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Abstracts and the descriptions of works in Art and Science submitted to www.IntellectualArchive.com in April 2012

ID #: 242 **Natural Sciences / Physics / Relativity**

Submitted on: Apr 01, 2012

Author: **Florentin Smarandache**

Title: **Absolute Theory of Relativity & Parameterized Special Theory of Relativity & Noninertial Multirelativity**

Abstract: In this book we present our 1972 hypothesis that there is no speed barrier in the universe and one can construct arbitrary speeds -
thus refuting the speed of light postulate.
While Einstein considered a relative space and relative time but the ultimate speed of light, we do the opposite: we consider an absolute time and absolute space but no ultimate speed, and we call it the Absolute Theory of Relativity (ATR). The ATR has no time dilation, no length contraction, no relativity of simultaneity, and no relativistic paradoxes.
We then parameterize Einstein's thought experiment with atomic clocks, supposing that we know neither if the space and time are relative or absolute, nor if the speed of light is ultimate speed or not. We obtain a Parameterized Special Theory of Relativity (PSTR). Our PSTR generalizes not only Einstein`s Special Theory of Relativity, but also our ATR, and introduces three more possible Relativities to be studied in the future.
Afterwards, we extend our research considering not only constant velocities but constant accelerations too.
Eventually we propose a Noninertial Multirelativity for the same thought experiment, i.e. considering non-constant accelerations and arbitrary 3D-curves.

Web link: ***www.IntellectualArchive.com/getfile.php?file=AAjFkhSDIfn&orig_file=ParameterizedSTR.pdf***

ID #: 243 **Natural Sciences / Astronomy / Extrasolar planets**

Submitted on: Apr 01, 2012

Author: **Florentin Smarandache, V. Christianto, & Pavel Pintr**

Title: **Quantization and Discretization at large scales**

Abstract: The ongoing search of extrasolar planets is one of the most attractive fields of research in astrophysics and astronomy. Up to now, 360 extrasolar planets have been discovered near stars with similar mass as the Sun. There is also discovery related to the so-called Earth-like planets. With regards to these discoveries, one intriguing question is whether there is relationship between orbit distance of the planets and their stars. Various formulas have been suggested since 1990s, and they suggest that there may be reason to accept quantization of distances of those planets both in our solar system and also in extrasolar systems as well. This book discusses this issue (Rubcic & Rubcic), along with other interesting issues such as protoplanetary formation of solar system (Pintr, prof. Perinova , & Dr. Luks), precession in solar system (Pitkanen) and other topics. Another line of thought explored herein is the correspondence between cosmological phenomena nd condensed matter physics, and therefore we can think that the quantization of orbit distances can be caused by superfluid helium quantization. This issue is explored by F. Smarandache and V. Christianto. Moreover, F. Smarandache also discusses possible new era of research that is pertaining to superluminal physics and instantaneous physics. Ion Patrascu and D. Rabounski discuss superluminality from their perspectives. And M. Pereira discusses his Hypergeometrical Universe model. This book is published after our previous book: Quantization in astrophyisics, Brownian motion, and Supersymmetry which was released about five years ago. Perhaps the ideas presented herein will have impact on discussions concerning quantum cosmology, which so far it cannot be observed. On the contrary, quantization at large scales can be observed. We hope that this volume will add a new chapter in our understanding of the Universe, from the viewpoint of quantization and discretization at large scales. Special thanks go to journal editors who have granted permission to reprint papers included here, including Chaos, Soliton, Fractals editor, Prespacetime Journal editor, Fizika editor, Progress in Physics editor and Apeiron editor. This book can be ordered in a paper bound reprint from: Books on Demand ProQuest Information & Learning (University of Microfilm International) 300 N. Zeeb Road P.O. Box 1346, Ann Arbor MI 48106-1346, USA Tel.: 1-800-521-0600 (Customer Service) http://wwwlib.umi.com/bod/basic Copyright 2012 by Zip

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Web link: ***www.IntellectualArchive.com/getfile.php?file=CW2le7vP5mW&orig_file=Florentin_Smarandache__V_Christianto_Pavel_Pintr_Quantization_and_Discretization.pdf***

ID #: 244 **Natural Sciences / Computer Sciences / Automata theory**

Submitted on: Apr 01, 2012

Author: **A. N. Trahtman**

Title: **An Algorithm for Road Coloring**

Abstract: A coloring of edges of a finite directed graph turns the graph into a finite-state automaton. The synchronizing word of a deterministic automaton is a word in the alphabet of colors (considered as letters) of its edges that maps the automaton to a single state. A coloring of edges of a directed graph of uniform outdegree (constant outdegree of any vertex) is synchronizing if the coloring turns the graph into a deterministic finite automaton possessing a synchronizing word. The road coloring problem is the problem of synchronizing coloring of a directed finite strongly connected graph of uniform outdegree if the greatest common divisor of the lengths of all its cycles is one. The problem posed in 1970 has evoked noticeable interest among the specialists in the theory of graphs, automata, codes, symbolic dynamics as well as among the wide mathematical community.

Web link: ***www.IntellectualArchive.com/getfile.php?file=mUno2QgWfv0&orig_file=A_N_Trahtman_Algorithm_for_Road_Coloring.pdf***

ID #: 245 **Natural Sciences / Other / Climatology**

Submitted on: Apr 01, 2012

Author: **A. N. Trahtman**

Title: **The Moisture from the Air as Water Resource in Arid Region: Hopes, Doubts and Facts**

Abstract: The recovery of clean water from dew has remained a fascinating problem in the arid regions of the globe. The stone heaps near the city of Feodosia in the Crimean peninsula were considered for manyyears to be artificial dew-catching constructions for obtaining drinking water. Several attempts to reconstruct these systems have been made but they have been considered unsuccessful because of low yield. This has caused some doubts and negative estimations regarding the role of the Crimean stone heaps as water collectors. The opinion that there were no dew-catching constructions in Crimea still dominates today. The traditional model of the Crimean water collector will be modified by the consideration of the role of the draught in the process of condensation. Qualitative and quantitative analysis of the process and of draught outbreak will be proposed. The efficiency of the collector will be estimated.

Web link: ***www.IntellectualArchive.com/getfile.php?file=emhP8DNNE1N&orig_file=A_N_Trahtman_Moisture_from_the_Air_as_Water_Resource.pdf***

ID #: 246 **Natural Sciences / Computer Sciences / Automata theory**

Submitted on: Apr 01, 2012

Author: **A. N. Trahtman**

Title: **A Partially Synchronizing Coloring**

Abstract: Some consequences for coloring of an arbitrary finite digraph are presented. We describe a subquadratic algorithm of the road coloring for the k-synchronization implemented in the package TESTAS. A new linear visualization program demonstrates the obtained coloring. Some consequences for coloring of an arbitrary finite digraph and of such a graph of uniform outdegree are presented.

Web link: ***www.IntellectualArchive.com/getfile.php?file=e3hcZNogq1E&orig_file=A_N_Trahtman_Partially_Synchronizing_Coloring.pdf***

ID #: 247 **Natural Sciences / Computer Sciences / Automata theory**

Submitted on: Apr 01, 2012

Author: **A. N. Trahtman**

Title: **Reducing the time complexity of testing for local threshold testability**

Abstract: New necessary and sufficient conditions for a deterministic infinite automaton to be locally threshold testable are found. On the basis of these conditions, we modify the algorithm to verify local threshold testability of the automaton and to reduce the time complexity of the algorithm. The algorithm is

implemented as a part of the C/C++ package TESTAS.

Web link: ***www.IntellectualArchive.com/getfile.php?file=ZVDuJxSo6pr&orig_file=A_N_Trahtman_Reducing_the_time_complexity_of_testing.pdf***

ID #: 248 **Natural Sciences** / **Computer Sciences** / **Automata theory**

Submitted on: Apr 01, 2012

Author: **A. N. Trahtman**

Title: **The Road Coloring and Cerny conjecture**

Abstract: A synchronizing word of a deterministic automaton is a word in the alphabet of colors (considered as letters) of its edges that maps the automaton to a single state. A coloring of edges of a directed graph is synchronizing if the coloring turns the graph into a deterministic infinite automaton possessing a synchronizing word. The road coloring problem is the problem of synchronizing coloring of a directed infinite strongly connected graph with constant outdegree of all its vertices if the greatest common divisor of lengths of all its cycles is one. The problem was posed by Adler, Goodwyn and Weiss over 30 years ago and evoked noticeable interest among the specialists in the theory of graphs, deterministic automata and symbolic dynamics. The positive solution of the road coloring problem is presented. Some consequences on the length of the synchronizing word are discussed.

Web link: ***www.IntellectualArchive.com/getfile.php?file=khnfiZWEgJI&orig_file=A_N_Trahtman_Road_Coloring_and_Cerny_Conjecture.pdf***

ID #: 249 **Natural Sciences** / **Computer Sciences** / **Automata theory**

Submitted on: Apr 01, 2012

Author: **A. N. Trahtman**

Title: **The Road Coloring Problem**

Abstract: A synchronizing word of a deterministic automaton is a word in the alphabet of colors (considered as letters) of its edges that maps the automaton to a single state. A coloring of edges of a directed graph is synchronizing if the coloring turns the graph into a deterministic infinite automaton possessing a synchronizing word. The road coloring problem is the problem of synchronizing coloring of a directed infinite strongly connected graph with constant outdegree of alits vertices if the greatest common divisor of lengths of all its cycles is one. The problem was posed by Adler, Goodwyn and Weiss over 30 years ago and evoked noticeable interest among the specialists in the theory of graphs, deterministic automata and symbolic dynamics. The positive solution of the road coloring problem is presented.

Web link: ***www.IntellectualArchive.com/getfile.php?file=FUp4JJNOiev&orig_file=A_N_Trahtman_road_coloring_problem.pdf***

ID #: 250 **Natural Sciences** / **Computer Sciences** / **Automata theory**

Submitted on: Apr 01, 2012

Author: **A. N. Trahtman**

Title: **Synchronization of some DFA**

Abstract: The natural problem of synchronization of DFA draws quite often the attention and various aspects of this problem were touched upon the literature. The synchronization makes the behavior of an automaton resistant against input errors since, after detection of an error, a synchronizing word can reset the automaton back to its original state, as if no error had occurred.

Web link: ***www.IntellectualArchive.com/getfile.php?file=h56Bc2CcxXC&orig_file=A_N_Trahtman_Synchronization_of_some_DFA.pdf***

ID #: 251 **Natural Sciences** / **Computer Sciences** / **Automata theory**

Submitted on: Apr 01, 2012

Author: **A. N. Trahtman**

Title: **Notable trends concerning the synchronization of graphs and automata**

Abstract: A word w is called synchronizing (recurrent, reset, directed) word of a deterministic finite automaton (DFA) if w sends all states of the automaton on a unique state. Jan Cerny had found in 1964 a sequence of n-state complete DFA with shortest synchronizing word of length (n-1)^2. He had conjectured that it is an upper bound for the length of the shortest synchronizing word for any n-state

complete DFA. The examples of DFA with shortest synchronizing word of length (n-1)^2 are relatively rare. To the Cerny sequence were added in all examples of Cerny, Piricka and Rosenauerova (1971), of Kari (2001) and of Roman (2004). By help of a program based on some effective algorithms, a wide class of automata of size less than 11 was checked.

Web link: ***www.IntellectualArchive.com/getfile.php?file=OoNenDheM8J&orig_file=A_N_Trahtman_the_synchronization_of_graphs_and_automata.pdf***

ID #: 253 **Natural Sciences** / **Physics** / **Astrophysics**

Submitted on: Apr 03, 2012

Author: **Daniele Fargion**

Title: **Neutrino Solar Flare detection for a saving alert system of satellites and astronauts**

Abstract: Largest Solar Neutrino Flare may be soon detectable by Deep Core neutrino detector immediately and comunicate to satellites or astronauts. Its detection is the fastest manifestation of a later (tens minutes,hours) dangerous cosmic shower. The precursor trigger maybe saving satellites and even long flight astronauts lives. We shall suggest how. Moreover their detection may probe the inner solar flare acceleration place as well as the neutrino flavor mixing in a new different parameter windows. We show the updated expected rate and signature of neutrinos and antineutrinos in largest solar flare for present tens Megaton Deep Core telescope at tens Gev range. Speculation for additional Icecube gigaton array signals are also considered.

Web link: ***www.IntellectualArchive.com/getfile.php?file=bLGNixKnY6G&orig_file=Daniele_Fargion_Neutrino_Solar_Flare_detection.pdf***

ID #: 254 **Natural Sciences** / **Physics** / **Astrophysics**

Submitted on: Apr 03, 2012

Author: **Daniele Fargion**

Title: **UHECR by lightest nuclei in Nearby Universe and its parasite neutrino trace**

Abstract: UHECR mystery survived first Auger claims of AGN connection within a GZK (100 Mpc size) Universe. Last 2010 UHECR maps and compositions do show a much lower correlation with AGN SuperGalactic maps and with protons (the two main ingredient of that claim). The three main AUGER results that survived are: an embarrassing absence of Virgo cluster UHECR, somehow an expected signal; a steady presence of Cen-A clustering and a remarkable signature of nuclei (not nucleon) composition. We claim that the He-like lightest nuclei may solve most of the puzzle: He UHECR cannot arrive from Virgo because light nuclei fragility and opacity; Cen-A UHECR are spread (if He-Li-Be) as much as the observed ones; the light nuclei may fit well Auger composition signature as well as Hires spectra. Future multiplet of half energy UHECR (Eth/Z around 15-30 EeV) must trace in tails overlapping around some of higher UHECR spread.

Web link: ***www.IntellectualArchive.com/getfile.php?file=OOv83sbGhmt&orig_file=Daniele_Fargion_UHECR_by_lightest_nuclei.pdf***

ID #: 255 **Natural Sciences** / **Astronomy** / **Astrometry**

Submitted on: Apr 03, 2012

Author: **Jiang Dong**

Title: **The Principle and Application of Maser Navigation**

Abstract: The traditional celestial navigation system (CNS) is used the moon, stars, and planets as celestial guides. Then the star tracker (i.e. track one star or planet or angle between it) and star sensor (i.e. sense many star simultaneous) be used to determine the attitude of the spacecraft. Pulsar navigation also be introduced to CNS. Maser is another interested celestial in radio astronomy which has strong flux density as spectral line. Now we analysis the principle of maser navigation which base on measuring Doppler shift frequency spectra and the feasibility that use the exist instrument. We give the navigation equations of maser-based navigation system and discuss the integrated navigation use maser, then give the perspective in the Milky Way and the intergalatic. Our analysis show that use one meter antenna can achieve tens of meters position accuracy which better than today`s star sensor.

Web link: ***www.IntellectualArchive.com/getfile.php?file=RRfb4dJekO8&orig_file=Jiang_Dong_The_Principle_and_Application_of_Maser_Navigation.pdf***

ID #: 257 **Natural Sciences** / **Biology** / **Ecology**

Submitted on: Apr 03, 2012

Author: **Glen Gilchrist**

Title: **Seed Treatment Effects on Emergence of Luffa aegyptiaca**

Abstract: Luffa aegyptiaca (Luffa sponge gourd) is increasingly seen as both a source of vegetative nutrition and as a source of the "luffa" used as to exfoliate during bathing. As such, the commercial growing of Luffa aegyptiaca is increasingly being investigated using more intensive farming methods. Two factors traditionally used to promote / speed germination and emergence of vegetable seeds is investigated. It is concluded that temperature pre-treatment of the seeds (-12C, 24 hours) yields a p=0.004 significance in promoting emergence, whilst pre soaking (water, 18C, 24hrs) yields p=0.821

Web link: ***www.IntellectualArchive.com/getfile.php?file=fkDu54bBdx8&orig_file=Investigating the emergence of Luffa seeds.pdf***

ID #: 259 **Natural Sciences** / **Physics** / **Quantum field theory**

Submitted on: Apr 04, 2012

Author: **Dhananjay P. Mehendale**

Title: **Two Experiments to test Bohr`s Complementarity Principle**

Abstract: We suggest two possible experiments to verify the mysterious passing of single photon through both the slits simultaneously. The first experiment aims to measure polarization of photons reaching the screen using polarization detectors fixed on the screen on both sides of the midway line made up of locus of points equidistant from both the slits and further using two types of synchronization setups. Again, using the same two types of synchronization setups, we suggest the second experiment which is based on a simple idea, justified by uncertainty principle. We suggest that we can distinguish between photons that have definitely gone through both the slits simultaneously and those other photons that have gone only through any single slit, either through the one on the left side or through the other on the right side, at a time. We fix in the second experiment photon detectors on the screen on both sides of the midway line made up of locus of points equidistant from both the slits. These experiments aim at achieving experimental confirmation for complementarity principle due to N. Bohr.

Web link: ***www.IntellectualArchive.com/getfile.php?file=e7eC4FM2ZfL&orig_file=Bohr2.pdf***

ID #: 262 **Natural Sciences** / **Physics** / **Relativity**

Submitted on: Apr 04, 2012

Author: **Anatoly Nikishov**

Title: **On the simplified tree graphs in gravity**

Abstract: Firstly, I give the reason why is wrong my previously made assumption that the volume integral over the pressure may not be zero in a system where the gravitation plays no role in holding the system together. Secondly, in the first nonlinear approximation I obtain the inner and outer Schwarzschild solutions in harmonic and isotropic coordinates in two different ways. One way is to start from standard solution and make the appropriate coordinate transformation. The other way is to use the perturbation theory with elements of Schwinger and Weinberg source approach. This latter method is applicable in general case and it is useful to study all its peculiarities on known simple example such as Schwarzschild solution. It turns out that this method is simpler then S-metrics approach (previously made by Duff) and more informative as it it shows which contribution comes from what region of space.

Web link: ***www.IntellectualArchive.com/getfile.php?file=2tEc1gLvcAF&orig_file=A_I_Nikishov_On_the_simplified_tree_graphs.pdf***

ID #: 265 **Social Sciences** / **Economics** / **Financial**

Submitted on: Apr 08, 2012

Author: **Marco Bianchetti, Mattia Carlicchi**

Title: **Interest Rates After The Credit Crunch: Multiple-Curve Vanilla Derivatives and SABR**

Abstract: We present a quantitative study of the markets and models evolution across the credit crunch crisis. In particular, we focus on the fixed income market and we analyze the most relevant empirical evidences regarding the divergences between Libor and OIS rates, the explosion of Basis Swaps spreads, and the diffusion of collateral agreements and CSA-discounting, in terms of credit and liquidity effects.

We also review the new modern pricing approach prevailing among practitioners, based on multiple yield curves reflecting the different credit and liquidity risk of Libor rates with different tenors and the overnight discounting of cash flows originated by derivative transactions under collateral with daily margination. We report the classical and modern no-arbitrage pricing formulas for plain vanilla interest rate derivatives, and the multiple-curve generalization of the market standard SABR model with stochastic volatility.
We then report the results of an empirical analysis on recent market data comparing pre- and post-credit crunch pricing methodologies and showing the transition of the market practice from the classical to the modern framework. In particular, we prove that the market of Interest Rate Swaps has abandoned since March 2010 the classical Single-Curve pricing approach, typical of the pre-credit crunch interest rate world, and has adopted the modern Multiple-Curve CSA approach, thus incorporating credit and liquidity effects into market prices. The same analysis is applied to European
Caps/Floors, finding that the full transition to the modern Multiple-Curve CSA approach has retarded up to August 2010. Finally, we show the robustness of the SABR model to calibrate the market volatility smile coherently with the new market evidences.

Web link: ***www.IntellectualArchive.com/getfile.php?file=cJeZ4umJtrg&orig_file=Marco_Bianchetti__Mattia_Carlicchi_Interest_Rates.pdf***

ID #: 266 **Natural Sciences** / **Mathematics** / **Graph theory**

Submitted on: Apr 08, 2012

Author: **V. A. Shcherbacov**

Title: **A-nuclei and A-centers of a quasigroup**

Abstract: A-nuclei (groups of regular permutations) of a quasigroup are studied. A quasigroup is A-nuclear if and only if it is group isotope. Any quasigroup with permutation medial or paramedial identity is an abelian group isotope. Definition of A-center of a quasigroup is given. A quasigroup is A-central if and only if it is abelian group isotope. If a quasigroup is central in Belyavskaya-Smith sense, then it is A-central. Conditions when A-nucleus define normal congruence of a quasigroup are established, conditions normality of nuclei of some inverse quasigroups are given. Notice, definition of A-nucleus of a loop and A-center of a loop coincides, in fact, with corresponding standard definition.

Web link: ***www.IntellectualArchive.com/getfile.php?file=qDGEruSVj77&orig_file=V_A_Shcherbacov_A_nuclei_and_A_centers.pdf***

ID #: 267 **Social Sciences** / **Economics** / **Financial**

Submitted on: Apr 11, 2012

Author: **Xiang Yu**

Title: **Utility Maximization with Addictive Consumption Habit Formation in Incomplete Semimartingale Markets**

Abstract: This paper studies the problem of continuous time expected utility maximization of consumption together with addictive habit formation in general incomplete semimartingale financial markets. Introducing an auxiliary state processes and a modified dual space, we embed our original problem into an auxiliary time-separable utility maximization problem with the shadow random endowment. We establish existence and uniqueness of the optimal solution using convex duality on the product space by defining the primal value function as depending on both the initial wealth and initial standard of living. We also provide market independent sufficient conditions on both stochastic discounting processes of the habit formation process and on the utility function for our original problem to be well posed and to modify the convex duality approach when the auxiliary dual process is not necessarily integrable.

Web link: ***www.IntellectualArchive.com/getfile.php?file=gjIVbJJug8Z&orig_file=Xiang_Yu_Utility_Maximization_with_Addictive_Consumption.pdf***

ID #: 268 **Natural Sciences** / **Mathematics** / **Differential equations**

Submitted on: Apr 11, 2012

Author: **A. L. Onishchik, E. G. Vishnyakova**

Title: **Locally free sheaves on complex supermanifolds**

Abstract: An important part of the classical theory of real or complex manifolds is the theory of vector bundles. With any vector bundle over a manifold (M,F) the sheaf of its (smooth, real analytic or complex analytic) sections is associated which is a locally free sheaf of F-modules, and in this way all the

locally free sheaves of F-modules over (M,F) can be obtained. In the present paper, locally free sheaves of O-modules over a complex analytic supermanifold (M,O) are studied. Given a locally free sheaf E of O-modules over a complex analytic supermanifold (M,O), we construct a locally free sheaf over the retract of (M,O) which is called the retract of E. Our first result is a classification of locally free sheaves of modules which have a given retract in terms of non-abelian 1-cohomology. Then we study locally free sheaves of modules over projective superspaces. A spectral sequence which connects the cohomology with values in a locally free sheaf of modules with the cohomology with values in its retract is constructed.

Web link: ***www.IntellectualArchive.com/getfile.php?file=fqBfNEiU61A&orig_file=Onishchik__Vishnyakova_Locally_free_sheaves.pdf***

ID #: 269 **Natural Sciences / Computer Sciences / Evolutionary computation**

Submitted on: Apr 11, 2012

Author: **Marina Sapir**

Title: **Bipartite ranking algorithm for classification and survival analysis**

Abstract: Unsupervised aggregation of independently built univariate predictors is explored as an alternative regularization approach for noisy, sparse datasets. Bipartite ranking algorithm Smooth Rank implementing this approach is introduced. The advantages of this algorithm are demonstrated on two types of problems. First, Smooth Rank is applied to two-class problems from bio-medical field, where ranking is often preferable to classification. In comparison against SVMs with radial and linear kernels, Smooth Rank had the best performance on 8 out of 12 benchmark benchmarks. The second area of application is survival analysis, which is reduced here to bipartite ranking in a way which allows one to use commonly accepted measures of methods performance. In comparison of Smooth Rank with Cox PH regression and CoxPath methods, Smooth Rank proved to be the best on 9 out of 10 benchmark datasets.

Web link: ***www.IntellectualArchive.com/getfile.php?file=hfiVpajJFYu&orig_file=Marina_Sapir_Bipartite_ranking_algorithm.pdf***

ID #: 270 **Natural Sciences / Mathematics / Algebra**

Submitted on: Apr 11, 2012

Author: **Vladimir L. Popov**

Title: **Some subgroups of the Cremona groups**

Abstract: We explore algebraic subgroups of of the Cremona group over an algebraically closed field of characteristic zero. First, we consider some class of algebraic subgroups of C_n that we call flattenable. It contains all tori. Linearizability of the natural rational actions of flattenable subgroups on the affine space A^n is intimately related to rationality of the invariant fields and, for tori, is equivalent to it. We prove stable linearizability of these actions and show the existence of nonlinearizable actions among them. This is applied to exploring maximal tori in C_n and to proving the existence of nonlinearizable, but stably linearizable elements of infinite order in C_n for n>=6. Then we consider some subgroups J(x_1,..., x_n) of C_n that we call the rational de Jonquieres subgroups. We prove that every affine algebraic subgroup of J(x_1,..., x_n) is solvable and the group of its connected components is Abelian.

Web link: ***www.IntellectualArchive.com/getfile.php?file=qPhaN4gELIW&orig_file=V_Popov_Some_subgroups_of_the_Cremona_groups.pdf***

ID #: 271 **Natural Sciences / Mathematics / Number theory**

Submitted on: Apr 11, 2012

Author: **Marek Wolf**

Title: **Computer experiments with Mersenne primes**

Abstract: We have calculated on the computer the sum Bm of reciprocals of all 47 known Mersenne primes with the accuracy of over 12000000 decimal digits. Next we developed Bm into the continued fraction and calculated geometrical means of the partial denominators of the continued fraction expansion of Bm. We get values converging to the Khinchin`s constant. Next we calculated the n-th square roots of the denominators of the n-th convergents of these continued fractions obtaining values approaching the Khinchin-Levy constant. These two results suggests that the sum of reciprocals of all Mersenne primes is irrational, supporting the common believe that there is an infinity of the Mersenne primes. For comparison we have done the same procedures with slightly modified set of 47 numbers obtaining quite different results. Next we investigated the continued fraction whose

partial quotients are Mersenne primes and we argue that it should be transcendental.

Web link: ***www.IntellectualArchive.com/getfile.php?file=4KjRL9fGoRI&orig_file=Marek_Wolf_Computer_experiments_with_Mersenne_primes.pdf***

ID #: 272 **Natural Sciences** / **Mathematics** / **Number theory**

Submitted on: Apr 11, 2012

Author: **Marek Wolf**

Title: **Some heuristics on the gaps between consecutive primes**

Abstract: We propose the formula for the number of pairs of consecutive primes p_n, p_{n+1} < x separated by gap d=p_{n+1}-p_n expressed directly by the number of all primes <x, i.e. by pi(x). As the application of this formula we formulate 7 conjectures, among others for the maximal gap between two consecutive primes smaller than x, for the generalized Brun`s constants and the first occurrence of a given gap d. Also the leading term loglog(x) in the prime harmonic sum is reproduced from our guesses correctly. These conjectures are supported by the computer data.

Web link: ***www.IntellectualArchive.com/getfile.php?file=hI2S6Yi9iok&orig_file=Marek_Wolf_Some_heuristics_on_the_gaps.pdf***

ID #: 275 **Natural Sciences** / **Mathematics** / **Algebra**

Submitted on: Apr 12, 2012

Author: **Konstantine Zelator**

Title: **Five Exponential Diophantine Equations and Mayhem Problem M429**

Abstract: Crux Mathematicorum with Mathematical Mayhem, is a problem solving journal published by the Canadian Mathematical Society. In the March 2010 issue, the following problem was proposed: Determine all positive integers a,b, and c such that a^(b^c)=(a^b)^c. A solution by this author was published in the December 2010 issue of Crux. Accordingly, all such positive integer triples are the following: The triples of the form (1,b,c); with b, c any positive integers; the triples (a,b,1); a, b positive integers, with a being at least 2; and the triples of the form (a,2,2); a being a positive integer not equal to 1. Motivated by mayhem problem M429, in this work we investigate for more 3-variable exponential diophantine equations: x^(y^z)=x^(z^y) (2), x^(y^z)=y^(xz) (3) x^(yz)=y^(xz) (4), x^(y^z)=z^(xy) (5) We completely determine the positive integer solution sets of equations (2), (3), and (4). This is done in Theorems2,3, and4 respectively. We also find three different families of solutions to equation (5); listed in Theorem5.

Web link: ***www.IntellectualArchive.com/getfile.php?file=njv31Ldpeji&orig_file=Konstantine_Zelator_Five_Exponential_Diophantine_Equations.pdf***

ID #: 276 **Natural Sciences** / **Mathematics** / **Algebra**

Submitted on: Apr 12, 2012

Author: **Konstantine Zelator**

Title: **Integer roots of quadratic and cubic polynomials with integer coefficients**

Abstract: The subject matter of this work is quadratic and cubic polynomial functions with integer coefficients;and all of whose roots are integers. The material of this work is directed primarily at educators,students,and teachers of mathematics,grades K12 to K20.The results of this work are expressed in Theorems3,4,and5. Of these theorems, Theorem3, is the one that most likely, the general reader of this article will have some familiarity with.In Theorem3, precise coefficient conditions are given;in order that a quadratic trinomial(with integer) have two integer roots or zeros.On the other hand, Theorems4 and5 are largely unfamiliar territory. In Theorem4, precise coefficient conditions are stated; for a monic cubic polynomial to have a double(i.e.of multiplicity 2) integer root, and a single integer root(i.e.of multiplicity 1).The entire family of such cubics can be described in terms of four groups or subfamilies; each such group being a two-integer parameter subfamily.

Web link: ***www.IntellectualArchive.com/getfile.php?file=ijW2nJM1K1C&orig_file=Konstantine_Zelator_Integer_roots_of_quadratic.pdf***

ID #: 277 **Natural Sciences** / **Mathematics** / **Algebra**

Submitted on: Apr 12, 2012

Author: **Konstantine Zelator**

Title: **The Diophantine Equation arctan(1/x)+arctan(m/y)=arctan(1/k)**

Abstract: In the fall 2011 issue of the Journal`Mathematics and Computer Education`, author Unal Hasan, in the one page article "Proof without Words", gives a purely geometric proof of the equality, arctan(1/3)+ arctan(1/7) = arctan(1/2) (1) (See reference [1]) Now consider the two-variable diophantine equation(x and y being positive integer variables), arctan(1/x) + arctan(m/y) = arctan(1/k) (2), where m and k are given or fixed positive integers with gcd(m,k^2+1)=1;and also with gcd(m,y)=1. Equality (1) then says that the pair (3,7)is a positive integer solution to (2) in the case m=1=k. We prove, in Theorem1(a,) that equation (2) has exactly N(number of positive divisors of k^2+1) distinct positive integer solutions (x,y), given by x=k+m(k^2+1)/d, y=km+d; d a positive divisor of k^2+1. As a result of Th.1, we list nine arctangent equalities in Section5 of this article, including inequality (1) above.

Web link: ***www.IntellectualArchive.com/getfile.php?file=kaxKKO5eoHI&orig_file=Konstantine_Zelator_The_Diophantine_Equation_arctan.pdf***

ID #: 278 **Natural Sciences** / **Mathematics** / **Algebra**

Submitted on: Apr 12, 2012

Author: **Konstantine Zelator**

Title: **The Rational Number n/p as a sum of two unit fractions**

Abstract: In a 2011 paper published in the journal "Asian Journal of Algebra"(see reference[1]), the authors consider, among other equations,the diophantine equations 2xy=n(x+y) and 3xy=n(x+y). For the first equation, with n being an odd positive integer, they give the solution x=(n+1)/2, y=n(n+1)/2. For the second equation they present the particular solution, x=(n+1)/3,y=n(n+1)/3, where is n is a positive integer congruent to 2modulo3. If in the above equations we assume n to be prime, then these two equations become special cases of the diophantine equation, nxy=p(x+y) (1), with p being a prime and n a positive integer greater than or equal to 2. This 2-variable symmetric diophantine equation is the subject matter of this article; with the added condition that the intager n is not divisible by the prime p. Observe that this equation can be written in fraction form: n/p= 1/x + 1/y

Web link: ***www.IntellectualArchive.com/getfile.php?file=L3MGLkqf6v4&orig_file=Konstantine_Zelator_The_Rational_Number_n_p.pdf***

ID #: 279 **Natural Sciences** / **Mathematics** / **Algebra**

Submitted on: Apr 12, 2012

Author: **Vladimir L. Popov**

Title: **On the Makar-Limanov, Derksen invariants, and finite automorphism groups of algebraic varieties**

Abstract: A simple method of constructing a big stock of algebraic varieties with trivial Makar-Limanov invariant is described, the Derksen invariant of some varieties is computed, the generalizations of the Makar-Limanov and Derksen invariants are introduced and discussed, and some results on the Jordan property of automorphism groups of algebraic varieties are obtained.

Web link: ***www.IntellectualArchive.com/getfile.php?file=ju9LLxi5O0M&orig_file=Vladimir_Popov_On_the_Makar_Limanov_Derksen_invariants.pdf***

ID #: 280 **Natural Sciences** / **Mathematics** / **Algebra**

Submitted on: Apr 12, 2012

Author: **Vladimir L. Popov**

Title: **The cone of Hilbert nullforms**

Abstract: We describe a geometric-combinatorial algorithm that allows one, using solely the system of weights and roots, to determine the Hesselink strata of the null-cone of a linear representation of a reductive algebraic group and calculate their dimensions. In particular, it provides a constructive approach to calculating the dimension of the null-cone and determining all its irreducible components of maximal dimension. In the case of the adjoint representation (and, more generally, a θ-representation), the algorithm turns into the classification algorithm for the conjugacy classes of nilpotent elements in a semisimple Lie algebra (respectively, homogeneous nilpotent elements in a cyclically graded semisimple Lie algebra).

Web link: ***www.IntellectualArchive.com/getfile.php?file=2NWKYg8Chiw&orig_file=Vladimir_Popov_The_cone_of_Hilbert_nullforms.pdf***

ID #: 281 **Natural Sciences** / **Physics** / **Particle physics**

Submitted on: Apr 12, 2012

Author: **Aleksandr Volokitin**

Title: **Quantum friction and graphene**

Abstract: Friction is usually a very complicated process. It appears in its most elementary form when two flat surfaces separated by vacuum gap are sliding relative to each other at zero Kelvin and the friction is generated by the relative movement of quantum fluctuations. For several decades physicists have been intrigued by the idea of quantum friction. It has recently been shown that two non-contacting bodies moving relative to each other experience a friction due to quantum fluctuations inside the bodies. However until recent time there was no experimental evidence for or against this effect, because the predicted friction forces are very small, and precise measurements of quantum forces are incredibly difficult with present technology. The existence of quantum friction is still debated even among theoreticians. However, situation drastically changed with the creation of new material - graphene. We recently proposed that quantum friction can be observed in experiments studying electrical transport phenomena in nonsuspended graphene on amorphous SiO_2 substrate.

Web link: ***www.IntellectualArchive.com/getfile.php?file=8fsAXuZFfMg&orig_file=Aleksandr_Volokitin_Quantum_friction_and_graphene.pdf***

ID #: 283 **Social Sciences** / **Education** / **Technology**

Submitted on: Apr 17, 2012

Author: **Sergio Rojas**

Title: **Enhancing Reasoning Skills in the Process of Teaching and Learning of Physics via Dynamic Problem Solving Strategies: a Preparation for Future Learning**

Abstract: The large number of published articles in physics journals under the title "Comments on Â·Â·Â· " and "Reply to Â·Â·Â· " is indicative that the conceptual understanding of physical phenomena is very elusive and hard to grasp even to experts, but it has not stopped the development of Physics. In fact, from the history of the development of Physics one quickly becomes aware that, regardless of the state of conceptual understanding, without quantitative reasoning Physics would have not reached the state of development it has today. Correspondingly, quantitative reasoning and problem solving skills are a desirable outcomes from the process of teaching and learning of physics. Thus, supported by results from published research, we will show evidence that a well structured problem solving strategy taught as a dynamical process offers a feasible way for students to learn physics quantitatively and conceptually, while helping them to reach the state of an Adaptive Expert highly skillful on innovation and efficiency, a desired outcome from the perspective of a Preparation for Future Learning approach of the process of teaching and learning Physics effectively.

Web link: ***www.IntellectualArchive.com/getfile.php?file=xAOcFBiescf&orig_file=Sergio_Rojas_Enhancing_Reasoning_Skills.pdf***

ID #: 284 **Natural Sciences** / **Physics** / **Quantum field theory**

Submitted on: Apr 17, 2012

Author: **Sameer M. Ikhdair**

Title: **A study of quantum pseudodot system with a two-dimensional pseudoharmonic potential using Nikiforov-Uvarov method**

Abstract: We use the Nikiforov-Uvarov method to calculate the bound states (energy spectra and wave functions) of a two-dimensional (2D) electron gas interacted with an exactly solvable pseudoharmonic confinement potential in a strong uniform magentic field inside dot and Aharonov-Bohm flux field inside a pseudodot. We give a unified treatment for both SchrÂ¨odinger and spin-0 Klein-Gordon energy spectrum and wave functions as functions of chemical potential parameter, magnetic field strength, AB flux field and magnetic quantum number. We obtain analytic expression for the light interband absorption coefficient and threshold frequency of absorption as functions of applied magnetic field and geometrical size of quantum pseudodot. The temperature dependence energy levels for GaAs are also calculated.

Web link: ***www.IntellectualArchive.com/getfile.php?file=Md92GUfmjOd&orig_file=Sameer_M_Ikhdair__A_study_of_quantum_pseudodot_system.pdf***

ID #: 285 **Natural Sciences** / **Physics** / **Particle physics**

Submitted on: Apr 20, 2012

Author: **Sameer M. Ikhdair**

Title: **Bound state energies and wave functions of spherical quantum dots in presence of a confining potential model**

Abstract: We obtain the exact energy spectra and corresponding wave functions of the radial Schr\"odinger equation (RSE) for any (n,l) state in the presence of a combination of psudoharmonic, Coulomb and linear confining potential terms using an exact analytical iteration method. The interaction potential model under consideration is Cornell-modified plus harmonic (CMpH) type which is a correction form to the harmonic, Coulomb and linear confining potential terms. It is used to investigates the energy of electron in spherical quantum dot and the heavy quarkonia (QQ-onia).

Web link: ***www.IntellectualArchive.com/getfile.php?file=j1GjdM7YiUX&orig_file=Sameer_M_Ikhdair__Bound_state_energies_and_wave_functions.pdf***

ID #: 286 **Natural Sciences** / **Physics** / **Particle physics**

Submitted on: Apr 20, 2012

Author: **Sameer M. Ikhdair**

Title: **Bound states of the Klein-Gordon equation in D-dimensions with some physical scalar and vector exponential-type potentials including orbital centrifugal term**

Abstract: The approximate analytic bound state solutions of the Klein-Gordon equation with equal scalar and vector exponential-type potentials including the centrifugal potential term are obtained for any arbitrary orbital angular momentum number l and dimensional space D. The relativistic/non-relativistic energy spectrum equation and the corresponding unnormalized radial wave functions, in terms of the Jacobi polynomials P_{n}^{({\alpha},{\beta})}(z), where {\alpha}>-1, {\beta}>-1 and z\in[-1,+1] or the generalized hypergeometric functions _{2}F_{1}(a,b;c;z), are found. The Nikiforov-Uvarov (NU) method is used in the solution. The solutions of the Eckart, Rosen-Morse, Hulth\`en and Woods-Saxon potential models can be easily obtained from these solutions. Our results are identical with those ones appearing in the literature. Finally, under the PT-symmetry, we can easily obtain the bound state solutions of the trigonometric Rosen-Morse potential.

Web link: ***www.IntellectualArchive.com/getfile.php?file=50Cbg0IMaEO&orig_file=Sameer_M_Ikhdair__Bound_states_of_the_Klein-Gordon_equation.pdf***

ID #: 287 **Natural Sciences** / **Physics** / **Particle physics**

Submitted on: Apr 20, 2012

Author: **Sameer M. Ikhdair**

Title: **Effective Schroedinger equation with general ordering ambiguity position-dependent mass Morse potential**

Abstract: We solve the parametric generalized effective Schroedinger equation with a specific choice of posi-tion-dependent mass function and Morse oscillator potential by means of the Nikiforov-Uvarov (NU) method combined with the Pekeris approximation scheme. All bound-state energies are found explicitly and all corresponding radial wave functions are built analytically. We choose the Weyl or Li and Kuhn ordering for the ambiguity parameters in our numerical work to calculate the energy spectrum for a few and diatomic molecules with arbitrary vibration and rotation quantum numbers and different position-dependent mass functions. Two special cases including the constant mass and the vibration s-wave (l =0) are also investigated.

Web link: ***www.IntellectualArchive.com/getfile.php?file=Ko8H4CjvR4G&orig_file=Sameer_M_Ikhdair__Effective_Schroedinger_equation.pdf***

ID #: 288 **Natural Sciences** / **Physics** / **Particle physics**

Submitted on: Apr 20, 2012

Author: **Sameer M. Ikhdair**

Title: **Exact Solution of Dirac Equation with Charged Harmonic Oscillator in Electric Field: Bound States**

Abstract: In some quantum chemical applications, the potential models are linear combination of single exactly solvable potentials. This is the case equivalent of the Stark effect for a charged harmonic oscillator (HO) in a uniform electric field of specific strength (HO in an external dipole field). We obtain the exact s-wave solutions of the Dirac equation for some potential models which are linear combination of single exactly solvable potentials (ESPs). In the framework of the spin and pseudospin symmetric concept, we calculate the analytic energy spectrum and the corresponding two-component upper- and lower-spinors of the two Dirac particles by the Nikiforov-Uvarov (NU) method, in a closed form.

The nonrelativistic limit of the solution is also studied and compared with the other works.

Web link: ***www.IntellectualArchive.com/getfile.php?file=MPShIWsZeMk&orig_file=Sameer_M_Ikhdair__Exact_Solution_of_Dirac_Equation.pdf***

ID #: 289 **Natural Sciences / Physics / Particle physics**

Submitted on: Apr 20, 2012

Author: **Sameer M. Ikhdair**

Title: **Approximated l-states of the Manning-Rosen potential by Nikiforov-Uvarov method**

Abstract: The approximately analytical bound state solutions of the l-wave Schroedinger equation for the Manning-Rosen (MR) potential are carried out by a proper approximation to the centrifugal term. The energy spectrum formula and normalized wave functions expressed in terms of the Jacobi polynomials are both obtained for the application of the Nikiforov-Uvarov (NU) method to the Manning-Rosen potential. To show the accuracy of our results, we calculate the eigenvalues numerically for arbitrary quantum numbers n and l with two different values of the potential parameter {\alpha}. It is found that our results are in good agreement with the those obtained by other methods for short potential range, small l and {\alpha}. Two special cases are investigated like the s-wave case and Hulthen potential case.

Web link: ***www.IntellectualArchive.com/getfile.php?file=tNCLKq25pMG&orig_file=Sameer_M_Ikhdair__l-states_of_the_Manning-Rosen_potential.pdf***

ID #: 290 **Natural Sciences / Physics / Particle physics**

Submitted on: Apr 20, 2012

Author: **Sameer M. Ikhdair**

Title: **Quantization rule solution to the Hulthen potential in arbitrary dimension by a new approximate scheme for the centrifugal term**

Abstract: The bound state energies and wave functions for a particle exposed to the Hulthen potential field in the D-dimensional space are obtained within the improved quantization rule for any arbitrary l state. The present approximation scheme used to deal with the centrifugal term in the effective Hulthen potential is systematic and accurate. The solutions for the three-dimensional (D=3) case and the s-wave (l=0) case are briefly discussed.

Web link: ***www.IntellectualArchive.com/getfile.php?file=Wucf9ZSJYjw&orig_file=Sameer_M_Ikhdair__Quantization_rule_solution.pdf***

ID #: 291 **Natural Sciences / Physics / Quantum field theory**

Submitted on: Apr 20, 2012

Author: **Sameer M. Ikhdair**

Title: **On the bound-state solutions of the Manning-Rosen potential including improved approximation to the orbital centrifugal term**

Abstract: The approximate analytical bound state solution of the Schroedinger equation for the Manning-Rosen potential is carried out by taking a new approximation scheme to the orbital centrifugal term. The Nikiforov-Uvarov method is used in the calculations. We obtain analytic forms for the energy eigenvalues and the corresponding normalized wave functions in terms of the Jacobi polynomials or hypergeometric functions for different screening parameters 1/b. The rotational-vibrational energy states for a few diatomic molecules are calculated for arbitrary quantum numbers n and l with different values of the potential parameter {\alpha}. The present numerical results agree within five decimal digits with the previously reported results for different 1/b values. A few special cases of the s-wave (l=0) Manning-Rosen potential and the Hulthen potential are also studied.

Web link: ***www.IntellectualArchive.com/getfile.php?file=q3ILNPJtdDW&orig_file=Sameer_M_Ikhdair__solutions_of_the_Manning-Rosen_potential.pdf***

ID #: 292 **Natural Sciences / Physics / Nuclear physics**

Submitted on: Apr 20, 2012

Author: **Malcolm Macleod**

Title: **Electron as Magnetic Monopole**

Abstract: A formula for an electron as a geometrical shape whose axis is a magnetic monopole is proposed.

The electron formula is constructed from Planck length, Planck mass, elementary charge and c. This geometrical shape is symmetrical for an electron at rest.

Web link: ***www.IntellectualArchive.com/getfile.php?file=Z7pnZwtOKaK&orig_file=Malcolm_Macleod__Electron_as_Magnetic_Monopole.pdf***

ID #: 293 **Natural Sciences / Physics / Quantum field theory**

Submitted on: Apr 20, 2012

Author: **Malcolm Macleod**

Title: **Notes on Gravitons, Gravitational Waves and Bohr**

Abstract: In this essay, I outline a simple model based on a premise that wave-particle duality reflects a correspondent electric-gravity duality. It is the wave-state that characterizes the electric force interaction and the particle-state which characterizes the gravitational force interaction. Gravitons become waves mathematically equivalent to gravitational waves, differing only in phase. The counterparts for the atom are photons and atomic orbitals. The function is the same. A gravitational Rydberg formula is proposed, it suggests that gravitational waves are standing waves delineating the orbital path.

Web link: ***www.IntellectualArchive.com/getfile.php?file=MxDUQLmhwBu&orig_file=Malcolm_Macleod__Gravitons_Gravitational_Waves_and_Bohr.pdf***

ID #: 294 **Natural Sciences / Physics / Nuclear physics**

Submitted on: Apr 20, 2012

Author: **Malcolm Macleod**

Title: **Quintessence-Momentum as Link Between Mass and Charge**

Abstract: The natural constants, G; h; e and me are presented as geometrical shapes in terms of Planck momentum, Î± (Sommerfeld fine structure constant) and c. A square root solution of Planck momentum denoted Quintessence-momentum Q links the mass and charge constants. The electron formula describes a dimensionless magnetic monopole. The Rydberg constant R1, the most accurate of the natural constants, is used for crossreference, the solutions are consistent with CODATA 2010 precision.

Web link: ***www.IntellectualArchive.com/getfile.php?file=jgKWjiOT5Lw&orig_file=Malcolm_Macleod__Quintessence-Momentum.pdf***

ID #: 295 **Natural Sciences / Physics / Particle physics**

Submitted on: Apr 21, 2012

Author: **Jun-Bao Wu**

Title: **Splitting of Folded Strings in AdS_4*CP^3**

Abstract: We study classically splitting of two kinds of folded string solutions in AdS_4*CP^3. Conserved charges of the produced fragments are computed for each case. We find interesting patterns among these conserved charges.

Web link: ***www.IntellectualArchive.com/getfile.php?file=jgoeJeiUEkc&orig_file=Jun-Bao_Wu__Splitting_of_Folded_Strings.pdf***

ID #: 296 **Social Sciences / Education / Theory**

Submitted on: Apr 21, 2012

Author: **Sergio Rojas**

Title: **A non-standard approach to introduce simple harmonic motion**

Abstract: We`ll be presenting an approach to solve the equation of simple harmonic motion (SHM) which is non-standard as compared with the usual way of solution presented in textbooks. In addition to help students avoid the unnecessary memorization of formulas to solve physics problems, this approach could help instructors to present the subject in a teaching framework which integrates conceptual and mathematical reasoning, in a systemic way of thinking that will help students to reinforce their quantitative reasoning skills by using mathematical knowledge already familiar to students in a first calculus-based introductory physics course, such as the chain rule for derivatives, inverse trigonometric functions, and integration methods.

Web link: ***www.IntellectualArchive.com/getfile.php?file=RFJB5c1j7dd&orig_file=Sergio_Rojas__approac***

h_to_introduce_simple_harmonic_motion.pdf

ID #: 297 **Social Sciences / Education / Theory**

Submitted on: Apr 21, 2012

Author: **Sergio Rojas**

Title: **Physics Education Research and the Teaching and Learning of Physics**

Abstract: A brief account of some recent controversies about the teaching and learning of physics is presented. A shorter version of this outcome was accepted by The Physics Teacher, but publication is still pending.

Web link: ***www.IntellectualArchive.com/getfile.php?file=IjsQXbUhgNI&orig_file=Sergio_Rojas__Physics_Education_Research.pdf***

ID #: 298 **Natural Sciences / Computer Sciences / Mathematical logic**

Submitted on: Apr 22, 2012

Author: **Igal Sason**

Title: **On Refined Versions of the Azuma-Hoeffding Inequality with Applications in Information Theory**

Abstract: This paper presents some refined versions of the Azuma-Hoeffding inequality for discrete-parameter martingales with uniformly bounded jumps, and it considers some of their potential applications in information theory and related topics. The first part of this paper derives these refined inequalities, followed by a discussion on their relations to some classical results in probability theory. It also considers a geometric interpretation of some of these inequalities, providing an insight on the inter-connections between them. The second part exemplifies the use of these refined inequalities in the context of hypothesis testing, information theory, and communication. The paper is concluded with a discussion on some directions for further research. This work is meant to stimulate the use of some refined versions of the Azuma-Hoeffding inequality in information-theoretic aspects.

Web link: ***www.IntellectualArchive.com/getfile.php?file=DMKuhA4cgC6&orig_file=Igal_Sason__Azuma-Hoeffding_Inequality.pdf***

ID #: 299 **Natural Sciences / Mathematics / Algebra**

Submitted on: Apr 23, 2012

Author: **Liping Li**

Title: **Algebras stratified for all linear orders**

Abstract: In this paper we describe several characterizations of basic finite-dimensional k-algebras A stratified for all linear orders, and classify their graded algebras as tensor algebras satisfying some extra property. We also discuss whether for a given preorder $\preccurlyeq$, $\mathcal{F}(_{\preccurlyeq} \Delta)$, the category of A-modules with $_{\preccurlyeq} \Delta$-filtrations, is closed under cokernels of monomorphisms, and classify quasi-hereditary algebras satisfying this property.

Web link: ***www.IntellectualArchive.com/getfile.php?file=MO1eFwOB7te&orig_file=Liping_Li__Algebras_stratified_for_all_linear_orders.pdf***

ID #: 300 **Natural Sciences / Mathematics / Geometry**

Submitted on: Apr 23, 2012

Author: **J.R. Arteaga**

Title: **A Relationship between Geometry and Algebra**

Abstract: The three key documents for study geometry are: 1) "The Elements" of Euclid, 2) the lecture by B. Riemann at Gottingen in 1854 entitled Uber die Hypothesen welche der Geometrie zu Grunde liegen" (On the hypotheses which underlie geometry) and 3) the "Erlangen Program", a document written by F. Klein (1872) on his income as professor at the Faculty of Philosophy and the Senate of the Erlangen University. The latter document F. Klein introduces the concept of group as a tool to study geometry. The concept of a group of transformations of space was known at the time. The purpose of this informative paper is to show a relationship between geometry and algebra through an example, the projective plane. Erlangen program until today continues being a guideline of how to study geometry.

The paper is written in Spanish.

Web link: ***www.IntellectualArchive.com/getfile.php?file=A4MWVGXDnWg&orig_file=Jose_Bejarano__Relationship_between_Geometry_and_Algebra.pdf***

ID #: 301 **Natural Sciences / Mathematics / Algebra**

Submitted on: Apr 23, 2012

Author: **Liping Li**

Title: **A generalized Koszul theory and its application**

Abstract: Let A be a graded algebra. In this paper we develop a generalized Koszul theory by assuming that A_0 is self-injective instead of semisimple and generalize many classical results. The application of this generalized theory to directed categories and finite EI categories is described.

Web link: ***www.IntellectualArchive.com/getfile.php?file=9hJvIWKjcR0&orig_file=Liping_Li__A_generalized_Koszul_theory.pdf***

ID #: 303 **Natural Sciences / Physics / Particle physics**

Submitted on: Apr 24, 2012

Author: **Volodymyr P. Sergiievskyi**

Title: **Fast calculation of thermodynamic and structural parameters of solutions using the 3DRISM model and the multi-grid method**

Abstract: In the paper a new method to solve the tree-dimensional reference interaction site model (3DRISM) integral equations is proposed. The algorithm uses the multi-grid technique which allows to decrease the computational expanses. 3DRISM calculations for aqueous solutions of four compounds (argon, water, methane, methanol) on the different grids are performed in order to determine a dependence of the computational error on the parameters of the grid. It is shown that calculations on the grid with the step 0.05\Angstr and buffer 8\Angstr give the error of solvation free energy calculations less than 0.3 kcal/mol which is comparable to the accuracy of the experimental measurements. The performance of the algorithm is tested. It is shown that the proposed algorithm is in average more than 12 times faster than the standard Picard direct iteration method.

Web link: ***www.IntellectualArchive.com/getfile.php?file=rQkHbJTrdjQ&orig_file=Volodymyr_Sergiievskyi__3DRISM_model.pdf***

ID #: 304 **Natural Sciences / Mathematics / Differential equations**

Submitted on: Apr 24, 2012

Author: **J.R. Arteaga, M. Malakhaltsev**

Title: **Ideas of E. Cartan and S. Lie in modern geometry: G-structures and differential equations. Lecture 1**

Abstract: This is the lecture 1 of a mini-course of 4 lectures. Our purpose of this mini-curse is to explain some ideas of E. Cartan and S. Lie when we study differential geometry, particularly we will to explain the Cartan reduction method. The Cartan reduction method is a technique in Differential Geometry for determining whether two geometrical structure are the same up to a diffeomorphism. This method use new tools of differential geometry as principal bundles, G-structures and jets theory. We start with an example of a G-structure: the 3-webs in R^2. Here we use the Cartan method to classify the differential equations but not to resolve. This is a classification can be a weak classification in the sense of not involving all the structural invariants.

Web link: ***www.IntellectualArchive.com/getfile.php?file=cbNjKMBHijH&orig_file=Jose_Arteaga__Ideas_of_Cartan_in_modern_geometry_1.pdf***

ID #: 305 **Natural Sciences / Mathematics / Differential equations**

Submitted on: Apr 24, 2012

Author: **J.R. Arteaga, M. Malakhaltsev**

Title: **Ideas of E. Cartan and S. Lie in modern geometry: G-structures and differential equations. Lecture 2**

Abstract: This is the lecture 2 of a mini-course of 4 lectures. Our purpose of this mini-curse is to explain some ideas of E. Cartan and S. Lie when we study differential geometry, particularly we will to explain the Cartan reduction method. The Cartan reduction method is a technique in Differential Geometry for determining whether two geometrical structure are the same up to a diffeomorphism. This method

use new tools of differential geometry as principal bundles, G-structures and jets theory. We start with an example of a G-structure: the 3-webs in R^2. Here we use the Cartan method to classify the differential equations but not to resolve. This is a classification can be a weak classification in the sense of not involving all the structural invariants.

Web link: ***www.IntellectualArchive.com/getfile.php?file=MYsOtWSpmhG&orig_file=Jose_Arteaga__Ideas_of_Cartan_in_modern_geometry_2.pdf***

ID #: 306 **Natural Sciences / Mathematics / Differential equations**

Submitted on: Apr 24, 2012

Author: **J.R. Arteaga, M. Malakhaltsev**

Title: **Ideas of E. Cartan and S. Lie in modern geometry: G-structures and differential equations. Lecture 3**

Abstract: This is the lecture 3 of a mini-course of 4 lectures. Our purpose of this mini-curse is to explain some ideas of E. Cartan and S. Lie when we study differential geometry, particularly we will to explain the Cartan reduction method. The Cartan reduction method is a technique in Differential Geometry for determining whether two geometrical structure are the same up to a diffeomorphism. This method use new tools of differential geometry as principal bundles, G-structures and jets theory. We start with an example of a G-structure: the 3-webs in R^2. Here we use the Cartan method to classify the differential equations but not to resolve. This is a classification can be a weak classification in the sense of not involving all the structural invariants.

Web link: ***www.IntellectualArchive.com/getfile.php?file=fLdm0ggu43e&orig_file=Jose_Arteaga__Ideas_of_Cartan_in_modern_geometry_3.pdf***

ID #: 307 **Natural Sciences / Mathematics / Differential equations**

Submitted on: Apr 24, 2012

Author: **J.R. Arteaga, M. Malakhaltsev**

Title: **Ideas of E. Cartan and S. Lie in modern geometry: G-structures and differential equations. Lecture 4**

Abstract: This is the lecture 4 of a mini-course of 4 lectures. Our purpose of this mini-curse is to explain some ideas of E. Cartan and S. Lie when we study differential geometry, particularly we will to explain the Cartan reduction method. The Cartan reduction method is a technique in Differential Geometry for determining whether two geometrical structure are the same up to a diffeomorphism. This method use new tools of differential geometry as principal bundles, G-structures and jets theory. We start with an example of a G-structure: the 3-webs in R^2. Here we use the Cartan method to classify the differential equations but not to resolve. This is a classification can be a weak classification in the sense of not involving all the structural invariants.

Web link: ***www.IntellectualArchive.com/getfile.php?file=IulhOEcQ1pq&orig_file=Jose_Arteaga__Ideas_of_Cartan_in_modern_geometry_4.pdf***

ID #: 308 **Natural Sciences / Physics / Optics**

Submitted on: Apr 26, 2012

Author: **Andrei B. Utkin**

Title: **Droplet-shaped waves: Casual finite-support analogs of X-shaped waves**

Abstract: A model of steady-state X-shaped wave generation by a superluminal (supersonic) pointlike source infinitely moving along a straight line is extended to a more realistic causal scenario of a source pulse launched at time zero and propagating rectilinearly at constant superluminal speed. In the case of infinitely short (delta) pulse, the new model yields an analytical solution, corresponding to the propagation-invariant X-shaped wave clipped by a droplet-shaped support, which perpetually expands along the propagation and transversal directions, thus tending the droplet-shaped wave to the X-shaped one.

Web link: ***www.IntellectualArchive.com/getfile.php?file=Xp7FGBsKg2j&orig_file=Andrei_Utkin__Droplet-shaped_waves.pdf***

ID #: 309 **Natural Sciences / Physics / Mechanics**

Submitted on: Apr 27, 2012

Author: **D.V. Prokhorenko**

Title: **An Illustration of Generalized Thermodynamics by Several Physical Examples**

Abstract: It has been shown recently that Bose Gase with weak pair (enough well) interaction is non ergodic system. But Bose Gase with weak pair interaction is so general system that it is evident that the majority of statistical mechanics systems are non ergodic too. It is also has been shown that it is possible to generalize the scheme of standard statistical mechanics and thermodynamics to take into account non ergodicity. This generalization is called a generalized thermodynamics. In some points this generalized thermodynamics coincide with standard equilibrium thermodynamics but some new specific results take place. It has been shown that this new generalized thermodynamics can be used to explain some physiological phenomena which take place in the living cell when the cell is exciting and dying. In the present paper we try to illustrate some basic points of this generalized thermodynamics on some physical examples.

Web link: ***www.IntellectualArchive.com/getfile.php?file=E5gVgKZlhNL&orig_file=D_V_Prokhorenko__Illustration_of_Generalized_Thermodynamics.pdf***

ID #: 310 **Natural Sciences** / **Computer Sciences** / **Multiprocessing**

Submitted on: Apr 28, 2012

Author: **Agnieszka Lupinska**

Title: **Parallel implematation of flow and matching algorithms**

Abstract: Acknowledgement
My most sincere thanks go to my adviser, Dr Maciej Slusarek, for his guidance, encouragement and support during the development of this work.

In our work we present two parallel algorithms and their lock-free implementations using a popular GPU environment Nvidia CUDA. The first algorithm is the push-relabel method for the flow problem in grid graphs. The second is the cost scaling algorithm for the assignment problem in complete bipartite graphs.

Web link: ***www.IntellectualArchive.com/getfile.php?file=fZWfLjQLinJ&orig_file=Agnieszka_Lupinska__Flow_and_matching_algorithms.pdf***

ID #: 311 **Natural Sciences** / **Physics** / **Astrophysics**

Submitted on: Apr 28, 2012

Author: **Alexei M. Frolov**

Title: **On the absorption of radiation by the negatively charged hydrogen ion**

Abstract: Absorption of infrared and visible radiation from stellar emission spectra by the negatively charged hydrogen ions H^{-} is considered. We derive the explicit formulas which can be used to determine the total absorption coefficient (per unit volume) for the negatively charged hydrogen ions ^{1}H^{-} (protium) and ^{2}H^{-} (deuterium or D^{-}). The computed bound-free and free-free absorption coefficients a_{ν} and k_{ν} can be used to evaluate the actual absorption of infrared and visible radiation by the H^{-} ion in photospheres of many cold stars with surface temperatures $T_s \le$ 8,250 K.

Web link: ***www.IntellectualArchive.com/getfile.php?file=bdejjH9RdYI&orig_file=Alexei_Frolov__On_the_absorption_of_radiation.pdf***

ID #: 312 **Natural Sciences** / **Physics** / **Particle physics**

Submitted on: Apr 28, 2012

Author: **C. S. Unnikrishnan**

Title: **Thermal expansion of the earth and the speed of neutrinos**

Abstract: It is pointed out that one of the systematic effects that can affect the measurement of the speed of neutrinos significantly is the variability of the unaveraged measurement of the distance between two points on the earth due to thermal expansion. Possible difference between estimates done with surface GPS apparatus and the true underground baseline can change substantially the statistical significance of the result of superluminal speed of neutrinos, reported recently.

Web link: ***www.IntellectualArchive.com/getfile.php?file=gZJb7JLgOlj&orig_file=C_S_Unnikrishnan__Thermal_expansion_of_the_earth.pdf***

ID #: 313 **Natural Sciences** / **Mathematics** / **Algebra**

Submitted on: Apr 28, 2012

Author: **Huijun Yang**

Title: **Almost Complex Structures on (n-1)-connected 2n-manifolds**

Abstract: Let M be a closed (n-1)-connected 2n-dimensional smooth manifold with n > 2. In terms of the system of invariants for such manifolds introduced by Wall, we obtain necessary and sufficient conditions for M to admit an almost complex structure.

Web link: ***www.IntellectualArchive.com/getfile.php?file=As17t1fkkGs&orig_file=Huijun_Yang__Almost_Complex_Structures.pdf***

ID #: 314 **Natural Sciences** / **Mathematics** / **Combinatorics**

Submitted on: Apr 30, 2012

Author: **Yuri Burda**

Title: **On a Problem of Gromov about Generalizing Alexandrov-Fenchel Inequality**

Abstract: In this note we give an answer to a question about mixed volumes asked by Gromov in his paper "Convex Sets and Kahler Manifolds". For reader`s convenience we remind definitions and some of the properties of mixed volumes and mixed discriminants.

Web link: ***www.IntellectualArchive.com/getfile.php?file=bhVm6l8KBMp&orig_file=Yuri_Burda__On_a_Problem_of_Gromov.pdf***

End of April 2012 bulletin