

# Application of Double-Cusp Catastrophe Theory to The Physical Evolution of Qualia: Implications For Paradigm Shift in Medicine & Psychology

RICHARD L. AMOROSO  
Noetic Advanced Studies Institute  
120 Village Square MS 49  
Orinda, CA 94563-2502 USA  
Email: noeticj@mindspring.com

**Abstract.** Seminal work intended to found a new field of integrative Noetic Science is summarized. Until now the philosophy of *Biological Mechanism* has ruled medicine and psychology. Penrose claims, “*A scientific world-view which does not profoundly come to terms with the problem of conscious mind can have no serious pretensions of completeness*”.

A noetic action principle synonymous with the historic concept of *élan vital* is introduced as the basis of a Continuous State Conscious Universe (CSCU). The least unit of CSCU superspace defines *Awareness* as a fundamental physical quantity like *charge* in electrodynamics. This cosmological context reveals the origin of complexity in self-organized living-systems wherein the physical basis of qualia is formalized. The dynamics of this teleological action principle, mediated by a unitary noetic field pervading all biochemical species, optimizes the state of *well-being* through homeostasis and provides the fundamental basis for developing a *Moral Psychology*.

*Keywords:* Biological Mechanism, Catastrophe theory, Consciousness, Élan vital, Qualia

## 1. Noetic Cosmology Summarized

*Biological Mechanism* [Haldane, 1923; Beckner, 1972] states that physics and chemistry provide sufficient explanation for living-systems with no additional life principle required. The limits of this philosophy is surpassed by applying an advanced form of Wheeler-Feynman Absorber Theory [Wheeler, 1945; Amoroso, 2000a, 2002b, 2003a] to an extended form of Einstein’s original Static Universe Model [Cramer, 1986] in terms on a complex energy-dependent spacetime metric  $f : M_4 \rightarrow \hat{M}_4$  [Witten, 1981] within a non-compactified Kaluza-Klein Theory of twelve dimensions (11)12D [Overduin & Wessen, 1997]. The formalism for this highly ordered harmonic superspace  $S_N = S_0 + S_1 + S_2$  which is a *continuous state* cosmology with an  $M_4$  standing-wave present created/recreated from the complex advanced/retarded suprastructure of the future-past [Cramer, 1986; Amoroso, 2002b; Rauscher, 2002] has the basic form

$$R_{sym\hat{M}_4}^{S_{N_0}} = \frac{1}{2} \left[ R_{retC_4}^{S_{N_1}} + R_{advC_4}^{S_{N_2}} \right] \quad (1)$$

compatible with recent advances in 10(11)D Superstring Theory, now called M-Theory [Greene, 2002]. The least unit of this complex Noetic Superspace  $S_N$  represents the fundamental basis for awareness in a Continuous State Conscious Universe (CSCU)[Amoroso, 2003a,b; Stevens, 1989].

A form of Dirac Spherical Rotation [Rolands, 2004; Wolf, 2002; Amoroso, 2003a], an integral component of the metric’s transformation; provides a symmetry breaking leading to a new noetic action principle tantamount to the historic concept of *élan vital*, suggesting a Bohr-type complementarity of mind/body in the quantum brain [Pribram, 1991; Jibu & Yasue, 1995] and Cartesian dualism [Eccles, 1989] beyond [Amoroso, 2003a,b,c]. An inherent beat frequency during the continuous state compactification dimensional reduction topological transformation introduces the *élan vital* by holophote action through every spacetime point into every atom during the process of dimensional transformation:

$D_s \rightarrow D_t \rightarrow D_E$  and  $R_U \rightarrow R_Q \rightarrow R_C$  where spatial dimensions  $D_s$  are transformed into temporal dimensions  $D_t$  and temporal dimensions  $D_t$  into energy  $D_E$  in a cyclical process of unitarity  $R_U$  to  $R_Q$  quantum to classical  $R_C$ .

This process occurs by superluminal Lorentz boosts [Rauscher, 2002; Cole, 1977] and represents an additional set of Noetic transformations: Galilean  $\rightarrow$  Lorentz/Poincaré  $\rightarrow$  Noetic [Amoroso, 2003a; 200a].

## 2. Physical Basis Of Qualia

Qualia, the plural of *quale*, is ‘the subjective quality of experience; a *qualitative feel* associated with an experience’ [Chalmers, 1996; Nagel, 1974]. The physical CSCU cosmology of *élan vital* leads to a rigorous model for representing qualia [Amoroso, 2004, 2003c] allowing immediate application on the mind-side to psychology and on the body-side to medicine. In ‘What’s it like to be a bat?’ Nagel [1974] states that current reductionist attempts fail by filtering out any basis for consciousness; becoming meaningless since they are logically compatible with its absence. He assumes if an organism has conscious experience, “there is something it is like to *be* that organism”. This is the subjective character of experience for any conscious entity whether a bat or a Martian. Every experience has a specific subjective nature [Nagel, 1974].

To Nagel “there are facts which could not ever be represented or comprehended by human beings, simply because our structure does not permit us to operate with concepts of the requisite type”; because “to even form a *conception* of what it is like to be a bat one must take up the bat’s point of view”. If one removed the viewpoint of the subjective observer; what would be left? Nagel suggests the remaining properties might be those detectable by other human beings, the physical processes themselves or states intrinsic to the experience of awareness. This changes the perspective of qualia to the form “there is something it is like to undergo certain physical processes”. “If our idea of the physical ever expands to include mental phenomena, it will have to assign them an objective character”. Nagel recognizes the fact that:

Very little work has been done on the basic question (from which mention of the brain can be entirely omitted) whether any sense can be made of experiences having an objective character at all. Does it make sense ... to ask what my experiences are *really* like, as opposed to how they appear to me?...This question also lies at the heart of the problem of other minds ... If one understood how subjective experience could have an objective nature, one would understand the existence of subjects other than oneself [Nagel, 1974].

These are questions an integrative Noetic Science can answer. Standard definitions of qualia are an inadequate philosophical construct describing only subjective character. In the physical sense of Noetic Field Theory (NFT) components describing qualia from the objective sense are introduced - i.e. distinguishing the phenomenology of qualia from the noumenon or physical existence of the *thing in itself*.

The comprehensive definition of qualia must include three forms [Amoroso, 2004, 2003c]:

Type I. The Subjective - The *what it feels like* basis of awareness. Phenomenological states of the qualia experience. (The current definition of qualia Q-1)

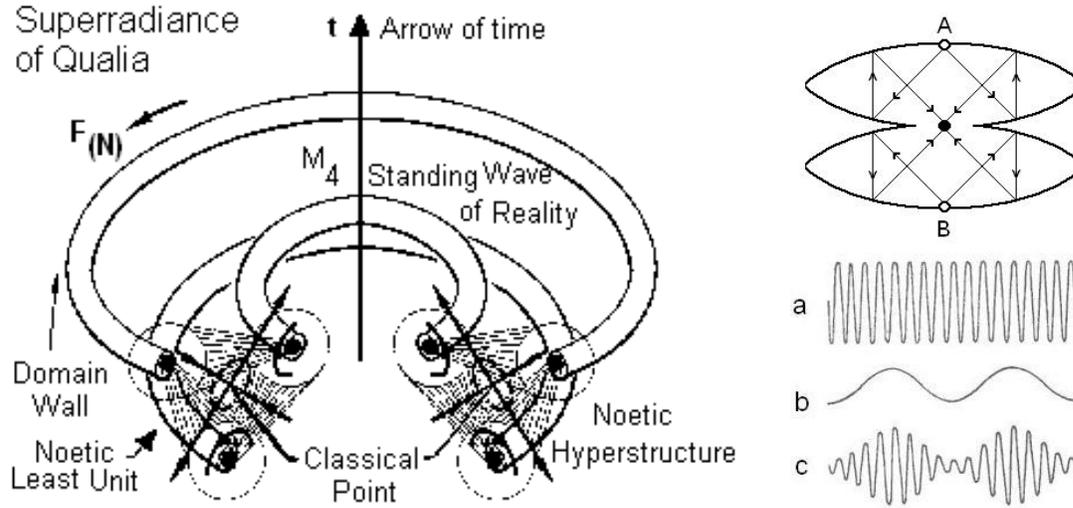
Type II. The Objective - Physical basis of qualia independent of the *subjective feel* that could be stored or transferred to another entity breaking the 1<sup>st</sup> person 3<sup>rd</sup> person barrier. The noumenal elements of qualia upon which the phenomenology is based.

Type III. The Universal - Living systems represent a Qualia substrate of the conscious universe, acting as a ‘blank slate’ carrier from within which Q-II are modulated into the Q-I of experience by a form of superradiance or hyper-holographic evanescence.

Three forms of qualia are considered physically real by NFT because the noetic fields of CSCU cosmology on which the noetic model is based are all physically real. See [Amoroso, 2004, 2003c].

A standard image requires a screen or other reflective surface to be resolved; but if the foci of two parabolic mirrors (Casimir-like plates in our model) are made to coincide, the two images superpose into a real 3D image that does not need a screen. See Figure 1 above. A science toy called the ‘magic mirage’ is used to demonstrate this effect of parabolic mirrors. Objects placed in the bottom appear like solid objects at the top of the device.

## Cosmological Origin and Production of the Three Types of Qualia



**Figure 1.** Metaphor for the emergence of qualia from the continuous action of the noetic least unit (1a), a microcosm of the CSCU where past oriented compactification periodically produces a classical spacetime point. The standing-wave domain walls represent the lightcone singularities of Q-III propagation, the surfaces of which act structurally as Casimir-like plates, and phenomenologically as a carrier wave base for Q-I qualia evanescence by Q-II modulation. 1b represents two pairs of parabolic mirrors (the Q-III Casimir domain walls) whose foci overlap; this is the high frequency wave in 1c denoted as *a*. The longer wave *b* represents Q-II qualia which is modulated by the Q-III wave into the usual Q-I qualia *c*. Thus *a*, *b*, and *c* in 1c represents the three forms of qualia and how they work together to form Q-I by superradiance of the noetic field.

The holophote action of *élan vital* energetics arises from the harmonic oscillation of least unit boundary conditions tiles the spacetime backcloth and pervades all self-organized living systems. The inherent beat frequency of this continuous action produces the Q-III carrier wave that is an *empty slate* modulating cognitive data of Q-II physical parameters into Q-I awareness states as a superposition of the two (Q-III and Q-II). This modulation of qualia occurs in the HD QED cavities of the cognitive domain. The QED cavities are a close-packed tiling of least unit noetic hyperspheres; the Casimir surfaces of which are able to reflect *quaneme* subelements. While the best reflectors of EM waves are polished metal mirrors, charged boundary conditions also reflect EM waves in the same way radio signals bounce off the ionized gases of the Kennelly-Heaviside layers in the Earth's ionosphere. This reflective 'sheath' enclosing the cognitive domain is charged by the Noeon radiation (exchange particle of the noetic field) [Amoroso & Martin, 1995] of the *élan vital*, the phases of which are 'regulated' in the complex HD space of the least unit CSCU cosmology.

How does noetic theory describe more complex qualia than the simple qualia of a light pencil? (The qualia-II of a light pencil is assumed to be *the* pencil of light [Amoroso, 2004, 2003c] Light quanta are microscopic in contrast to the macroscopic sphere of awareness. It thus seems reasonable to assume that scale invariant properties of the CSCU least unit of awareness would apply. Like phonemes as fundamental sound elements for audible language there are qualia-nemes or *quanemes* for awareness all based on the physical modulation of Q-II states by the geometric structural-phenomenology of the Q-III carrier base of living systems.

### 3. Catastrophe Theory and the Noetic Formalism

The structural-phenomenology of Double-Cusp Catastrophe (DCC) Theory in  $\geq 9D$  appears homeomorphic to the Riemannian manifold of both 10(11) dimensional M-Theory and the topological geometry of the continuous state dimensional reduction spin exchange compactification process inherent in the action of the corresponding scale invariant least unit of noetic superspace. In this general framework the double-cusp *equilibrium surface* is analyzed in terms of a hierarchy of *jumps in state* providing a framework for expanding the basis of allopathic medicine and psychology. One can say FAPP that the noetic least-unit tiling [Amoroso, 2003a] of the Planck backcloth is a complex HD catastrophe manifold mediated by the unitary noetic field.

The noetic action of consciousness  $F_{(N)}$  is not a 5<sup>th</sup> fundamental force but an integration of the electromagnetic and gravitational force at the unitary level where it is confined to the Universal sea of consciousness embodying an 11(12)D Noetic spacetime metric  $S_{(N)}$  [Amoroso, 2002b]. The well known Schrodinger equations central to quantum theory make correspondence to Newton's second law of motion  $F = ma$  which is also the starting point for deriving the noetic formalism. Newton's law of gravitation  $F = Gm_1m_2 / r^2$  is not chosen because it is not the fundamental form of gravitation and also contains an undesirable constant of dimensionality. Whereas  $F = ma$  is dimensionless. Likewise Einstein's gravity is also not chosen.

Substituting Einstein's mass-energy relation  $E = mc^2$  into Newton's 2<sup>nd</sup> law we obtain:  $F_{(n)} = E / c^2 a$  where  $F_{(n)}$  is the noetic force and  $E$  becomes the self-organized autopoietic energy [Varela & Maturana, 1974; Jantsch, 1984] related to  $\psi_e$  of the cosmology of mind defined in the fundamental dualistic relationship of noetic theory:

$$|\Psi_M\rangle = |B|\psi_b\rangle + (|\psi_e\rangle + |\psi_c\rangle) \quad (2)$$

i.e. the mind  $\Psi_M$  is not merely quantum brain dynamics  $B|\psi_b\rangle$ , but a classical  $\rightarrow$  quantum  $\rightarrow$  unitary continuum of brain, élan vital  $\psi_e$  and HD elemental intelligence  $\psi_c$ .  $E$  is scale invariant through all levels of the CSCU beginning at the highest level in the supralocal Megaverse as a hyperdimensional Wheeler Geon - a *ball* of photons of sufficient size to self cohere through gravity (Wheeler, 1955). At the micro level the Geon becomes synonymous with the de Broglie wave-like mental energy of a conscious entity. The Prion [Prusiner, 1982], the infectious protein responsible for spongiform encephalopathies (mad cow disease) is designated the simplest known life form, if correct that the prion protein is 'animated' by the self-organizing properties of the *élan vital* of the noetic field [Amoroso & Amoroso, 2004]. The  $E$  unit is comprised of a factor of *Einstein's*, the fundamental physical quantity defined as a 'mole - Avogadro number ( $10^{23}$ ) of photons'.

Next the derivation of the noetic equation is generalized for the conscious universe by taking an axiomatic approach to cosmological scaling from the work of Kafatos et al, [2000] suggesting that all lengths in the universe are scale invariant. Beginning with the heuristic relation  $c \equiv \dot{R}$  or  $\dot{R} = L / t = c$  where  $\dot{R}$  represents the rate of change of scale in the universe. This corresponds to the Hubble relation for perceived Doppler expansion of the universe where  $H_0 = \dot{R} / R$  and  $a = \dot{R} \times H_0$ . By substituting  $\dot{R}^2 / R$  for  $a$  in the original  $F_{(n)} = E / c^2 a$ , for final substitution we have  $F_{(n)} = E / c^2 \times \dot{R}^2 / R$ . Since  $c = \dot{R}$  the  $c^2$  &  $\dot{R}$  terms cancel and we are left with:

$$F_{(N)} = E / R \quad (3)$$

the unexpanded fundamental formalism for noetic action within a conscious entity in the CSCU model. It should be noted that  $R$  is a complex rotational length with standing wave properties and could be derived in terms of angular momentum or spacetime spinors at HD levels in domains described by future developments in M-Theory. But the derivation above is simpler at present.

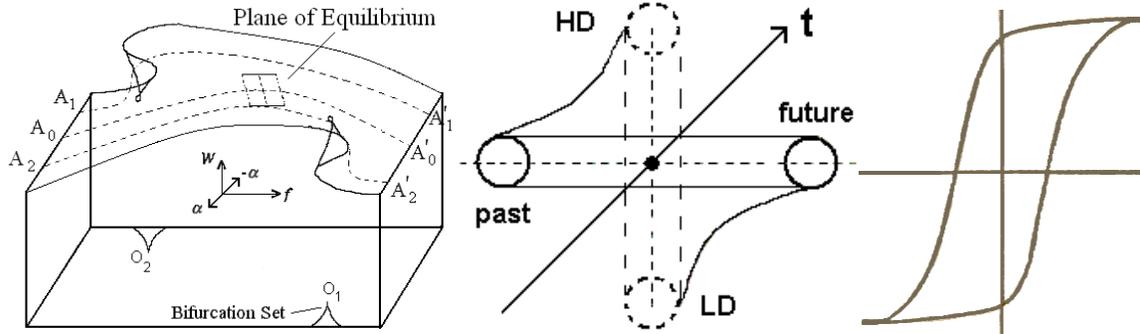
When applied in concert with the fundamental noetic equation of consciousness [Amoroso, 2002a] and the model of interactive computing [Milner, 1993; Wegner, 1998] double-cusp catastrophe theory provides a mathematical basis for the new noetic basis for medicine and psychology. The processes of metabolic homeostasis and intentional action are modulated by the ubiquitous flux of the unitary noetic field as described by the  $F_{(N)}$  formalism.

Equation (4) is a standard equation for the equilibrium surface of the DCC [Qin, 2001] as modeled in (Fig. 2); where  $B \pm Q$  is the state variable and  $\mu_d$  and  $\nu_d$  are the control parameters.

$$(B + Q)^3 + (B + Q)\mu_d + \nu_d = 0 \quad (4)$$

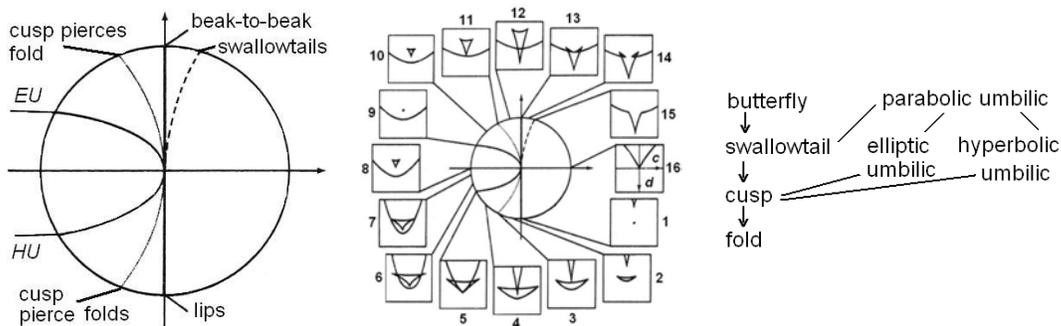
The position of the two cusps is found at  $\mu_d = 0$  and  $\nu_d = 0$ .

## Noetic Action on the Equilibrium Plane of a Double-Cusp Catastrophe



**Figure 2.** In 2a, the DCC is illustrated showing cusps at each end of the plane of equilibrium. The DCC is said to occur in  $\geq 9$  dimensions and thought to be the catastrophe form most compatible with NFT symmetry. The plane of equilibrium is a topological manifold tiled of noetic *least units*. The equilibrium manifold undergoes a ‘conscious’ quantum computation best described by interactive computation (Wegner, 1998; Milner, 1993). Fig. 2b graphically illustrates the fundamental scale invariant noetic equation  $F_{(N)} = E/R$  of conscious action. Any internal or external stress or change in  $E$  is a nonlinear dynamic process producing stability or instability in the boundary conditions of  $R$ ; an instability in  $E \rightarrow$  stress  $\rightarrow$  displacement  $\rightarrow$  catastrophe  $\rightarrow$  jump...whereas stable flux is homeostatic. 2b like noetic CSCU cosmology is also a form of hysteresis loop generalized in 2c.

## Unit Circle and Associated Flag of Temporal Evolution for Noetic Catastrophe Cycle



**Figure 3.** (Posten & Stuart, 1978) 3a represents a plane of the unit circle with corresponding cross sections in 3b: Section 16 for example shows a cusp. A single point in 1 grows to the ‘lips’ in 2. In 3 to 4 the original cusp 16 penetrates the mouth becoming a hyperbolic umbilic point at 5, turning into an elliptic umbilic at 6, shrinking to a point in 9. Growing again in 10 to pierce the fold line in 11 and through it in 12. A ‘beak-to-beak singularity in 13 breaks in 14, collapsing to a swallowtail 15. The seven fundamental catastrophes contain ‘subcatastrophes according to the diagram in 3c.

If fig. 3a is considered as a present moment; 3b is a flag of temporal permutations as the noetic catastrophe cycle evolves in time from future to past and higher to lower dimensions in the same manner as the CSCU cosmology for the spaces:  $R^{12} \supseteq \dots R^4 \supseteq R^3 \supseteq R^2 \supseteq R^1 \supseteq R^0$ .

This brief summary is only a primitive slice introducing the anticipated new field of integrative Noetic Science revolutionizing medicine and psychology and implementing myriad *conscious* technologies like sensory bypass prosthesis or E-wave (eternity–wave) accelerated healing for example. Experimental work is underway to isolate and utilize the noetic field for these tasks.

## References

- Amoroso, R.L. (2004) Ce Este Constiinta? Trepte Intru Cosmologia Mintii (What is Consciousness: Introducing the Cosmology of Being, N. Bulz et al (trans.) Bucharesti: Editura Academiei Romane, in press.
- Amoroso R.L. (2003a) Awareness: physical cosmology of the fundamental least unit, *Noetic Journal* 4:1, 1-15.
- Amoroso, R.L. (2003b) The Fundamental Limit and Origin of Biological Systems, *Noetic Journal* 4:1; 24-32.
- Amoroso, R.L. (2003c) The physical basis of qualia: Overcoming the 1<sup>st</sup> person 3<sup>rd</sup> person barrier, *Noetic J.* 4:3, pp. 212-230.
- Amoroso, R.L. (2002a) The Physical Basis of Consciousness: A Fundamental Formalism, Part 1 Noesis, XXVI, Romanian Acad.
- Amoroso R.L. (2002b) Developing the cosmology of a continuous state universe, in R.L. Amoroso, G. Hunter, M. Kafatos & J-P Vigier (eds.), *Gravitation and Cosmology: From the Hubble Radius to the Planck Scale*, Dordrecht: Kluwer Academic Pub.
- Amoroso, R.L. (2000a) The parameters of temporal correspondence in a continuous state conscious universe, in R. Buccheri & M. Saniga (eds.) *Studies in the Structure of Time: From Physics to Psycho(patho)logy*, Dordrecht Kluwer Academic.
- Amoroso, R.L., (2000b) Consciousness, a radical definition: Substance dualism solves the hard problem, In Amoroso, R.L., Antunes, R, Coelho, C., Farias, M., Leite, A., & Soares, P. (eds.) *Science & the Primacy of Consciousness*, Orinda: Noetic Press.
- Amoroso, R.L (1999) An introduction to noetic field theory: The quantization of mind, *Noetic J.* 2:1, pp. 28-37.
- Amoroso, R.L. & Amoroso P.J., 2004, The Fundamental Limit and Origin of Complexity in Biological Systems: A New Model for the Origin of Life, in D.M. Dubois (ed.) *Proceedings of CASYS03, Sixth International Conference on Computing Anticipatory Systems*, Liege, Belgium, August 11-16, 2003, New York: AIP Proceedings 718.
- Amoroso, R.L., & Martin, B. (1995) Modeling the Heisenberg matrix: Quantum coherence and thought at the holoscape manifold and deeper complementarity. In J. King & K.H. Pribram, Eds. *Scale in Conscious Experience: Is the Brain too Important to be Left to Biologists to Study?* Lawrence Earlbaum, Mahwah.
- Beckner, M.O. (1972) Mechanism in biology, in P. Edwards (ed.) *The Encyclopedia of Philosophy*, Vol. 5, pp 250-2, New York: Collier Macmillan.
- Chalmers, D. (1996) *The Conscious Mind*, Oxford: Oxford University Press.
- Cole, E.A.B., 1977, *Il Nuovo Cimento*, 40:2, 171-180.
- Cramer, J.G. (1986) The transactional interpretation of quantum mechanics, *Rev of Modern Physics* 58, pp. 647-687.
- Eccles, J.C. (1989) A unitary hypothesis of mind-brain interaction in the cerebral cortex, *Proc. R. Soc. Lond. B* 240, pp. 433-451.
- Gilmore, R. (1981) *Catastrophe Theory for Scientists & Engineers*, New York: Dover.
- Greene, B. (1999) *The Elegant Universe*, New York: Vintage Books.
- Haldane, J.S. (1923) *Mechanism, Life and Personality*, New York.
- Jantsch, E. (1984) *The Self-Organizing Universe*, New York: Pergamon.
- Jibu, M. & Yasue, K. (1995) *Quantum Brain Dynamics and Consciousness*, Amsterdam: John Benjamins.
- Kafatos, M., Roy, S. & Amoroso, R. (2000) Scaling in Cosmology & the Arrow of Time, in Buccheri, di Gesu & Saniga, (eds.) *Studies on Time*, Dordrecht: Kluwer Academic.
- Milner, R. (1993) Elements of interaction, *Comm. of the ACM*, 36:1, 78-89.
- Nagel, T. (1974) What's it like to be a bat?, *Philosophical Review*, 83, pp. 435-450
- Overduin, J.M. & Wesson, P.S., 1997, *Kaluza-Klein gravity*, *Physics Reports*, 283, pp. 303-378.
- Poston T. & Stewart, I (1978) *Catastrophe Theory & Its Applications*, New York: Dover.
- Pribram, K.H. (1991) *Brain and Perception*, Hillsdale: Lawrence Earlbaum.
- Prusiner, S. (1982) *Science*, 216, pp. 136-144.
- Qin, S. et al. , (2001), *Int. J of Solids & Structures*, 38, pp. 8093-8109.
- Rauscher, E., 2002, Non-Abelian gauge groups for real & complex Maxwell's equations, in R.L. Amoroso, G. Hunter, S. Jeffers & M. Kafatos, (eds.), *Gravitation & Cosmology: From the Hubble Radius to the Planck Scale*, Dordrecht: Kluwer.
- Rolands, P. (2004) The Dirac equation as the origin of symmetry breaking, in R. Amoroso, B. Lehnert & J-P Vigier (eds), *The Search For Unity in Physics*, Dordrecht: Kluwer, in press.
- Stevens, H.H (1989) Size of a least unit, in M. Kafatos (ed.) *Bell's Theorem, Quantum Theory and Conceptions of the Universe*, Dordrecht: Kluwer Academic.
- Varela, F.G., Maturana, H.R. & Uribe, R. (1974) Autopoiesis: The organization of living systems, its characterization and a model, *BioSystems*, 5, 187-196.
- Wegner, P.(1998) Interactive foundations of computing, *Theor. Computer Sci.*, 192, pp.315-351.
- Wheeler, J.A., & Feynman, R. (1945) *Rev. Mod. Physics*, 17, 157.
- Wheeler, J.A. (1955) Geons, *Physical Review*, 97:2, 511-536.
- Witten, E. (1981) Search for a realistic Kaluza-Klein Theory, *Nuclear Physics B*, 186. p. 412-28.
- Wolff, M. (2002) Cosmology, the quantum universe, and electron spin, in R.L. Amoroso, G. Hunter, M. Kafatos & J-P Vigier (eds.), *Gravitation and Cosmology: From the Hubble Radius to the Planck Scale*, Dordrecht: Kluwer Academic Publishers.