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**BULLETIN**

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Abstracts and the descriptions of works in  
Art and Science  
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**ID #: 910**      **Natural Sciences / Astronomy / General physics**

**Submitted on:** Oct 03, 2012

**Author:**      **Roberto Caimmi**

**Title:**        **Tidal interactions and principle of corresponding states: from micro to macro cosmos. A century after van der Waals` Nobel Prize**

**Abstract:**    The current attempt is aimed to honor the first centennial of Johannes Diderik van der Waals (VDW) awarding Nobel Prize in Physics. The VDW theory of ordinary fluids is reviewed in the first part of the paper, where special effort is devoted to the equation of state and the law of corresponding states. In addition, a few mathematical features involving properties of cubic equations are discussed, for appreciating the intrinsic beauty of the VDW theory. A theory of astrophysical fluids is shortly reviewed in the second part of the paper, grounding on the tensor virial theorem for two-component systems, and an equation of state is formulated with a convenient choice of reduced variables. Additional effort is devoted to particular choices of density profiles, namely a simple guidance case and two cases of astrophysical interest. The related macroisothermal curves are found to be qualitatively similar to VDW isothermal curves below the critical threshold and, for sufficiently steep density profiles, a critical macroisothermal curve exists, with a single horizontal inflexion point. Under the working hypothesis of a phase transition (assumed to be gas-stars) for astrophysical fluids, similar to the vapour-liquid phase transition in ordinary fluids, the location of gas clouds, stellar systems, galaxies, cluster of galaxies, on the plane scanned by reduced variables, is tentatively assigned. A brief discussion shows how van der Waals` two great discoveries, namely a gas equation of state where tidal interactions between molecules are taken into account, and the law of corresponding states, related to microcosmos, find a counterpart with regard to macrocosmos. In conclusion, after a century since the awarding of the Nobel Prize in Physics, van der Waals` ideas are still valid and helpful to day for a full understanding of the universe.

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**ID #: 911**      **Social Sciences / Economics / Environmental**

**Submitted on:** Oct 04, 2012

**Author:**      **Miakotyn Oleksandr**

**Title:**        **THE CREATION OF A FREE MARKET OF SOCIAL PROJECTS**

**Abstract:**    The creation of a free market of social projects could become a complement and alternative to governmental social programs. Creation of such a market would require a new method of tax collection and expenditure. An example of just such a social project and a possible implementation plan for it is suggested herein. This article considers and explores likely problems relative to the creation of this alternative free market of social projects. The forces influencing the market of goods and services are compared with this proposal of free market social projects. Implementation of such a free market for social projects would have positive consequences economically and socially.

**Web link:**    **[www.IntellectualArchive.com/getfile.php?file=OUKWeWKli3V&orig\\_file=The\\_Creation\\_of\\_a\\_Free\\_Market\\_of\\_Social\\_Projects.doc](http://www.IntellectualArchive.com/getfile.php?file=OUKWeWKli3V&orig_file=The_Creation_of_a_Free_Market_of_Social_Projects.doc)**

**ID #: 913**      **Natural Sciences / Physics / Quantum field theory**

**Submitted on:** Oct 06, 2012

**Author:**      **S. N. Sandhya, Subhashish Banerjee**

**Title:**        **Geometric Phase: a Diagnostic Tool for Entanglement**

**Abstract:**    Using a kinematic approach we show that the non-adiabatic, non-cyclic, geometric phase corresponding to the radiation emitted by a three level cascade system provides a sensitive diagnostic tool for determining the entanglement properties of the two modes of radiation. The nonunitary, noncyclic path in the state space may be realized through the same control parameters which control the purity/mixedness and entanglement. We show analytically that the geometric phase is related to concurrence in certain region of the parameter space. We further show that the rate of change of the geometric phase reveals its resilience to fluctuations only for pure Bell type

states. Lastly, the derivative of the geometric phase carries information on both purity/mixedness and entanglement/separability.

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**ID #: 914** Natural Sciences / Physics / Quantum field theory

**Submitted on:** Oct 06, 2012

**Author:** Subhashish Banerjee, C. M. Chandrashekar, Arun K. Pati

**Title:** Enhancement of Geometric Phase by Frustration of Decoherence: A Parrondo like Effect

**Abstract:** Geometric phase plays an important role in evolution of pure or mixed quantum states. However, when a system undergoes decoherence the development of geometric phase may be inhibited. Here, we show that when a quantum system interacts with two competing environments there can be enhancement of geometric phase. This effect is akin to Parronodo like effect on the geometric phase which results from quantum frustration of decoherence. Our result suggests that the mechanism of two competing decoherence can be useful in fault tolerant holonomic quantum computation.

**Web link:** [www.IntellectualArchive.com/getfile.php?file=t7PB1kQM8I2&orig\\_file=S\\_Banerjee\\_Enhancement\\_of\\_Geometric\\_Phase.pdf](http://www.IntellectualArchive.com/getfile.php?file=t7PB1kQM8I2&orig_file=S_Banerjee_Enhancement_of_Geometric_Phase.pdf)

**ID #: 915** Natural Sciences / Physics / Quantum field theory

**Submitted on:** Oct 06, 2012

**Author:** Sk. Sazim, Satyabrata Adhikari, Subhashish Banerjee, T. Pramanik

**Title:** Quantification of Entanglement of teleportation in Arbitrary Dimensions

**Abstract:** We study bipartite entangled states in arbitrary dimensions and obtain different bounds for the teleportation fidelity. In addition, we establish various relations between teleportation fidelity and the entanglement measures depending upon Schmidt rank of the states. These relations and bounds help us to determine the amount of entanglement required for teleportation. We call this amount of entanglement required for teleportation as "Entanglement of Teleportation". These bounds are used to determine the teleportation fidelity as well as the entanglement required for teleportation of states modeled by a two qutrit mixed system as well as two qubit open quantum systems.

**Web link:** [www.IntellectualArchive.com/getfile.php?file=jQhilH8ie8N&orig\\_file=S\\_Banerjee\\_Quantification\\_of\\_Entanglement.pdf](http://www.IntellectualArchive.com/getfile.php?file=jQhilH8ie8N&orig_file=S_Banerjee_Quantification_of_Entanglement.pdf)

**ID #: 916** Natural Sciences / Physics / Quantum field theory

**Submitted on:** Oct 06, 2012

**Author:** Satyabrata Adhikari, Subhashish Banerjee

**Title:** An Operational Meaning of Discord in terms of Teleportation Fidelity

**Abstract:** Quantum discord is a prominent measure of quantum correlations, playing an important role in expanding its horizon beyond entanglement. Here we provide an operational meaning of (geometric) discord, which quantifies the amount of non-classical correlation of an arbitrary quantum system in terms of its minimal distance from the set of classical states, in terms of teleportation fidelity for general two qubit and  $d \otimes d$  dimensional isotropic and Werner states. A critical value of the discord is found beyond which the two qubit state must violate the Bell inequality. This is illustrated by an open system model of a dissipative two qubit. For the  $d \otimes d$  dimensional states the lower bound of discord is shown to be obtainable from an experimentally measurable witness operator.

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**ID #: 917** Natural Sciences / Physics / Quantum field theory

**Submitted on:** Oct 06, 2012

**Author:** S. Omkar, R. Srikanth, Subhashish Banerjee

**Title:** Dissipative and Non-dissipative Single-Qubit Channels: Dynamics and Geometry

**Abstract:** Single-qubit channels are studied under two broad classes: amplitude damping channels and generalized depolarizing channels. A canonical derivation of the Kraus representation of the former, via the Choi isomorphism is presented for the general case of a system's interaction with a squeezed thermal bath. This isomorphism is also used to characterize the difference in the geometry and rank

of these channel classes. Under the isomorphism, the degree of decoherence is quantified according to the mixedness or separability of the Choi matrix. Whereas the latter channels form a 3-simplex, the former channels do not form a convex set as seen from an ab initio perspective. Further, where the rank of generalized depolarizing channels can be any positive integer upto 4, that of amplitude damping ones is either 2 or 4. Various channel performance parameters are used to bring out the different influences of temperature and squeezing in dissipative channels.

**Web link:** [www.IntellectualArchive.com/getfile.php?file=7GHC2tnfNWB&orig\\_file=S\\_Banerjee\\_\\_Dissipative\\_and\\_Non-dissipative.pdf](http://www.IntellectualArchive.com/getfile.php?file=7GHC2tnfNWB&orig_file=S_Banerjee__Dissipative_and_Non-dissipative.pdf)

**ID #: 918**      **Natural Sciences / Physics / Quantum field theory**

**Submitted on:** Oct 06, 2012

**Author:** Himadri Shekhar Dhar, Subhashish Banerjee, Arpita Chatterjee, Rupamanjari Ghosh

**Title:** **Controllable quantum correlations of two-photon states generated using classically driven three-level atoms**

**Abstract:** We investigate the dynamics of two-photon correlations generated by the interaction of a three-level atom in the  $\Lambda$  or V configuration, with two classical external driving fields, under the rotating-wave approximation, in the presence of level decays. Using the example of a Rubidium atom in each configuration, with field strengths validating the single-photon approximation, we compute measurement based correlations, such as measurement induced disturbance (MID), quantum discord (QD), and quantum work deficit (WD), and compare the results with that of quantum entanglement (concurrence). Certain correlation properties observed are generic, model independent and consistent with known results, e.g., MID is an upper bound on QD, QD and WD are monotonic, and the generic correlation behavior is strongly affected by the purity of the photon states.

**Web link:** [www.IntellectualArchive.com/getfile.php?file=jicYclhExGm&orig\\_file=S\\_Banerjee\\_\\_Controllable\\_quantum\\_correlations.pdf](http://www.IntellectualArchive.com/getfile.php?file=jicYclhExGm&orig_file=S_Banerjee__Controllable_quantum_correlations.pdf)

**ID #: 919**      **Natural Sciences / Physics / Quantum field theory**

**Submitted on:** Oct 06, 2012

**Author:** Bibhas Adhikari, Satyabrata Adhikari, Subhashish Banerjee

**Title:** **Graph representation of quantum states**

**Abstract:** In this work we propose graphical representation of quantum states. Pure states require weighted digraphs with complex weights, while mixed states need, in general, edge weighted digraphs with loops; constructions which, to the best of our knowledge, are new in the theory of graphs. Both the combinatorial as well as the signless Laplacian are used for graph representation of quantum states. We also provide some interesting analogies between physical processes and graph representations. Entanglement between two qubits is approached by the development of graph operations that simulate quantum operations, resulting in the generation of Bell and Werner states. As a byproduct, the study also leads to separability criteria using graph operations. This paves the way for a study of genuine multipartite correlations using graph operations.

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**ID #: 920**      **Natural Sciences / Physics / Quantum field theory**

**Submitted on:** Oct 06, 2012

**Author:** Srinatha Narayanaswamy, Omkar Srikrishna, R. Srikanth, Subhashish Banerjee, Anirban Pathak

**Title:** **The quantum cryptographic switch**

**Abstract:** We illustrate using a quantum system the principle of a cryptographic switch, in which a third party (Charlie) can control to a continuously varying degree the amount of information the receiver (Bob) receives, after the sender (Alice) has sent her information. Suppose Charlie transmits a Bell state to Alice and Bob. Alice uses dense coding to transmit two bits to Bob. Only if the 2-bit information corresponding to choice of Bell state is made available by Charlie to Bob can the latter recover Alice's information. By varying the information he gives, Charlie can continuously vary the information recovered by Bob. The performance of the protocol subjected to the squeezed generalized amplitude damping channel is considered. We also present a number of practical situations where a cryptographic switch would be of use.

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**ID #: 921**      **Natural Sciences / Physics / Quantum field theory**

**Submitted on:** Oct 06, 2012

**Author:**      **Archana Sharma, R. Srikanth, Subhashish Banerjee, Hema Ramachandran**

**Title:**        **An information theoretic study of number-phase complementarity in a four level atomic system**

**Abstract:**    We study number-phase uncertainty in a laser-driven, effectively four-level atomic system under electromagnetically induced transparency (EIT) and coherent population trapping (CPT). Uncertainty is described using (entropic) knowledge of the two complementary variables, namely, number and phase, where knowledge is defined as the relative entropy with respect to a uniform distribution. In the regime where the coupling and probe lasers are approximately of equal strength, and the atom exists in a CPT state, there is coherence between the ground states, and correspondingly large phase knowledge and lower number knowledge. The situation is the opposite in the case where coupling laser is much stronger and the atom exists in an EIT state. We study these effects also in the presence of a higher-order nonlinear absorption, which is seen to produce a dephasing effect.

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**ID #: 922**      **Natural Sciences / Physics / Mathematical Physics**

**Submitted on:** Oct 06, 2012

**Author:**      **Ricardo Lopez-Ruiz, Jose-Luis Lopez, Xavier Calbet**

**Title:**        **Exponential wealth distribution: a new approach from functional iteration theory**

**Abstract:**    Exponential distribution is ubiquitous in the framework of multi-agent systems. Usually, it appears as an equilibrium state in the asymptotic time evolution of statistical systems. It has been explained from very different perspectives. In statistical physics, it is obtained from the principle of maximum entropy. In the same context, it can also be derived without any consideration about information theory, only from geometrical arguments under the hypothesis of equiprobability in phase space. Also, several multi-agent economic models based on mappings, with random, deterministic or chaotic interactions, can give rise to the asymptotic appearance of the exponential wealth distribution. An alternative approach to this problem in the framework of iterations in the space of distributions has been recently presented. Concretely, the new iteration given by  $f_{n+1}(x) = \int \int_{u+v>x} \frac{f_n(u)f_n(v)}{u+v} du dv$ . It is found that the exponential distribution is a stable fixed point of the former functional iteration equation.

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**ID #: 923**      **Natural Sciences / Astronomy / Astrophysics**

**Submitted on:** Oct 06, 2012

**Author:**      **M. Fabrizio, M. Nonino, G. Bono, I. Ferraro, P. Fran sois, G. Iannicola, M. Monelli, F. Th venin, P. B. Stetson, A. R. Walker, R. Buonanno, F. Caputo, C. E. Corsi, M. Dall' Ora, R. Gilmozzi, C.R. James, T. Merle, L. Pulone, M. Romaniello**

**Title:**        **The Carina Project. IV. radial velocity distribution**

**Abstract:**    We present new and accurate radial velocity (RV) measurements of luminous stars of all ages (old horizontal branch, intermediate-age red clump, and young blue plume, as well as red giants of a range of ages;  $20.6 < V < 22$ ) in the Carina dwarf spheroidal galaxy, based on low-resolution spectra collected with the FORS2 multi-object slit spectrograph at the VLT. This data set was complemented by RV measurements based on medium and high-resolution archive spectra of brighter ( $V < 20.6$ ) Carina targets collected with the GIRAFFE multi-object fiber spectrograph at the VLT. The combined sample includes more than 21,340 individual spectra of  $\sim 2,000$  stars covering the entire body of the galaxy. To further improve the statistics, the accurate RV measurements recently provided by Walker et al. (2007) were also added to the current data set. We ended up with a sample of  $\sim 1,370$  RV measurements of candidate Carina stars that is  $\sim 75\%$  larger than any previous Carina RV sample.

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**ID #: 924**      **Natural Sciences / Mathematics / Calculus / Analysis**

**Submitted on:** Oct 06, 2012  
**Author:** Juhani Riihentausta  
**Title:** Domination conditions for families of quasinearly subharmonic functions  
**Abstract:** Domar has given a condition that ensures the existence of the largest subharmonic minorant of a given function. Later Rippon pointed out that a modification of Domar's argument gives in fact a better result. Using our previous, rather general and flexible, modification of Domar's original argument, we extend their results both to the subharmonic and quasinearly subharmonic settings.  
**Web link:** [www.IntellectualArchive.com/getfile.php?file=2UinSNJ1Jjv&orig\\_file=Juhani\\_Riihentausta\\_Domination\\_conditions.pdf](http://www.IntellectualArchive.com/getfile.php?file=2UinSNJ1Jjv&orig_file=Juhani_Riihentausta_Domination_conditions.pdf)

**ID #: 925** Natural Sciences / Mathematics / Calculus / Analysis

**Submitted on:** Oct 06, 2012  
**Author:** Juhani Riihentausta  
**Title:** Quasi-nearly subharmonicity and separately quasi-nearly subharmonic functions  
**Abstract:** Wiegierinck has shown that a separately subharmonic function need not be subharmonic. Improving previous results of Lelong, of Avaniissian, of Arsove and of us, Armitage and Gardiner gave an almost sharp integrability condition which ensures a separately subharmonic function to be subharmonic. Completing now our recent counterparts to the cited results of Lelong, Avaniissian and Arsove for so called quasi-nearly subharmonic functions, we present a counterpart to the cited result of Armitage and Gardiner for separately quasi-nearly subharmonic functions. This counterpart enables us to slightly improve Armitage's and Gardiner's original result, too. The method we use is a rather straightforward and technical, but still by no means easy, modification of Armitage's and Gardiner's argument combined with an old argument of Domar.  
**Web link:** [www.IntellectualArchive.com/getfile.php?file=Li7KiNnM7iF&orig\\_file=Juhani\\_Riihentausta\\_Quasi-nearly\\_subharmonicity.pdf](http://www.IntellectualArchive.com/getfile.php?file=Li7KiNnM7iF&orig_file=Juhani_Riihentausta_Quasi-nearly_subharmonicity.pdf)

**ID #: 926** Natural Sciences / Physics / Condensed Matter Physics

**Submitted on:** Oct 06, 2012  
**Author:** Jorge Velazquez, Alberto Robledo  
**Title:** Renewal stochastic processes with correlated events. Phase transitions along time evolution  
**Abstract:** We consider renewal stochastic processes generated by non-independent events from the perspective that their basic distribution and associated generating functions obey the statistical-mechanical structure of systems with interacting degrees of freedom. Based on this fact we look briefly into the less known case of processes that display phase transitions along time. When the density distribution  $\psi_n(t)$  for the occurrence of the  $n$ -th event at time  $t$  is considered to be a partition function, of a 'microcanonical' type for  $n$  'degrees of freedom' at fixed 'energy'  $t$ , one obtains a set of four partition functions of which that for the generating function variable  $z$  and Laplace transform variable  $\epsilon$ , conjugate to  $n$  and  $t$ , respectively, plays a central role. \*\*\*  
Journal reference: Physical Review E 83, 031103 (2011)\*\*\*  
**Web link:** [www.IntellectualArchive.com/getfile.php?file=eootWeNPpOL&orig\\_file=Alberto\\_Robledo\\_Renewal\\_stochastic\\_processes.pdf](http://www.IntellectualArchive.com/getfile.php?file=eootWeNPpOL&orig_file=Alberto_Robledo_Renewal_stochastic_processes.pdf)

**ID #: 927** Natural Sciences / Physics / Mathematical Physics

**Submitted on:** Oct 06, 2012  
**Author:** Bartolo Luque, Lucas Lacasa, Alberto Robledo  
**Title:** Feigenbaum graphs at the onset of chaos  
**Abstract:** We analyze the properties of the self-similar network obtained from the trajectories of unimodal maps at the transition to chaos via the horizontal visibility (HV) algorithm. We first show that this network is uniquely determined by the encoded sequence of positions in the dynamics within the Feigenbaum attractor and it is universal in that it is independent of the shape and nonlinearity of the maps in this class. We then find that the network degrees fluctuate at all scales with an amplitude that increases as the size of the network grows. This suggests the definition of a graph-theoretical Lyapunov exponent that measures the expansion rate of trajectories in network space. On good agreement with the map's counterpart, while at the onset of chaos this exponent vanishes, the subexponential expansion and contraction of network degrees can be fully described via a Tsallis-type scalar deformation of the expansion rate, that yields a discrete spectrum of non-null generalized exponents.



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**ID #: 928** Natural Sciences / Physics / Mathematical Physics

**Submitted on:** Oct 06, 2012

**Author:** I.M.Suslov

**Title:** Triviality, Renormalizability and Confinement

**Abstract:** According to recent results, the Gell-Mann - Low function  $\beta(g)$  of four-dimensional  $\phi^4$  theory is non-alternating and has a linear asymptotics at infinity. According to the Bogoliubov and Shirkov classification, it means possibility to construct the continuous theory with finite interaction at large distances. This conclusion is in visible contradiction with the lattice results indicating triviality of  $\phi^4$  theory. This contradiction is resolved by a special character of renormalizability in  $\phi^4$  theory: to obtain the continuous renormalized theory, there is no need to eliminate a lattice from the bare theory. In fact, such kind of renormalizability is not accidental and can be understood in the framework of Wilson's many-parameter renormalization group. Application of these ideas to QCD shows that Wilson's theory of confinement is not purely illustrative, but has a direct relation to a real situation. As a result, the problem of analytical proof of confinement and a mass gap can be considered as solved, at least on the physical level of rigor.

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**ID #: 929** Natural Sciences / Mathematics / Calculus / Analysis

**Submitted on:** Oct 06, 2012

**Author:** Vicent Caselles, Alessandra Lunardi, Michele Miranda Jr, Matteo Novaga

**Title:** Perimeter of sublevel sets in infinite dimensional spaces

**Abstract:** We compare the perimeter measure with the Airault-Malliavin surface measure and we prove that all open convex subsets of abstract Wiener spaces have finite perimeter. By an explicit counter-example, we show that in general this is not true for compact convex domains.

**Web link:** [www.IntellectualArchive.com/getfile.php?file=fRlujtqpr0G&orig\\_file=Michele\\_Miranda\\_\\_Perimeter\\_of\\_sublevel\\_sets.pdf](http://www.IntellectualArchive.com/getfile.php?file=fRlujtqpr0G&orig_file=Michele_Miranda__Perimeter_of_sublevel_sets.pdf)

**ID #: 934** Natural Sciences / Physics / General Physics

**Submitted on:** Oct 09, 2012

**Author:** Edward Kapuscik

**Title:** Special Theory of Relativity without special assumptions and tachyonic motion

**Abstract:** The most general form of transformations of spacetime coordinates in Special Theory of Relativity based solely on physical assumptions are described. Only the linearity of spacetime transformations and the constancy of the speed of light are used as assumptions. The application to tachyonic motion is indicated.

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**ID #: 936** Natural Sciences / Physics / Particle physics

**Submitted on:** Oct 10, 2012

**Author:** Lal Singh, Bhag C. Chauhan, Ravi Dutt, K. K. Sharma, S. Dev

**Title:** Model Independent Constraints on Solar Neutrinos

**Abstract:** Using the data from SNO NCD phase, SuperK, Borexino and KamLAND Solar phase, we derive in a model independent way, bounds on the possible components in the solar neutrino flux. We update the limits on the antineutrino ( $\bar{\nu}_x$ ) flux and sterile ( $\nu_s$ ) component and compare them with the previous results obtained using SNO Salt phase data and data from SuperKamiokande experiments. It is affirmed that the upper bound on  $\bar{\nu}_x$  is independent of the  $\nu_s$  component. We recover the  $\nu_s$  and  $\bar{\nu}_x$  upper bounds existing in the literature. We also obtain bounds on  $f_B$ , the SSM normalization factor and the common parameter range for  $f_B$  and the  $\nu_s$  components in the light of latest data. In summary, we update, in a model independent way, the previous results existing in literature in the light of latest solar neutrino data.

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**ID #: 937** Natural Sciences / Physics / Mathematical Physics

**Submitted on:** Oct 10, 2012

**Author:** Hassan F. El-Nashar, Hilda A. Cerdeira

**Title:** Geometrical Properties of Coupled Oscillators at Synchronization

**Abstract:** We study the synchronization of  $N$  nearest neighbors coupled oscillators in a ring. We derive an analytic form for the phase difference among neighboring oscillators which shows the dependency on the periodic boundary conditions. At synchronization, we find two distinct quantities which characterize four of the oscillators, two pairs of nearest neighbors, which are at the border of the clusters before total synchronization occurs. These oscillators are responsible for the saddle node bifurcation, of which only two of them have a phase-lock of phase difference equals  $\pm\pi/2$ . Using these properties we build a technique based on geometric properties and numerical observations to arrive to an exact analytic expression for the coupling strength at full synchronization and determine the two oscillators that have a phase-lock condition of  $\pm\pi/2$ . \*\*\* The paper is published in CNSNS --Communications in Nonlinear Science and Numerical Simulations, 16, 4508 (2011) <http://dx.doi.org/10.1016/j.cnsns.2011.03.011> \*\*\*

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**ID #: 938** Social Sciences / Economics / Financial

**Submitted on:** Oct 10, 2012

**Author:** Eder Lucio Fonseca, Fernando F. Ferreira, Paulsamy Muruganandam, Hilda A. Cerdeira

**Title:** Identifying financial crises in real time

**Abstract:** Following the thermodynamic formulation of multifractal measure that was shown to be capable of detecting large fluctuations at an early stage, here we propose a new index which permits us to distinguish events like financial crisis in real time. We calculate the partition function from where we obtain thermodynamic quantities analogous to free energy and specific heat. The index is defined as the normalized energy variation and it can be used to study the behavior of stochastic time series, such as financial market daily data. Famous financial market crashes - Black Thursday (1929), Black Monday (1987) and Subprime crisis (2008) - are identified with clear and robust results. The method is also applied to the market fluctuations of 2011. From these results it appears as if the apparent crisis of 2011 is of a different nature from the other three. We also show that the analysis has forecasting capabilities.

**Web link:** [www.IntellectualArchive.com/getfile.php?file=7JofjJ1hXEM&orig\\_file=Hilda\\_Cerdeira\\_Identifying\\_financial\\_crises.pdf](http://www.IntellectualArchive.com/getfile.php?file=7JofjJ1hXEM&orig_file=Hilda_Cerdeira_Identifying_financial_crises.pdf)

**ID #: 939** Natural Sciences / Astronomy / Solar astronomy

**Submitted on:** Oct 10, 2012

**Author:** Arnold O. Benz, Marina Battaglia, Nicole Vilmer

**Title:** Location of Decimetric Pulsations in Solar Flares

**Abstract:** This work investigates the spatial relation between coronal X-ray sources and coherent radio emissions, both generally thought to be signatures of particle acceleration. Two limb events were selected during which the radio emission was well correlated in time with hard X-rays. The radio emissions were of the type of decimetric pulsations as determined from the spectrogram observed by Phoenix-2 of ETH Zurich. The radio positions were measured from observations with the Nancay Radioheliograph between 236 and 432 MHz and compared to the position of the coronal X-ray source imaged with RHESSI. The radio pulsations originated at least 30 - 240 Mm above the coronal hard X-ray source. The altitude of the radio emission increases generally with lower frequency. The average positions at different frequencies are on a line pointing approximately to the coronal hard X-ray source. Thus, the pulsations cannot be caused by electrons trapped in the flare loops, but are consistent with emission from a current sheet above the coronal source.

**Web link:** [www.IntellectualArchive.com/getfile.php?file=cf8B9XOKOXk&orig\\_file=Arnold\\_Benz\\_Location\\_of\\_Decimetric\\_Pulsations.pdf](http://www.IntellectualArchive.com/getfile.php?file=cf8B9XOKOXk&orig_file=Arnold_Benz_Location_of_Decimetric_Pulsations.pdf)

**ID #: 940** Natural Sciences / Physics / Quantum field theory

**Submitted on:** Oct 10, 2012

**Author:** G. Contopoulos, N. Delis, C. Efthymiopoulos

**Title:** Order in de Broglie - Bohm quantum mechanics

**Abstract:** A usual assumption in the so-called {it de Broglie - Bohm} approach to quantum dynamics is that the quantum trajectories subject to typical {it guiding} wavefunctions turn to be quite irregular, i.e. {it chaotic} (in the dynamical systems` sense). In the present paper, we consider mainly cases in which the quantum trajectories are {it ordered}, i.e. they have zero Lyapunov characteristic numbers. We use perturbative methods to establish the existence of such trajectories from a theoretical point of view, while we analyze their properties via numerical experiments. Using a 2D harmonic oscillator system, we first establish conditions under which a trajectory can be shown to avoid close encounters with a moving nodal point, thus avoiding the source of chaos in this system. \*\*\* Published in J. Phys. A 45, 165301 \*\*\*

**Web link:** [www.IntellectualArchive.com/getfile.php?file=KdMhstuUMhp&orig\\_file=G\\_Contopoulos\\_\\_Order\\_in\\_de\\_Broglie.pdf](http://www.IntellectualArchive.com/getfile.php?file=KdMhstuUMhp&orig_file=G_Contopoulos__Order_in_de_Broglie.pdf)

**ID #: 941** Natural Sciences / Physics / Quantum field theory

**Submitted on:** Oct 10, 2012

**Author:** C. Efthymiopoulos, N. Delis, G. Contopoulos

**Title:** Wavepacket approach to particle diffraction by thin targets: Quantum trajectories and arrival times

**Abstract:** We develop a wavepacket approach to the diffraction of charged particles by a thin material target and we use the de Broglie-Bohm quantum trajectories to study various phenomena in this context. We find the form of the separator, i.e. the limit between the domains of prevalence of the ingoing and outgoing quantum flow. The structure of the quantum-mechanical currents in the neighborhood of the separator implies the formation of an array of {emph{quantum vortices}} (nodal point - X point complexes). We show how the deformation of the separator near Bragg angles explains the emergence of a diffraction pattern by the de Broglie - Bohm trajectories. We calculate the arrival time distributions for particles scattered at different angles. The predictions of the de Broglie - Bohm theory for  $\Delta T$  turn to be different from estimates of the same quantity using other theories on time observables like the sum-over-histories or the Kijowski approach. \*\*\* Published in Ann. Phys. 327, 438 \*\*\*

**Web link:** [www.IntellectualArchive.com/getfile.php?file=UIFCeXQh3ni&orig\\_file=G\\_Contopoulos\\_\\_Wavepacket\\_approach.pdf](http://www.IntellectualArchive.com/getfile.php?file=UIFCeXQh3ni&orig_file=G_Contopoulos__Wavepacket_approach.pdf)

**ID #: 942** Natural Sciences / Astronomy / Cosmology

**Submitted on:** Oct 10, 2012

**Author:** Hermano Velten, Dominik J. Schwarz

**Title:** Constraints on dissipative unified dark matter

**Abstract:** Modern cosmology suggests that the Universe contains two dark components -- dark matter and dark energy -- both unknown in laboratory physics and both lacking direct evidence. Alternatively, a unified dark sector, described by a single fluid, has been proposed. Dissipation is a common phenomenon in nature and it thus seems natural to consider models dominated by a viscous dark fluid. We focus on the study of bulk viscosity, as isotropy and homogeneity at large scales implies the suppression of shear viscosity, heat flow and diffusion. The generic ansatz  $\xi \propto \rho^\nu$  for the coefficient of bulk viscosity ( $\rho$  denotes the mass/energy density), which for  $\nu = -1/2$  mimics the  $\Lambda$ CDM background evolution, offers excellent fits to supernova and  $H(z)$  data. We show that viscous dark fluids suffer from large contributions to the integrated Sachs-Wolfe effect (generalising a previous study by Li & Barrow) and a suppression of structure growth at small-scales. \*\*\* Published in JCAP09 (2011) 016 \*\*\*

**Web link:** [www.IntellectualArchive.com/getfile.php?file=KRBAfcUOO5H&orig\\_file=Hermano\\_Velten\\_\\_Constraints\\_on\\_dark\\_matter.pdf](http://www.IntellectualArchive.com/getfile.php?file=KRBAfcUOO5H&orig_file=Hermano_Velten__Constraints_on_dark_matter.pdf)

**ID #: 943** Natural Sciences / Physics / Condensed Matter Physics

**Submitted on:** Oct 10, 2012

**Author:** P. A. Marchetti, F. Ye, Z. B. Su, L. Yu

**Title:** Non-BCS superconductivity for underdoped cuprates by spin-vortex attraction

**Abstract:** Within a gauge approach to the t-J model, we propose a new, non-BCS mechanism of

superconductivity for underdoped cuprates. The gluing force of the superconducting mechanism is an attraction between spin vortices on two different  $N$  sublattices, centered around the empty sites described in terms of fermionic holons. Due to the no-double occupation constraint, there is a gauge attraction between holon and spinon binding them into a physical hole. Through gauge interaction the spin vortex attraction induces the formation of spin-singlet (RVB) spin pairs with a lowering of the spinon gap. Lowering the temperature the approach exhibits two crossover temperatures: at the higher crossover a finite density of incoherent holon pairs are formed leading to a reduction of the hole spectral weight, at the lower crossover also a finite density of incoherent spinon RVB pairs are formed, giving rise to a gas of incoherent preformed hole pairs, and magnetic vortices appear in the plasma phase. \*\*\* Article was published in arXiv.org (1102.4221) and "Journal of Physics and Chemistry of Solids" 72 (2011) 337 \*\*\*

**Web link:** [www.IntellectualArchive.com/getfile.php?file=WSneEw5J8k&orig\\_file=P\\_A\\_Marchetti\\_\\_Non-B\\_CS\\_superconductivity.pdf](http://www.IntellectualArchive.com/getfile.php?file=WSneEw5J8k&orig_file=P_A_Marchetti__Non-B_CS_superconductivity.pdf)

**ID #: 944** Natural Sciences / Mathematics / Algebra

**Submitted on:** Oct 10, 2012

**Author:** Adi Jarden, Saharon Shelah

**Title:** Non-Forking Frames in Abstract Elementary Classes

**Abstract:** The stability theory of first order theories was initiated by Saharon Shelah in 1969. The classification of abstract elementary classes was initiated by Shelah, too. In several papers, he introduced non-forking relations. Later, in [Shh], he introduced the good non-forking frame, an axiomatization of the non-forking notion. We improve results of Shelah on good non-forking frames, mainly by weakening the stability hypothesis in several important theorems, replacing it by the almost  $\lambda$ -stability hypothesis: The number of types over a model of cardinality  $\lambda$  is at most  $\lambda^{+}$ . In the context of elementary classes, the superstability assumption gives the existence of types with well-defined dimension and the  $\omega$ -stability assumption gives the existence and uniqueness of models prime over sets. In our context, the local character assumption is an analog to superstability and the density of the class of uniqueness triples with respect to the relation  $\preceq_{\text{bs}}$  is the analog to  $\omega$ -stability.

**Web link:** [www.IntellectualArchive.com/getfile.php?file=13biPHs8gjj&orig\\_file=Adi\\_Jarden\\_\\_NON-FORKING\\_FRAMES.pdf](http://www.IntellectualArchive.com/getfile.php?file=13biPHs8gjj&orig_file=Adi_Jarden__NON-FORKING_FRAMES.pdf)

**ID #: 945** Natural Sciences / Physics / Condensed Matter Physics

**Submitted on:** Oct 11, 2012

**Author:** P. A. Marchetti, F. Ye, Z. B. Su, L. Yu

**Title:** Hole pairing from attraction of opposite chirality spin vortices: Non-BCS superconductivity in Underdoped Cuprates

**Abstract:** Within a gauge approach to the t-J model, we propose a new, non-BCS mechanism of superconductivity for underdoped cuprates. We implement the no-double occupancy constraint with a (semionic) slave-particle formalism. The dopant generates a vortex-like quantum distortion of the AF background centered on the empty sites, with opposite chirality for cores on the two  $N$  sublattices. Empty sites are described in terms of spinless fermionic holons and the long-range attraction between spin vortices on two opposite  $N$  sublattices is the holon pairing force, leading eventually to SC. The spin fluctuations are described by bosonic spinons with a gap generated by scattering on spin vortices. Due to the occupation constraint, there is a gauge attraction between holon and spinon, binding them into a physical hole. Through gauge interaction the spin vortex attraction induces the formation of spin-singlet RVB pairs reducing the spinon gap. \*\*\* Article was published on arXiv.org (1105.5078) and in Phys.Rev. B84 (2011) 214525 \*\*\*

**Web link:** [www.IntellectualArchive.com/getfile.php?file=X2khWsmkgJ3&orig\\_file=P\\_A\\_Marchetti\\_\\_Hole\\_pairing.pdf](http://www.IntellectualArchive.com/getfile.php?file=X2khWsmkgJ3&orig_file=P_A_Marchetti__Hole_pairing.pdf)

**ID #: 946** Natural Sciences / Astronomy / Solar astronomy

**Submitted on:** Oct 11, 2012

**Author:** Tomasz Mrozek

**Title:** Failed Eruption of a Filament as a Driver for Vertical Oscillations of Coronal Loops

**Abstract:** We present observations of a failed eruption of a magnetic flux rope recorded during the M6.2 flare of 14 July 2004. The observations were mainly made with TRACE 171 Å and 1600 Å filters. The flare was accompanied by a destabilization of a magnetic structure observed as a filament

eruption. After an initial acceleration the eruption slowed down and finally was stopped by the overlying coronal loops. The observations suggest that the whole event is well described by the quadrupole model of a solar flare. The failed eruption stretched the loops lying above and then they were observed oscillating. We were able to observe clear vertical polarization of the oscillatory motion in TRACE images. The derived parameters of the oscillatory motion are the initial amplitude of 9520 km, the period of 377 s, and the exponential damping time of 500 s. Differences between the existing models and the observations have been found. The analyzed event is the second sample for global vertical kink waves found besides the first by Wang and Solanki (2004).

**Web link:** [www.IntellectualArchive.com/getfile.php?file=MlghhG6e8TN&orig\\_file=Tomasz\\_Mrozek\\_\\_Failed\\_Eruption.pdf](http://www.IntellectualArchive.com/getfile.php?file=MlghhG6e8TN&orig_file=Tomasz_Mrozek__Failed_Eruption.pdf)

**ID #: 948**      **Natural Sciences / Physics / Particle physics**

**Submitted on:** Oct 17, 2012

**Author:**      **Ervin Goldfain**

**Title:**        **Dynamic Stability of the Standard Model and the Fine Tuning Problem**

**Abstract:**    The Standard Model for particle physics (SM) is a nonlinear field theory in which both Yang-Mills and Higgs bosons are self-interacting objects. Their classical or quantum evolution is inevitably sensitive to the transition from order to chaos. With some noteworthy exceptions, the mainstream of theoretical particle physics has ignored the dynamical contribution of chaos in Quantum Field Theory. Here we point out that quantum corrections to the classical interaction of the Higgs with gauge bosons may lower the threshold for the onset of chaos and destabilize the vacuum in the low or intermediate TeV scale. The inability of the vacuum to survive in this energy region hints to a straightforward solution for the fine-tuning problem. It also implies that perturbative estimates on vacuum stability well above the LHC scale are likely to be invalid.

**Web link:** [www.IntellectualArchive.com/getfile.php?file=ifCSNHjLKW&orig\\_file=Dynamic\\_instability\\_of\\_the\\_Standard\\_Model\\_and\\_the\\_Fine\\_Tuning\\_Problem\\_\(1\).docx](http://www.IntellectualArchive.com/getfile.php?file=ifCSNHjLKW&orig_file=Dynamic_instability_of_the_Standard_Model_and_the_Fine_Tuning_Problem_(1).docx)

**ID #: 949**      **Social Sciences / History / History of religion**

**Submitted on:** Oct 19, 2012

**Author:**      **Adesanya Ibiyinka Olusola, PhD**

**Title:**        **Negative Images of Women in the Old Testament and Its Impact on Women in the Contemporary Society**

**Abstract:**    The paper discusses the negative images of women in some selected passages of the Old Testament. Since it is not possible to deal with all negative pictures about women in the Old Testament, the work concentrates only on three images: women's biological make up, women as the genesis of evil and woman as harlots. The paper recognizes that even though there are good pictures of some women like Deborah, Miriam and Huldah, these women in actual sense do not represent the condition of every Israelite woman. Perhaps more than any other the patriarchal Old Testament culture that treats women as sinners affirms and reinforces the attitude of men to women in the contemporary society. Different images and languages of denigration usually used against women in the society are clearly spelt out. However, the paper concludes that a new form of expression and interpretation of tradition should be used to uphold the images of women  
KEYWORDS: WOMEN, CHURCH, IMAGES, NEGATIVE EVIL

**Web link:** [\*semi-private registration\*](#)

**ID #: 952**      **Social Sciences / Psychology / Cognitive psychology**

**Submitted on:** Oct 19, 2012

**Author:**      **Orap Maryna**

**Title:**        **The methodological basis of psychological studies of personality's speech organization**

**Abstract:**    Article is devoted to the definition of the methodological foundations of the study of personality's speech organization. The content of system-structural and system-functional approach to the creation of a theoretical model of speech organization is revealed. The general system theory makes it possible to consider speech organization as an ordered set of elements which are characterized by specific structural and functional connections.

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**ID #: 953**      **Natural Sciences / Physics / General Physics**

**Submitted on:** Oct 22, 2012

**Author:**      **Edward KapuÅ·cik**

**Title:**        **On Speeds in Special Relativity**

**Abstract:**    It is shown that the commonly accepted fundamental paradigm of Special Relativity on the maximality of the speed of light is false. Tachyons, the superluminal objects, are allowed by Special Relativity equally well as subluminal particles are. However, for tachyons there do not exist rest frames and the notion of rest mass or rest energy for tachyons cannot be operationally defined. Instead of that the notion of energy in the reference frame where tachyons move with infinite speed is defined. The expressions for energy and momentum of superluminal objects are derived. The momentum vanishes for objects moving with infinite speed. This may explain the weakness of interaction of superluminal objects with other objects. The paper appeals for a change in teaching Special Relativity.

**Web link:**    **[www.IntellectualArchive.com/getfile.php?file=TMuSiJTo9gl&orig\\_file=Speeds in STR.tex](http://www.IntellectualArchive.com/getfile.php?file=TMuSiJTo9gl&orig_file=Speeds in STR.tex)**

**ID #: 954**      **Natural Sciences / Physics / General Physics**

**Submitted on:** Oct 22, 2012

**Author:**      **Edward KapuÅ·cik**

**Title:**        **On Speeds in Special Relativity**

**Abstract:**    It is shown that the commonly accepted fundamental paradigm of Special Relativity on the maximality of the speed of light is false. Tachyons, the superluminal objects, are allowed by Special Relativity equally well as subluminal particles are. However, for tachyons there do not exist rest frames and the notion of rest mass or rest energy for tachyons cannot be operationally defined. Instead of that the notion of energy in the reference frame where tachyons move with infinite speed is defined. The expressions for energy and momentum of superluminal objects are derived. The momentum vanishes for objects moving with infinite speed. This may explain the weakness of interaction of superluminal objects with other objects. The paper appeals for a change in teaching Special Relativity.

**Web link:**    **[www.IntellectualArchive.com/getfile.php?file=LDmK6KvMZKf&orig\\_file=Speeds in STR.pdf](http://www.IntellectualArchive.com/getfile.php?file=LDmK6KvMZKf&orig_file=Speeds in STR.pdf)**

**ID #: 955**      **Natural Sciences / Other / Trans-Disciplinarian**

**Submitted on:** Oct 23, 2012

**Author:**      **Diego Lucio Rapoport**

**Title:**        **Klein Bottle Logophysics: A Unified Principle for Non-linear Systems, Cosmology, Geophysics, Biology, Biomechanics and Perception**

**Abstract:**    We present a unified principle for science that surmounts dualism, in terms of torsion fields and the non-orientable surfaces, notably the Klein Bottle and its logic, the MÅ·bius strip and the projective plane. We apply it to the complex numbers and cosmology, to non-linear systems integrating the issue of hyperbolic divergences with the change of orientability, to the biomechanics of vision and the mammal heart, to the morphogenesis of crustal shapes on Earth in connection to the wavefronts of gravitation, elasticity and electromagnetism, to pattern recognition of artificial images and visual recognition, to neurology and the topographic maps of the sensorium, to perception, in particular of music. We develop it in terms of the fundamental 2:1 resonance inherent to the MÅ·bius strip and the Klein Bottle, the minimal surfaces representation of the wavefronts, and the non-dual Klein Bottle logic inherent to pattern recognition, to the harmonic functions and vector fields that lay at the basis of geophysics and physics at large. We discuss the relation between the topographic maps of the sensorium, and the issue of turning inside-out of the visual world as a general principle for cognition, topological chemistry, cell biology and biological morphogenesis in particular in embryology

**Web link:**    **[semi-private registration](#)**

**ID #: 957**      **Natural Sciences / Physics / Biophysics**

**Submitted on:** Oct 24, 2012

**Author:**      **N.Ch. Pesheva and J.G. Brankov**

**Title:**        **Position-induced phase change in a TASEP with a double-chain section: a model of biological**

**transport**

**Abstract:** The totally asymmetric simple exclusion processes (TASEP) has been used since 1968 to model different biochemical processes, including kinetics of protein synthesis, molecular motors traffic, collective effects in genetic transcription. Here, we consider TASEP defined on an open network consisting of simple head and tail chains with a double-chain section in-between. Our results of Monte Carlo simulations show a novel property of the model when the simple chains are in the maximum-current phase: upon moving the double-chain defect from the central position forward or backward along the network, keeping fixed the length of both the defect and the whole network, a position-induced phase change in the parallel defect chains takes place. This phenomenon is explained in terms of finite-size dependence of the effective injection and removal rates at the ends of the double-chain defect. Some implications of the results for molecular motors cellular transport along such networks are suggested. However, at present these are just speculations which need further examinations.

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**ID #: 958**      **Natural Sciences / Physics / General Physics**

**Submitted on:** Oct 24, 2012

**Author:** Edward Kapuścik

**Title:** Did Guenter Nimtz discover tachyons?

**Abstract:** It is argued that in the famous G. Nimtz experiment tachyons were produced and annihilated. We base our considerations on the new version of Special Relativity elaborated by one of the authors.

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**ID #: 959**      **Natural Sciences / Mathematics / Geometry**

**Submitted on:** Oct 24, 2012

**Author:** Alexander Krasulin

**Title:** Five-Dimensional Tangent Vectors in Space-Time: V. Generalization of Covariant Derivative

**Abstract:** In this part of the series I discuss the five-vector generalizations of affine connection and gauge fields. I also give definition to the exterior derivative of nonscalar-valued five-vector forms and consider the five-vector analogs of the field strength tensor. In conclusion I discuss the nonspacetime analogs of five-vectors.

**Web link:** [www.IntellectualArchive.com/getfile.php?file=qCelij0RViM&orig\\_file=5D\\_tangent\\_vectors\\_Part\\_5.pdf](http://www.IntellectualArchive.com/getfile.php?file=qCelij0RViM&orig_file=5D_tangent_vectors_Part_5.pdf)

**ID #: 961**      **Natural Sciences / Physics / General Physics**

**Submitted on:** Oct 26, 2012

**Author:** Antoine Acke

**Title:** GRAVITATION EXPLAINED BY THE THEORY OF INFORMATONS

**Abstract:** The "theory of informatons" explains the gravitational interactions by the hypothesis that "information" is the substance of gravitational fields. The constituent element of that substance is called an "informaton".

The theory starts from the idea that any material object manifests itself in space by the emission of informatons: granular mass and energy less entities rushing away with the speed of light and carrying information about the position and the velocity of the emitter.

In this article the gravitational field is characterized; the laws of gravito-electromagnetism are mathematically deduced from the dynamics of the informatons; the gravitational interactions are explained as the effect of the trend of a material object to become blind for flows of informatons generated by other objects; and gravitons are identified as informatons carrying a quantum of energy.

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End of October 2012 bulletin