified with fermion particles, their localized tachyons can be physically interpreted as describing the virtual particle-antiparticle clouds that dress the fermion particles. ...".

( for details about fermions as orbifolds see viXra 1210.0072 )

## Here is how all this works with Penrose-Hameroff Quantum Consciousness:

In Journal of Cosmology 14 (2011) ( [journalofcosmology.com/Consciousness160.html](http://journalofcosmology.com/Consciousness160.html) ) Penrose and Hameroff said "... consciousness depends on biologically 'orchestrated' quantum computations in collections of microtubules within brain neurons ...

Microtubules are lattices of tubulin dimers ...[  ]... Discrete states of tubulins ... act as bits, switching between states, and interacting ... with neighbor tubulin states ...

orchestrated ... reduction of the quantum state ... (**Orch OR**) is taken to ... be a **quantum-gravity process** related to the fundamentals of spacetime geometry ... [and to] result in a moment of conscious awareness and/or choice ...

'OR' here refers to the ... viewpoint that ... the reduction R of the quantum state ('collapse of the wavefunction') ... is an actual physical phenomenon which is not part of the conventional unitary formalism U of quantum theory (or quantum field theory) ...

OR is taken to ... result from the mass displacement between the ... quantum-superposed alternative... quantum state[s] ... being sufficient, in gravitational terms, for the superposition to become unstable. ...

the superposition reduces to one of the alternatives in a time scale  $\tau$  that can be estimated (for a superposition of two states each of which can be taken to be stationary on its own) according to the formula

$$\tau \approx \hbar/EG.$$

Here  $\hbar$  ( $=h/2\pi$ ) is Dirac's form of Planck's constant  $h$  and  $EG$  is the gravitational self-energy of the difference between the two mass distributions of the superposition.

... For a superposition for which each mass distribution is a rigid translation of the other,  $EG$  is the energy it would cost to displace one component of the superposition in the gravitational field of the other, in moving it from coincidence to the quantum-displaced location ...

The separation is ... a space-time separation, not just a spatial one. Thus the time of separation contributes as well as the spatial displacement. Roughly speaking, it is the product of the temporal separation  $T$  with the spatial separation  $S$  that measures the overall degree of separation, and OR takes place when this overall separation reaches a critical amount. ...

To estimate  $S$ , we compute (in the Newtonian limit of weak gravitational fields) the **gravitational self-energy  $EG$  of the difference between the mass distributions of the ... superposed states**. ... The quantity  $S$  is ... given by:  $S \approx EG$  and  $T \approx \tau$ , whence

$$\tau \approx \hbar/EG, \text{ i.e. } EG \approx \hbar/\tau.$$

Thus ... OR occurs with the resolving out of one particular space-time geometry from the previous superposition when, on the average,  $\tau \approx \hbar/EG$

... this is ... an element of proto-consciousness

... In the 1970s neurophysiologist Benjamin Libet performed experiments on patients having brain surgery while awake ... Libet determined that conscious perception of a stimulus required up to 500 msec of brain activity post-stimulus, but that conscious awareness occurred at 30 msec poststimulus, i.e. that subjective experience was referred 'backward in time'. .. The Orch OR scheme allows conscious experience to be temporally non-local to a degree, where this temporal non-locality would spread to the kind of time scale  $\tau$  that would be involved in the relevant Orch OR process, which might indeed allow this temporal non-locality to spread to a time  $\tau = 500\text{ms}$  ...".

## Here is my view of the role of gravitational self-energy:

### First consider Superposition of States involving one tubulin

with one electron of mass  $m$  and two different position states separated by  $a$ .  
The Superposition Separation Energy Difference is the gravitational energy

$$E = G m^2 / a$$

For any single given tubulin  $a = 1 \text{ nanometer} = 10^{(-7)} \text{ cm} \dots$

Since the human brain is on the order of  $10 \text{ cm}$ , its volume is about  $10^3 \text{ cm}^3$ .

Since the human brain has about  $10^{18}$  tubulin electrons,

the human brain has about  $10^{18} / 10^3 = 10^{15}$  tubulin electrons/cm<sup>3</sup>

Since for an electron Compton radius =  $10^{(-11)} \text{ cm}$

and Schwarzschild radius =  $10^{(-55)} \text{ cm}$

and since the speed of light  $c = 3 \times 10^{10} \text{ cm/sec}$

and since  $E_{\text{electron}} = G m^2 / a$

we have for a single Electron

$$T = h / ( G m^2 / a ) = ( h / m c ) ( c^2 / G m ) ( a / c ) = \\ = ( \text{Compton} / \text{Schwarzschild} ) ( a / c )$$

where

$2 G m / c^2 =$  Schwarzschild Radius of a classical black hole of mass  $m$  and

$h / m c =$  Compton Radius of the Sidharth Kerr-Newman naked singularity model of an elementary particle of mass  $m$

so that (ignoring for simplicity some factors like 2 and pi etc )

$$T = h / E = ( \text{Compton} / \text{Schwarzschild} ) ( a / c ) = 10^{26} \text{ sec} = 10^{19} \text{ years}$$

### Now consider the case of N Tubulin Electrons in Coherent Superposition

Jack Sarfatti said "... Since all the Electrons are nonlocally connected into a coherent whole ... change  $m$  to  $M = Nm$  for a network of  $N$  connected ... [ tubulin/electrons ]... We

are ... looking at ... the gravity self energy of the whole. Since it also has to be a metric fluctuation ... use Wheeler's "L" for the scale of ... metric quantum gravity fluctuation ...

So how do we relate  $L$  to the microdisplacements of the pieces of the whole?

The obvious thing ... is  $L^3 = N a^3$  [where] " $a$ " is the displacement of each piece. ...".

Jack Sarfatti defines

the Superposition Energy  $E_N$  of  $N$  superposed Conformation Electrons in  $N$  Tubulins as

$$E_N = G M^2 / L$$

where  $L$  is the mesoscopic quantum phase coherence length

for the collective mode of  $N$  Conformation Electrons of total mass  $M$  in the  $N$  Tubulins,

so that

$$E_N = N^2 G m^2 / a N^{(1/3)} = \\ = N^{(5/3)} G m^2 / a = \\ = N^{(5/3)} E_{\text{electron}}$$

To get the decoherence time for the system of N Tubulin Electrons recall that  
 (ignoring for simplicity some factors like 2 and pi etc )

$$T_{\text{electron}} = h / E_{\text{electron}} = ( \text{Compton} / \text{Schwarzschild} ) ( a / c ) = 10^{26} \text{ sec}$$

so that

$$\begin{aligned} T_N &= h / E_N = h / N^{(5/3)} E_{\text{electron}} = \\ &= N^{(-5/3)} T_{\text{electron}} = \\ &= N^{(-5/3)} 10^{26} \text{ sec} \end{aligned}$$

So we have the following rough approximate Table of Decoherence Times  $T_N$   
 for various phenomena and structures involving various Numbers of Tubulin Dimers:

Time $T_N$	Number of Tubulins	Scale L = $= N^{(1/3)} \text{ s}$
$10^{(-43)}$ sec (Planck)	$10^{41}$	500 km
$10^{(-5)}$ sec	$10^{18}$	1 cm
$5 \times 10^{(-4)}$ sec (2 kHz)	$10^{17}$	0.5 cm
$25 \times 10^{(-3)}$ sec (40 Hz)	$10^{16}$	0.2 cm
$100 \times 10^{(-3)}$ sec (EEG alpha)	$4 \times 10^{15}$	0.16 cm
$500 \times 10^{(-3)}$ sec (Libet)	$1.5 \times 10^{15}$	0.11 cm

Note that Quantum States involving  $10^{15}$  to  $10^{16}$  tubulins  
 ( 0.1 to 1 % of the  $10^{18}$  tubulins in a human brain)

give Decoherence Times on the order of human brain waves such as

Beta waves (14 to 30 Hz),  
 Alpha waves (8 to 13 Hz),  
 Theta waves (4 to 7 Hz), and  
 Delta waves (1 to 3 Hz).

and Schumann resonances such as

7.8, 14, 20, 26, 33, 39 and 45 Hz

and the Libet conscious perception time of up to 500 msec.

Penrose and Hameroff also said ( [journalofcosmology.com/Consciousness160.html](http://journalofcosmology.com/Consciousness160.html) )

**"... How could microtubule quantum states in one neuron extend to those in other neurons throughout the brain? ..."**

Penrose and Hameroff propose quantum tunneling through gap junctions  
but I favor the use of

### **Resonant Connections among Quantum States mediated by Bohmions of the Bohm-Sarfatti Quantum Potential**

where the Bohmions are the massless spin 2 states of 26-dim Bosonic String Theory  
with Strings physically interpreted as World-Lines and fermions arising from orbifolding.  
( for details about fermions as orbifolds see viXra 1210.0072 )

Peter R. Holland says in his book "The Quantum Theory of Motion" (Cambridge 1993) "... the total force ... from the quantum potential ... does not necessarily fall off with distance and indeed the forces between particles may become stronger ... This is because ... the quantum potential ... depends on the form of ...[the quantum state]... rather than ... its ... magnitude ...".

so

**Resonant Connections do not decline as inverse square of distance like Gravity  
but if based on Bohmions of the Bohm-Sarfatti Quantum Potential  
can be strong connections regardless of spacetime separation.**

**The Bohm-Sarfatti Quantum Potential is so called because**  
since it is derived from the massless spin 2 states of 26-dim Bosonic String Theory  
**it inherits a Back-Reaction Property** similar to that of General Relativity  
**advocated by Jack Sarfatti** whose basic idea is  
a reciprocal Back-Reaction of the particles of the Quantum State Form on the Quantum Potential just as General Relativity has Matter/Energy back-reaction on Geometry.  
Jack Sarfatti has pointed out that conscious back-reaction could violate the assumption of equilibrium that ordinary quantum theory uses to obtain the Born approximation, noting that Antony Valentini in quant-ph/0203049 said "... pilot-wave theory indeed allows ... one to consider arbitrary 'nonequilibrium' initial distributions ...".

**The Resonant Connection process is like that of Quantum Electrodynamics**  
described by Carver Mead in his book "Collective Electrodynamics" (MIT 2000)  
There is a "... **first-order effect in which energy** flows from the high-amplitude resonator to the low-amplitude resonator ... the energy **shifts back and forth between ... two ... coupled ... resonators ... despite an arbitrary separation between the resonators** ... With the two resonators coupled, the energy shifts back and forth between the two resonators in such a way that the total energy is constant ... The conservation of energy holds despite an arbitrary separation between the resonators ...".