Is Entanglement Signaling Really Impossible?

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Back From the Future

- Discover Magazine on Yakir Aharonov's theory
- A series of quantum experiments shows that measurements performed in the future can influence the present. Does that mean the universe has a destiny—and the laws of physics pull us inexorably toward our prewritten fate?
- **by Zeeya Merali; photography by Adam Magyar**
- **From the April 2010 issue; published online August 26, 2010**

President Obama gives medal to Yakir Aharonov for his back from the future extension of quantum physics.

Feeling The Future?

- Bem, D. J. (2011). Feeling the Future: Experimental evidence for anomalous retroactive influences on cognition and affect. *Journal of Personality and Social Psychology, 100*, 407-425.
- Bem, D. J., Utts, J., & Johnson, W. O. (2011). Must psychologists change the way they analyze their data? A response to Wagenmakers, Wetzels, Borsboom, & van der Maas (2011).
- Bem, D. J. (2010). Response to Alcock's "Back from the Future: Comments on Bem."

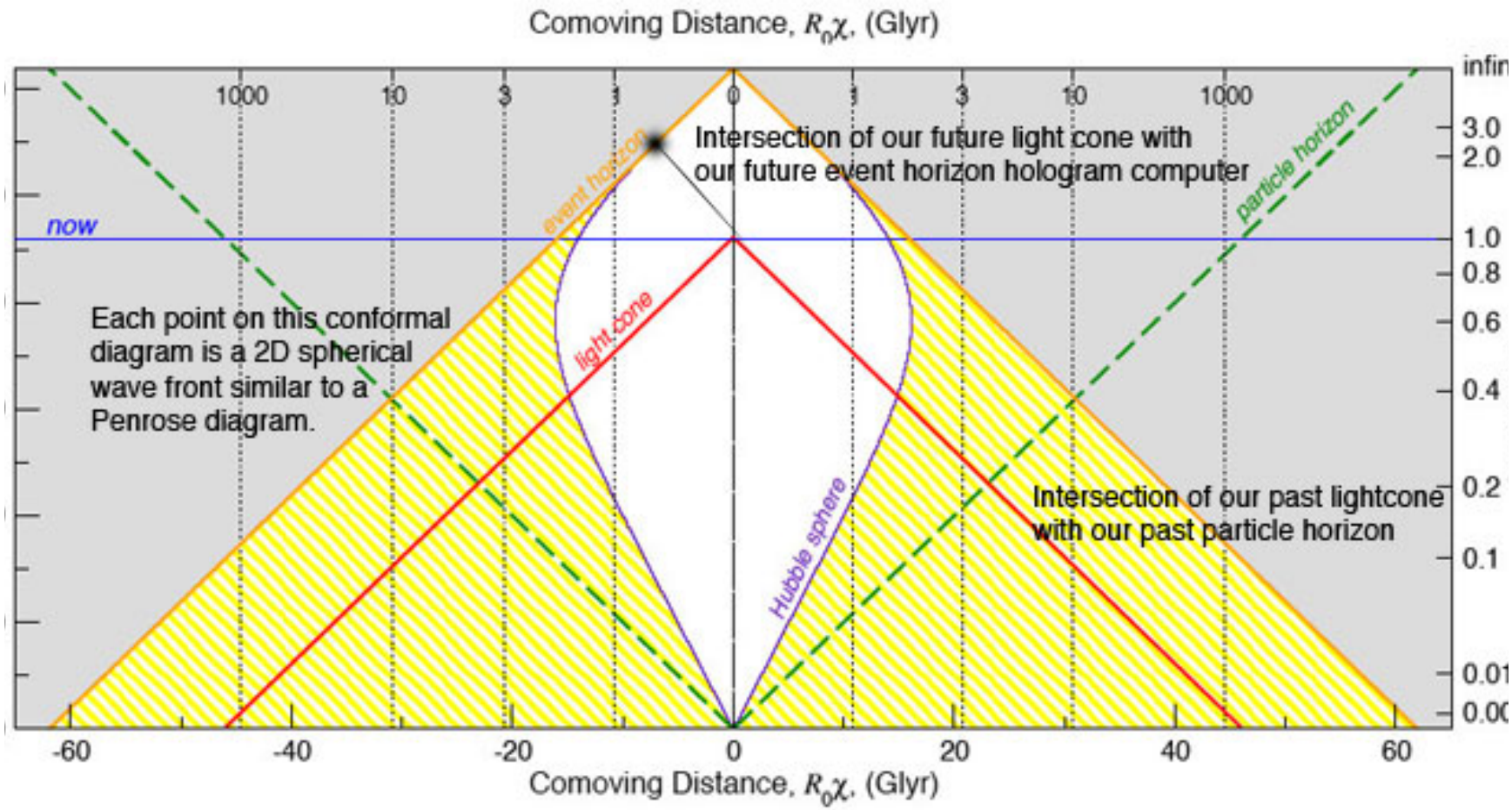
Brief History of Retro-Causality

- Dirac 1930's a-causal radiation reaction & ZPF
- Wheeler-Feynman 1940's advanced classical EM potentials with total future absorber (horizon)
- Hoyle-Narlikar quantized Wheeler-Feynman
- Cramer's & de Beauregard's Wheeler-Feynman retro-interpretation of quantum entanglement.
- Yakir Aharonov's destiny state, pre and post selection in weak measurements
- CIA SRI Remote Viewing Puthoff & Targ

Back From The Future Dark Energy

- Roger Penrose on Ben Libet's brain presponse in "Emperor's New Mind"& Fred Alan Wolf's "Star Wave" Wolf FA. "On the quantum physical theory of subjective antedating." Journal of Theoretical Biology. 1989; 136: 13.
- Radin, Bierman and several others: Future conditions working backward on current (non-conscious) physiology.
- Henry Stapp on retro-PK in Phys Rev. A
- Brian Josephson on signal nonlocality in living matter.
- Antony Valentini 2002 on signal nonlocality as extension of Bohm's quantum theory.
- Daryl Bem's "Feeling the Future" Cornell experiments.
- Dark energy as advanced Hawking radiation back from our future cosmological event horizon hc/Lp^4 redshifts to hc/Lp^2A where A is area-entropy of our future 2D dS event horizon 't Hooft –Susskind hologram screen computer (Seth Lloyd) with ~ 10^{123} pixels.

Future Cosmic Event Horizon



My Second Coming?

MIT Physics Professor David Kaiser in “How the Hippies Saved Physics”

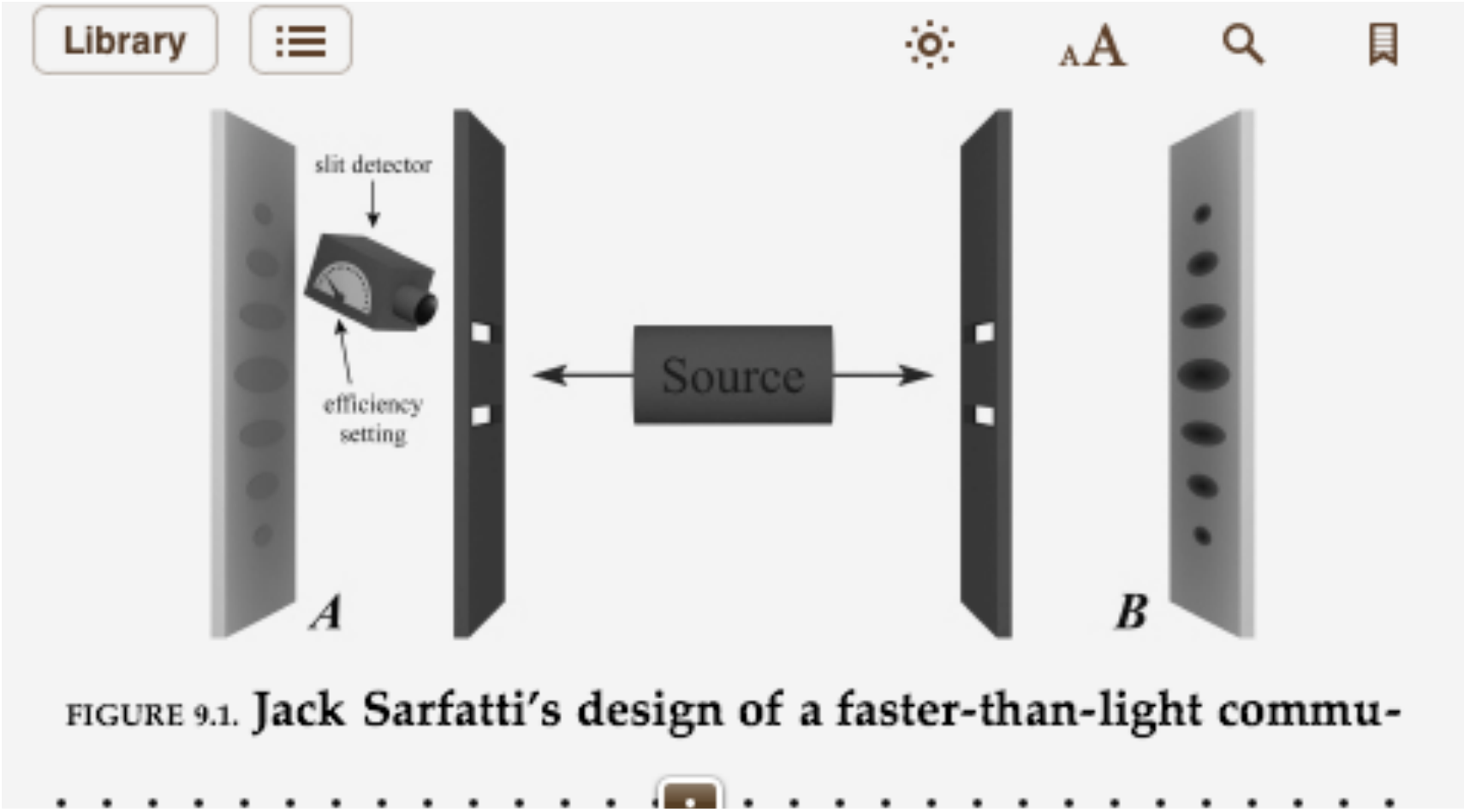


FIGURE 9.1. **Jack Sarfatti's design of a faster-than-light commu-**

An overlooked loophole?

- Consensus opinion is that quantum entanglement cannot be used as a stand-alone communication channel without an auxiliary light speed limited classical key to unlock the message at the receiver.

Non-Orthogonal Coherent States

- Hermitian observables guarantee orthogonal sender base states that erase any nonlocal influence of the sender settings on the detection probabilities at the receiver.
- However, this is no longer true when the entangled whole has different macro-quantum coherent Glauber sender states.
- Glauber states are *distinguishable* non-orthogonal eigenstates of the non-Hermitian photon destruction operator.

Signal Nonlocality

- Antony Valentini has argued that the breakdown of the Born probability rule entails "signal non locality" (aka entanglement signals).

Antony Valentini wrote

- *"It is argued that immense physical resources - for nonlocal communication, espionage, and exponentially-fast computation - are hidden from us by quantum noise, and that this noise is not fundamental but merely a property of an equilibrium state in which the universe happens to be at the present time. It is suggested that 'non-quantum' or nonequilibrium matter might exist today in the form of relic particles from the early universe. We describe how such matter could be detected and put to practical use. Nonequilibrium matter could be used to send instantaneous signals, to violate the uncertainty principle, to distinguish non-orthogonal quantum states without disturbing them, to eavesdrop on quantum key distribution, and to outpace quantum computation (solving NP-complete problems in polynomial time)."*
- http://arxiv.org/abs/quant-ph/0203049

Coherent State Sender Entangled With A Single Qubit Receiver

$$|A,B\rangle = \frac{1}{\sqrt{2}}\left(|\alpha\rangle_A|0\rangle_B + |\beta\rangle_A|1\rangle_B\right)$$

$$\langle A,B|B,A\rangle = \frac{1}{2}\begin{pmatrix}\langle\alpha|\alpha\rangle_A\langle 0|0\rangle_B + \langle\beta|\beta\rangle_A\langle 1|1\rangle_B \\ +\langle\alpha|\beta\rangle_A\langle 0|1\rangle_B + \langle\beta|\alpha\rangle_A\langle 1|0\rangle_B\end{pmatrix}$$

$$= \frac{1}{2}\left(\langle\alpha|\alpha\rangle_A + \langle\beta|\beta\rangle_A\right) = 1$$

Nonorthogonal Sender Coherent States Give Signal Nonlocality

$$\langle \alpha | \beta \rangle = e^{-\frac{1}{2}\left(|\alpha|^2 + |\beta|^2 - 2\alpha * \beta\right)} \neq \delta(\alpha - \beta)$$

Entangled Density Matrix

$$\rho_{AB} = |A,B\rangle\langle B,A| = \frac{1}{2}\begin{pmatrix} |\alpha\rangle_A|0\rangle_B\,{}_B\langle 0|\,{}_A\langle\alpha| + |\beta\rangle_A|1\rangle_B\,{}_B\langle 1|\,{}_A\langle\beta| \\ +|\alpha\rangle_A|0\rangle_B\,{}_B\langle 1|\,{}_A\langle\beta| + |\beta\rangle_A|1\rangle_B\,{}_B\langle 0|\,{}_A\langle\alpha| \end{pmatrix}$$

The Nonlocal Entanglement Signal

$$P(1)_B = Tr\left\{|1\rangle_B\ {}_B\langle 1|\,\rho_{AB}\right\} = \frac{1}{2}\left(1+|\langle\alpha|\,\beta\rangle|_A^2\right)$$

Violation of Born Probability Rule

$$P(0)_B = Tr\left\{|0\rangle_B \, {}_B\langle 0| \rho_{AB}\right\} = \frac{1}{2}\left(1 + \left|\langle\alpha|\beta\rangle\right|_A^2\right) = P(1)_B$$

$$P(0)_B + P(1)_B = 1 + \left|\langle\alpha|\beta\rangle\right|_A^2 > 1$$

Back From The Future

- The space-time interval between the sending and the receiving irreversible measurements is irrelevant depending only on the free will of the local observers.
- This is a pre-metrical topological information effect. There is asymmetry between the sending and the receiving. Therefore, there is no ambiguity between active (retro) cause and passive effect.

More is Different

- The Born probability interpretation breaks down because of "phase rigidity" (P.W. Anderson's "More is different").
- This is a new regime that is to orthodox quantum theory what general relativity is to special relativity.
- Indeed, this solves the Schrodinger Cat paradox, why there is a classical world without large-scale quantum weird superpositions.

Nonlinear, Local, Non-Unitary

- The Glauber states are Landau-Ginzburg order parameters from ODLRO (Penrose-Onsager) in the photon-field propagator similar to Gorkov's treatment of the BCS superconductor.
- This macro-quantum coherent dynamics is a non-unitary, non-linear and local signal coupled to micro-quantum unitary, linear and nonlocal noise.
- This model is consistent with Vitiello-Freeman coherent bio-condensate brain dynamics.

Frozen Virtual Goldstone Boson Condensates Create Classical World

- Ensures the large-scale (Infra Red) classical world because the order parameter Goldstone boson ground state condensate is local, nonunitary and nonlinear.
- For example, a solid atomic crystal lattice forms from the spontaneous breaking of the continuous 3D translation group into a discrete crystallography group.
- The order parameter is the condensate of off-mass-shell virtual Goldstone phonons of zero frequency and finite momenta ~ inverse lattice spacings.
- Indeed, the classical world is made from frozen virtual Goldstone boson "Bose-Einstein" analog ground state condensates described by IR Landau-Ginzburg effective c-number field theories coupled to micro-quantum noise.