

MACROQUANTUM ASPECTS OF CONSCIOUSNESS AND NONLOCALITY OF QUANTUM COLLAPSE

Dejan Raković

University of Belgrade, Faculty of Electrical Engineering, Serbia
www.dejanrakovic.com

Abstract. In this paper we restrict ourselves on the approach and critique of the Copenhagen and von Neumann interpretations of quantum mechanics, and those attempts including ours to resolve manifestly open quantum-mechanical problems in the context of consciousness: physical nature of the wave function nonlinear collapse; physical nature of the instantaneous action of the wave function nonlocal collapse; and existence of the relevant macroscopic quantum degrees of freedom related to altered and transitional states of consciousness, isolated enough to preserve their quantum coherence. Our approach can account for space-time-transcending collapse-like quantum-gravitationally-induced and consciousness-channeled transpersonal interactions (including most intriguing space-time quantum-entanglement-resembling retroactive intentional influences), with significant spiritual implications and conditions for observation of quantum-coherent quantum-holographic implicate order and classically-reduced explicate order.

Keywords: *Macroquantum aspects of consciousness; Altered & Transitional states of consciousness; Field-related collective consciousness; Nonlocality of quantum entanglement & Quantum collapse; Transpersonal interactions; Spiritual implications; Quantum-holographic implicate order; Classically-reduced explicate order.*

Introduction

Initially, *quantum mechanics* appeared as a theory of *microscopic physical systems* (elementary particles, atoms, molecules) and phenomena at small space-time scales; typically, quantum phenomena are manifested at dimensions smaller than 1 nm and time intervals shorter than 1 μ s. However, from the very beginning of the quantum-mechanical founding one century ago, the question of its *universality* was raised, i.e. the question of general validity of the quantum-physical laws for *macroscopic phenomena* as well (like in superconductivity and superfluidity), mostly treated by the methods of classical physics. In the history of quantum physics, and especially quantum mechanics, this question has been temporarily put aside for very different reasons, being considered as a difficult scientific problem. The situation is additionally complicated by the existence of different schools of quantum mechanics, arguing about physical-epistemological status of the so called *collapse (reduction) of the wave function*. In this respect the situation is not much better today, and it can be said freely that the problem of universal validity of quantum mechanics is still open [1-3].

On these lines, *holistic manifestations of consciousness*, like altered and transitional states of consciousness [4], conscious/unconscious transitions, consciousness pervading body, and free will [5], as well as *nonlocality of quantum mechanics* demonstrated by Einstein-Podolsky-Rosen effect [6] and Bell inequalities multiply confirmed experimentally last years [7], imply that *some manifestations of consciousness* must have *deeper macroscopic quantum origin* (in spite of recent Tegmark's theoretical investigations [8] which demonstrate that interactions with environment destroy in less than 10^{-13} s macroscopic quantum coherence within the brain, whose electrochemical neural networks might correspondingly be sufficient for modeling normal states of consciousness [9-11] – but not altered and transitional states of consciousness as well [12,13], whose nonlocal properties might be understood better through quantum-relativistic manifestations of the macroscopic acupuncture EM/ionic microwave ultralowfrequency-modulated quantum-holographic neural networks [4]).

There are numerous macroquantum models of consciousness (some of them cited in ref. [8], whose aim is to investigate existence of the relevant brain/body degrees of freedom isolated enough

to preserve their quantum coherence), and it is difficult to pretend on complete survey of these attempts. Therefore, in this paper we shall restrict ourselves on the approach and critique of the Copenhagen and von Neumann interpretations of quantum mechanics, and those attempts including ours to resolve *manifestly open quantum-mechanical problems in the context of consciousness* [14]: (1) physical nature of the wave function *nonlinear collapse*; (2) physical nature of the instantaneous action of the wave function *nonlocal collapse*; and (3) existence of the relevant *macroscopic quantum degrees of freedom* related to altered and transitional states of consciousness, isolated enough to preserve their quantum coherence.

Field-related consciousness and non-local channeling of quantum collapse

The first attempts to *treat consciousness strictly quantummechanically* originate from von Neumann [15], being supported by Wigner [16] and lately by Stapp [17]: in contrast to *Copenhagen interpretation* of Bohr, Dirac, and Heisenberg [18], which insists on *positivistic* limitations of quantum theory only on the observer knowledge about quantum system (thus becoming essentially subjective and epistemologic theory, as the only reality of this theory is 'our knowledge') – *von Neumann's* theory offers *ontologically* objective description of the reality and thus quantum framework for cosmological and biological evolution, including consciousness itself.

Besides, in the *problem of quantum measurement* i.e. collapse of the initial state of the quantum system in one of the possible probabilistic states of the system (when (linear) Schrodinger equation is *a priori* suspended and its boundary conditions are replaced by those corresponding to the collapsed state of the quantum system), in contrast to Copenhagen interpretation which treats it (*quantum inconsistently*) as an *ad hoc* process in the interaction of quantum system with classical measuring device – *von Neumann's* theory treats the measuring device quantum consistently by postponing the collapse of the initial quantum state until the final interaction with observer's consciousness in the chain quantum system/measuring device/observer, but also *not explaining* (nonlinear) *nature of the collapse*, with additional problem that ontological nonlocality of the collapse requests (relativistically inconsistent) *instantaneous action on distance* along space-like surfaces (which is the problem also implicitly transferred in the relativistic quantum field theory in spite of the relativistic invariance of the Tomonaga-Schwinger space-like surfaces [17])!

On the other hand, in the context of *quantum transpersonal implications* – if *consciousness* has indeterministic characteristics (*free will*), it still must play essential role in the *wave function quantum collapse* [4,15,17], the only indeterministic property of the quantum mechanics, which has itself *manifestly open problems* of the physical nature of *nonlinear collapse* and relativistically inconsistent instantaneous action on distance of the *nonlocal collapse* of the wave function [4,17].

One possible solution of the problem of (nonlinear) collapse is proposed by Penrose [19] in *gravitationally induced reduction* of the wave function, in which the gravitational field of measuring device included in the superposition of corresponding possible probabilistic states of the device implies the superposition of different space-time geometries, and when the geometries become sufficiently different (on the Planck-Wheeler scale $\sim 10^{-35}$ m) this implies the break of standard quantum superposition of the state quantum system (*S*) / measuring device or environment (*E*) (ill-defined in strictly separate space-time geometries) and Nature *must choose* between one of them and actually affects *objective reduction* of the wave function: $|\Phi\rangle_S |\Psi\rangle_E = \sum_i c_i |\Phi_i\rangle_S |\Psi_i\rangle_E \rightarrow |\Phi_j\rangle_S |\Psi_j\rangle_E$ (while regarding non-algorithmic quantum-gravitational aspects of consciousness [19], Penrose tried to search for sufficiently isolated relevant macroscopic quantum degrees of freedom in microtubular cytoskeletal structures of neurons (but not in out-of-body displaceable acupuncture system in altered and transitional states of consciousness, isolated enough to preserve their quantum coherence [4,14]!), which was undergone to severe critiques in Tegmark's paper [8]).

According to author's biophysical quantum-holographic/quantum-relativistic model of consciousness [4], the similar objective reduction of the wave function might have quantum-gravitational origin in space-time microscopic wormhole tunnels of highly noninertial microparticle interactions in quantum measurement-like situations (fully equivalent, according to Einstein's principle of equivalence, to strong gravitational fields – in which opening of wormholes is predicted [20]). The question how it is possible that these highly noninertial microparticle processes with inevitable relativistic generation of microparticles' wormholes were not taken into account within quantum mechanics which is yet extremely accurate theory(?) – might be answered as they were(!), but implicitly within the *ad hoc* von Neumann's projection postulate [15] to account for quantum mechanical 'wave packet collapse' in quantum measurement situations (implying also that von Neumann's *ad hoc* projection postulate is based on quantum gravitational phenomena, being on deeper physical level than nonrelativistic quantum mechanical ones!). On the other hand, nonlocality of field-related collective consciousness [4], as a giant space-time associative neural network with distributed individual consciousnesses (related to bodily acupuncture EM/ionic microwave ultra-lowfrequently-modulated quantum-holographic neural networks, mutually interacting quantum-gravitationally in transitional states of individual consciousnesses [4]), might explain (apparently) instantaneous action in (nonlinear) quantum-gravitationally induced [19] and (nonlocally) channeled collapse by field-related collective consciousness (and 'seemingly paradoxical' nonlocality of quantum entanglement in both space and time [21]), which can account for numerous nonlocal space-time transcending *transpersonal interactions* [22-35] (including most intriguing space-time quantum-entanglement-resembling retroactive intentional influences, reviewed in Ch. 11 of Ref. [34]).

For more details on quantum-holographic transpersonal and spiritual implications, as well as implicate and explicate orders of quantum-hologram and their observation, cf. Appendix.

Conclusion

The Copenhagen and von Neumann interpretations of quantum mechanics are critically considered, as well as those attempts including ours to resolve manifestly open quantummechanical problems in the context of consciousness: physical nature of the wave function nonlinear collapse; physical nature of the instantaneous action of the wave function nonlocal collapse; and existence of the relevant macroscopic quantum degrees of freedom related to altered and transitional states of consciousness, isolated enough to preserve their quantum coherence. We showed that our approach can account for space-time-transcending collapse-like quantum-gravitationally-induced and consciousness-channeled transpersonal interactions, including most intriguing space-time quantum-entanglement-resembling retroactive intentional influences.

In the Appendix quantum-holographic transpersonal and spiritual implications, as well as implicate and explicate orders of quantum-holographic reality and their observation are considered in more details.

Note added in proof. Extraordinary psychokinetic (and healing) inborn abilities, vividly demonstrated recently by young Serbian boy whose breast is sticking metallic, plastic or glass objects weighted up to several kilograms (http://www.youtube.com/watch?v=faUJAgvvV_c), are supporting hereby revealed holistic quantum-holographic/quantum-gravitational theoretical framework for transpersonal, and particularly psychokinetic phenomena (in space-time transcending highly-noninertial strong-gravitation-equivalent transitional states of consciousness, based on locally created 'wormholes' stabilized by so called 'exotic matter' (vacuum fluctuations in strongly curved space-time of the 'wormhole' tunnels) with anti-gravitational manifestations [20])! This framework also suggests physical basis of von Neumann's projection postulate on micro-quantum scale, to account for quantum mechanical 'wave packet collapse' (via locally quantum-gravitationally-induced 'wormholes' in highly-noninertial strong-gravitation-equivalent quantum measurement-like situations)!

APPENDIX

Quantum-holographic transpersonal and spiritual implications

According to author's *biophysical quantum-holographic/quantum-relativistic model of consciousness* [4], *transpersonal interactions* [22-35] might be interpreted by *collapse-like consciousness-channeled quantum-gravitational tunneling* of operator's individual consciousness – mentally addressed on the target's content of collective consciousness in operator's *transitional states of consciousness* (short-lasting highly-noninertial strong-gravitation-equivalent – according to Einstein's principle of equivalence – being presumably the physical basis of von Neumann's projection postulate in quantum measurement-like situations on micro-quantum scale too!) – thus intentionally channeling composite state of the 'field' of target-under-influence-of-operator part of collective consciousness, $|\Phi\rangle_S \rightarrow |\Phi_j\rangle_S$, and automatically influencing complementary 'particle' output $|\Psi\rangle_E \rightarrow |\Psi_j\rangle_E$ in quantum-gravitationally-induced and consciousness-channeled collapse ($|\Phi\rangle_S |\Psi\rangle_E = \sum_i c_i |\Phi_i\rangle_S |\Psi_i\rangle_E \rightarrow |\Phi_j\rangle_S |\Psi_j\rangle_E$).

This could be also the model for unusual *anticipative properties of psyche* both in *quantum-holographic* short-lasting quantum-coherent *transitional states of consciousness* and quantum-gravitational-tunnelling of *mentally-channeled transpersonal-communications* of the out-of-body displaced EM/ionic part of acupuncture system/individual consciousness with subsequent *classically-reduced extrasensory-perception* of the mentally-addressed out-of-body complementary environment (that might be also the Tesla's *problem-with-solution* [36] on the level of *quantum-holographic collective consciousness*, which arises association on Jung's 'archetypes' and Plato's 'world of ideas', too!). After returning of the displaced consciousness upon the body, in order that transpersonally acquired information ascends to the level of *normally conscious state*, it is necessary to *overcome two filters* [4,36] (*acupuncture system/nervous system threshold filter*, which requires 'emotional colouring' of the solving problem, and *frontolimbic-amplification ERTAS filter*, which requires 'emotional-thinking priority' of the solving problem).

It should be added that locally created 'wormholes' in transitional states of consciousness might reveal the basis for explanation [4] of some *psychokinetic phenomena* [22,31] related to relatively higher vital energies/stronger fields. Namely, as 'wormholes' are stabilized by so called 'exotic matter' (vacuum fluctuations in strongly curved space-time of the 'wormhole' tunnels) which pushes the wormhole's walls apart anti-gravitationally [20], this might account for some anti-gravitationally manifested psychokinetic phenomena [22,31].

It should be pointed out, that in the context of *necessary conditions for decoherence* [37], defining of open quantum system and environment is – *simultaneous process* – so that in the context of universal validity of quantum mechanics consciousness is *relative concept*, non-locally also influenced by farther parts of existing observing universe (and *vice versa!*) [38], simultaneously creating conditions for the process of decoherence in the context of *existing relative borderline*:

$$|\Phi\rangle_S |\Psi\rangle_E \equiv |(partial)individual/collective consciousness\rangle_S |(complementary)environment\rangle_E.$$

This is fully in accordance with the idea of *collective consciousness* as a possible *ontological property of the physical field itself* [4,14,38-40], with different micro-quantum and macro-quantum (both non-biological and biological, real and virtual) excitations. Then, as *cosmic collective consciousness* $|\Phi\rangle_S \sim \prod_k |\phi^k\rangle_{S_k} = \sum_i c_i |\Phi_i\rangle_S$, coincident with the 'field' of Universe, has its *complementary 'particle' cosmic environment* ($|\Psi\rangle_E = \sum_i c_i |\Psi_i\rangle_E$), their strong-interaction-coupling affects *decoherence of the 'field' of cosmic collective consciousness* into stationary

classically-reduced (observing) stochastic state, $(\hat{\rho}_S = \sum_i |c_i|^2 |\Phi_i\rangle_{SS} \langle \Phi_i|)$, with probabilities $(|c_i|^2)$ of realizations of corresponding classically-decoherent states of cosmic collective consciousness; on the other hand, cosmic composite quantum state $(|\Phi\rangle_S |\Psi\rangle_E)$ evolves without collapse (due to absence of the complementary outside-cosmic environment!), which implies that Universe as a whole is quantum hologram subject to deterministic Schrödinger evolution [4,40]!

However, prayer-induced hypothetical macroscopic vacuum non-loaded spiritual excitations (whose exciting by prayers arises associations on 'Holy Grace' as in-deterministic intervention in otherwise deterministic evolution of the quantum-holographic cosmic (and embedded human) History, which thus provides essentially new non-Schrödinger boundary conditions!) might modify cosmic collective consciousness $(|\Phi'\rangle_S \sim \prod_k |\phi^k\rangle_{S_k})$ and thus cosmic composite quantum state $(|\Phi'\rangle_S |\Psi'\rangle_E)$, i.e. classically-reduced stochastic state of cosmic collective consciousness $(\hat{\rho}'_S = \sum_i |c'_i|^2 |\Phi'_i\rangle_{SS} \langle \Phi'_i|)$, so implying possibility of *prayer-optimized* [4,40] (most probable and energetically most convenient) preferences of cosmic collective consciousness (and conversely, on modification of the cosmic-consciousness-observable classically-reduced stochastic state of the complementary "particle" cosmic environment $(\hat{\rho}'_E = \sum_i |c'_i|^2 |\Psi'_i\rangle_{EE} \langle \Psi'_i|)$, implying possibility of *prayer-optimized* (most probable) preferences of future cosmic alternatives!).

Implicate and explicate orders of quantum-holographic reality and their observation

From the above there appears that classically-reduced level (of quantum system/consciousness $\hat{\rho}_S(t)$ or environment $\hat{\rho}_E(t)$), is permanently emerging from and dissolving into quantum-holographic level $(|\Phi(t)\rangle_S |\Psi(t)\rangle_E)$, and this permanent pulsating is going on extremely fast, with observing Bohm's *explicate order* of classically-reduced mixtures (of quantum system/consciousness $\hat{\rho}_S(t)$ or environment $\hat{\rho}_E(t)$) of quantum-holographic reality *via* measuring devices/senses. On the other hand, non-stationary quantum-holographic reality of Bohm's *implicate order*

$$|\Phi(t)\rangle_S |\Psi(t)\rangle_E \sim \prod_k |\phi^k(t)\rangle_{S_k} |\Psi(t)\rangle_E = \sum_i c_i |\Phi_i(t)\rangle_S |\Psi_i(t)\rangle_E$$

might be observed *exclusively* in non-stationary quantum-coherent superpositions of states, characteristic of quantum-holographic creative-religious altered and transitional states of consciousness (individual

$|\phi^k(t)\rangle_{S_k} = \sum_i c_{k_i} |\phi^{k_i}(t)\rangle_{S_k}$ or collective $|\Phi(t)\rangle_S = \sum_i c_i |\Phi_i(t)\rangle_S$) [4,40]. This viewpoint is close to experiences of many *shamanistic tribal traditions*, which consider that *genuine* (quantum-holographic!) reality is represented by *dreams* [33], while (classically-reduced!) awake state is lie/illusion (*maya*, as it is argued in *Eastern traditions* [41-43])!

In the same context, necessity of direct quantum-holographic coupling of individual and cosmic collective consciousness in observing *implicate order* really requires weak out-of-body quantum-communication coupling consciousness-environment, i.e. previous *reprogramming of all psychosomatic loads* (cleansing of possessive or hedonistic *emotional-mental sin/karmic connections* with the world – which as loading 'mental addresses' would give rise to *quantum projections* of mentally/channeled tunneled consciousness on corresponding *out-of-body environment*, and thus to classically-reduced out-of-body *extrasensory observing* of mentally-addressed environment!) – and so the efforts of *mystics of all traditions* to *clean consciousness/soul* through spiritual practice

(prayer, meditation) and thus to reach their final eschatological goal (*Kingdom of God, nirvana*), i.e. *post-mortem salvation* (of the sin-free/karmic-free non-bounded soul) [41,44] appear reasonable!

Acknowledgements – The paper is partly financed by the Serbian Ministry of Science, Technology and Development, Projects Nos. 148028G and 178027.

References

1. J. Kofler, Č. Brukner, Classical world arising out of quantum physics under the restriction of coarse-grained measurements, *Phys. Rev. Lett.* 99 (2007) 180403; J. Kofler, Č. Brukner, Conditions for quantum violation of macroscopic realism, *Phys. Rev. Lett.* 101 (2008) 090403; and refs therein.
2. W. H. Zurek, Decoherence and the transition from quantum to classical, *Phys. Today* 44(10) (1991) 36; W. H. Zurek, Decoherence, einselection, and the quantum origins of the classical, *Rev. Mod. Phys.* 75 (2003) 715.
3. G. C. Ghirardi, A. Rimini, T. Weber, Unified dynamics for microscopic and macroscopic systems, *Phys. Rev. D* 34 (1986) 470; R. Penrose, On gravity's role in quantum state reduction, *Gen. Rel. Grav.* 28 (1996) 581.
4. D. Raković, *Integrative Biophysics, Quantum Medicine and Quantum-Holographic Informatics: Psychosomatic-Cognitive Implications* (IASC & IEPSP, Belgrade, 2009); D. Raković, *Fundamentals of Biophysics*, 3rd ed (IASC & IEPSP, Belgrade, 2008), in Serbian; see also www.dejanrakovic.com.
5. A. Shimony, in R. Penrose, A. Shimony, N. Cartwright, S. Hawking, eds, *The Large, the Small and the Human Mind* (Cambridge Univ, Cambridge, 1995).
6. A. Einstein, B. Podolsky, N. Rosen, Can quantum-mechanical description of physical reality be considered complete, *Phys. Rev.* 47 (1935), 777.
7. J. S. Bell, *Speakable and Unspeakable in Quantum Mechanics* (Cambridge Univ. Press, Cambridge, 1987), and references therein; A. Aspect, J. Dalibard, G. Roger, Experimental test of Bell's inequalities using time-varying analyzers, *Phys. Rev. Lett.* 49 (1982) 1804; W. Tittel, J. Brendel, H. Zbinden, N. Gisin, Violation of Bell inequalities by photons more than 10km apart, *Phys. Rev. Lett.* 81 (1998) 3563.
8. M. Tegmark, Importance of quantum decoherence in brain processes, *Phys. Rev. E* 61 (2000) 4194.
9. B.J. Baars, *A Cognitive Theory of Consciousness* (Cambridge Univ. Press, Cambridge, MA, 1988).
10. K.R. Poper and J.C. Eccles, *The Self and Its Brain* (Springer, Berlin, 1977).
11. F. Crick, *The Astonishing Hypothesis: The Scientific Search for the Soul* (Charles Scribner's Sons, New York, 1994).
12. C. Tart, ed., *Altered States of Consciousness* (Academic, New York, 1972).
13. D. Raković, Dj. Koruga, eds., *Consciousness: Scientific Challenge of the 21st Century* (ECPD, Belgrade, 1995; 1996); Lj. Rakić, G. Kostopoulos, D. Raković, Dj. Koruga, eds., *Brain & Consciousness: Proc. ECPD Symposium & Workshop* (ECPD, Belgrade, 1997); V. Jerotić, Dj. Koruga, D. Raković, eds., *Science – Religion – Society* (Theological Faculty of Serbian Orthodox Church & Serbian Ministry of Religions, Belgrade, 2002), in Serbian.
14. D. Raković, M. Dugić, M. M. Ćirković, Macroscopic quantum effects in biophysics and consciousness, *NeuroQuantology* (www.NeuroQuantology.com) 2(4) (2004) 237.
15. J. von Neumann, *Mathematical Foundations of Quantum Mechanics* (Princeton Univ. Press, Princeton, 1955).
16. E. Wigner, Remarks on the mind-body problem, in *Symmetries and Reflections* (Indiana Univ. Press, Bloomington, 1967).
17. H.P. Stapp, Quantum theory and the role of mind in nature, *Found. Phys.* 31 (2001) 1465; H. Stapp, *Mind, Matter, and Quantum Mechanics* (Springer, New York & Berlin, 1993).
18. N. Bohr, Can quantum-mechanical description of physical reality be considered complete, *Phys. Rev.* 48 (1935) 696; P. A. M. Dirac, at *Solvay Conf. Electrons et Photons: Rapports et Discussions du Cinquieme Conseil de Physique* (Gauthier-Villars, Paris, 1928); W. Heisenberg, The representation of nature in contemporary physics, *Daedalus* 87 (1958) 95.

19. R. Penrose, *The Emperor's New Mind* (Oxford Univ. Press, New York, 1989); R. Penrose, *Shadows of the Mind: A Search for the Missing Science of Consciousness* (Oxford Univ. Press, Oxford, England, 1994); R. Penrose, On gravity's role in quantum state reduction, *Gen. Rel. Grav.* 28 (1996) 581.
20. M. S. Morris, K. S. Thorne, U. Yurtsever, Wormholes, time machines, and the weak energy condition, *Phys. Rev. Lett.* 61 (1988) 1446; M. Visser, Quantum wormholes, *Phys. Rev. D* 43 (1991) 402-409; K. S. Thorne, *Black Holes and Time Warps: Einstein's Outrageous Legacy* (Picador, London, 1994), and refs therein.
21. E. Schrödinger, Die gegenwärtige Situation in der Quantenmechanik, *Naturwissenschaften* 23 (1935), 807, 823, 844; A. J. Leggett, A. Garg, Quantum mechanics versus macroscopic realism: Is the flux there when nobody looks?, *Phys. Rev. Lett.* 54 (1985) 857; J. P. Paz, G. Mahler, Proposed test for temporal Bell inequalities, *Phys. Rev. Lett.* 71 (1993) 3235; A. Peres, Delayed-choice for entanglement swapping, *J. Mod. Opt.* 47 (2000) 139; Č. Brukner, M. Aspelmeyer, A. Zeilinger, Complementarity and information in "Delayed-choice for entanglement swapping", *Found. Phys.* 35 (2005), 1909; Č. Brukner, S. Taylor, S. Cheung, V. Vedral, Quantum entanglement in time, *arXiv:quant-ph/0402127v1* (2004); M. Brooks, Entanglement: The weirdest link, *New Scientist* 181 (2004) 32.
22. R. G. Jahn, The persistent paradox of psychic phenomena: an engineering perspective, *Proc. IEEE* 70 (1982) 136; R. G. Jahn, B. J. Dunne, *Margins of Reality: The Role of Consciousness in the Physical World* (Harcourt Brace Jovanovic, New York, 1987); R. G. Jahn, B. J. Dunne, *Consciousness and the Source of Reality: The PEAR Odyssey* (ICRL Press, Princeton, 2011); and many PEAR (Princeton Engineering Anomalies Research) archive publications www.princeton.edu/~pear
23. R. Targ, H. Puthoff, *Mind-Reach: Scientific Look at Psychic Ability* (Delacorte, New York, 1977).
24. D. Radin, *The Conscious Universe: The Scientific Truth of Psychic Phenomena* (HarperEdge, New York, 1997); D. Radin, *Entangled Minds: Extrasensory Experiences in a Quantum Reality* (Paraview Pocket Books, New York, 2006).
25. V. P. Kaznacheev, A. V. Trofimov, *Cosmic Consciousness of Humanity* (Elendis-Progress, Tomsk, 1992).
26. W. A. Tiller, W. E. Dibble, Jr., M. J. Kohane, Exploring robust interactions between human intention and inanimate/animate systems, *Ditron Preprint*, presented at *Int. Conf. Toward a Science of Consciousness - Fundamental Approaches*, May 1999, UN Univ., Tokyo, Japan.
27. M. A. Persinger, E. W. Tsang, J. N. Booth, S. A. Koren, Enhanced power within a predicted narrow band of theta activity during stimulation of another by circum-cerebral weak magnetic fields after weekly spatial proximity: Evidence for macroscopic quantum entanglement?, *NeuroQuantology* (www.NeuroQuantology.com), 6(1) (2008) 7.
28. A. Liptay-Wagner, Differential diagnosis of the near-death experience: which illness cannot be considered as NDE?, *Proc. 6th Int. Multi-Conf. Information Society IS'2003, Mind-Body Studies* (IS, Ljubljana, 2003); P. van Lommel, R. van Wees, V. Meyers, I. Elfferich, Near-death experience in survivors of cardiac arrest: prospective study in the Netherlands, *The Lancet*, 15. Dec. 2001; see also www.revital.negral.hu.
29. D. Chopra, *Quantum Healing: Exploring the Frontiers of Mind/Body Medicine* (Bantam, New York, 1989).
30. L. Dossey, *Healing Words: The Power of Prayer and the Practice of Medicine* (Harper, San Francisco, 1993).
31. M. Talbot, *The Holographic Universe* (Harper Collins Publ., New York, 1991).
32. S. Ostrander, L. Schroeder, *Psychic Discoveries* (Marlowe, New York, 1997).
33. L. McTaggart, *The Field: The Quest for the Secret Force of the Universe* (Harper Collins, New York, 2002).
34. L. McTaggart, *The Intention Experiment* (Free Press, New York, 2007).
35. D. Raković, *Recollections, Dreams, Thoughts: About Past and Future 1984-2007. On Crossway of Quantum-Holographic and Classically-Reduced Reality* (IASC & IEFPG, Belgrade, 2008), in Serbian; see also www.dejanrakovicfund.org.
36. D. Raković, Tesla and quantum-coherent states of consciousness: Case study for understanding quantum-holographic nature of creativity, in D. Mirjanić (ed), *Ideas of Nikola Tesla* (ANU RS, Banja Luka, 2006);

- D. Raković, On nature and control of creativity – Tesla as a case study, *2nd Int. Workshop on Knowledge Federation “Self-organizing Collective Mind”*, Knowledge Federation, Dubrovnik (2010), preprint.
37. M. Dugić, On diagonalization of the composite-system observable separability, *Phys. Scripta* 56 (1997) 560; M. Dugić, *Contribution to Foundations of Decoherence Theory in Non-relativistic Quantum Mechanics*, PhD Thesis (Faculty of Science, Kragujevac, 1997), in Serbian.
 38. M. Dugić, M. M. Ćirković, D. Raković, On a possible physical metatheory of consciousness, *Open Systems and Information Dynamics* 9(2) (2002)153.
 39. M. Dugić, Quantum-holographic and classical Hopfield-like associative nets: Implications for modelling two cognitive modes of consciousness, *Opticheskii J* 72(5) (2005) 13 (Special Issue on Topical Meeting on Optoinformatics ‘Optics Meets Optika’, Saint-Petersburg, 18-21 Oct. 2004).
 40. D. Raković, Scientific bases of quantum-holographic paradigm, in I. Kononeko, ed., *Proc Int Conf Measuring Energy Fields* (Kamnik, Slovenia, 2007), Invited lecture.
 41. K. Wilber, *The Atman Project* (Quest, Wheaton, 1980).
 42. P. Vujićin, States of consciousness in esoteric practice, in D. Raković, Dj. Koruga, eds., *Consciousness: Scientific Challenge of the 21st Century* (ECPD: Belgrade, 1995), and refs therein.
 43. Swami Prabhavananda, Ch. Isherwood (tr.), *The Yoga Sutras of Patanjali. How to Know God* (New American Library: New York, 1969).
 44. J. Vlahos, *Orthodox Psychotherapy: Holy Fathers Science* (Missionary School of St. Alexander Nevskiy Church, Belgrade, 1998), Serbian transl from Greek.