

**BULETINUL ȘTIINȚIFIC**  
**al Universității “Politehnica” din Timișoara, Romania**  
**SCIENTIFIC BULLETIN**  
**of “Politehnica” University of Timișoara, Romania**

**Contents and Abstracts**

**Seria MATEMATICĂ - FIZICĂ**  
**Transactions on MATHEMATICS & PHYSICS**  
**Tom 50 (64) , Fascicola 2, 2005, ISSN 1224-6069**

**CONTENTS**

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**MATHEMATICS**

1. M. BAICA, A. PERETTI – *The Fundamental Solution of the Equation  $X^2-DY^2 = 1$*  ..... 1
2. O. LIPOVAN – *Pseudosubmeasurable and Integrable Functions* ..... 10
3. Gh.M. TUDOR - *L'équation Diophantienne  $x^x \cdot y^y = z^z$  (V)* ..... 18
4. L. CĂDARIU – *Fixed Points in Generalized Metric Space and the Stability of a Quartic Functional Equation* ..... 25
5. M.ČANAK, L.PROTIĆ, L.STEFANOVSKA – *Particular Solution of Vekua Differential Equation by using Mitrinovic Method* ..... 35
6. Gh.M. TUDOR, T.BÎNZAR – *On Some Exponential Diophantienne Equations* .... 47
7. I. DRAGOMIRESCU – *On the Chandrasekhar-Galerkin Method in a Convection Problem for a Micropolar Fluid* ..... 53

**PHYSICS**

8. B. ROTHENSTEIN, St. POPESCU, G.J. SPIX – *Illustrating Einstein's Special Relativity: A relativistic Diagram that Displays in True Values the Components of a Four Vector* ..... 62
9. C. GRUESCU, M. COSTACHE – *Design of a Kepler Telescope Providing an Erected Image* ..... 76
10. M. CRISTEA – *IR Absorbtion of some  $M_2O_3$  Oxides and Their Solid Solutions* ..... 83
11. S.BABETI, G. ZET – *Solutions in Dilaton Gauge Theory of Gravitation* ..... 92
12. B.S. TOŠIĆ - *A Century of Quantum Physics* ..... 100
13. I. LUMINOSU, L. FARA – *Exergetic Analysis of a Flat-Plate Solar Collector* ..... 108
14. M.V. PUTZ – *The Quantum Statistics of the Chemical Reactivity. Part III: Electronic Density Reactivity* ..... 115

## ABSTRACTS

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### Mathematics

#### THE FUNDAMENTAL SOLUTION OF THE EQUATION $X^2 - DY^2 = 1$

Malvina BAICA and Aldo PERETTI

**Abstract:** In this paper the authors use Analytic Number Theory tools to find the fundamental solution of the equation  $X^2 - DY^2 = 1$ . Algebraically this equation is related with units in algebraic number quadratic fields.

**Keywords:** Analytic Number Theory, quadratic fields

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#### PSEUDOSUBMEASURABLE AND INTEGRABLE FUNCTIONS

Octavian LIPOVAN

**Abstract:** We define the notion of pseudosubmeasurable as a generalized of the submeasure notion. Using families of pseudosubmeasures and the associated topological rings, the pseudosubmeasurable function concept is defined. The convergence in measure, almost everywhere convergence and almost uniform convergence are generalized to the sequence of functions with values pseudometric spaces. Finally, we develop an integration theory for these functions, with respect to semigroup valued measure.

**Keywords:** Pseudosubmeasures, pseudometric spaces, convergence in measure, almost everywhere convergence, almost uniform convergence

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#### L'ÉQUATION DIOPHANTINNE $x^x \cdot y^y = z^z$ (V)

Gheorghe M. TUDOR

**Résumé.** En ce qui concerne l'équation signalée plus haute, nous envisagerons quelques questions relatives aux solutions  $(x, y, z)$ , où  $x, y, z$  sont des nombres naturels. Au sujet de ce problème, nous avons en vue l'équation  $x^x \cdot y^y = z^z$ , pour laquelle le mathématicien chinois CHAO-KO a trouvé un nombre infini de telles solutions  $(x, y, z)$ , dont  $x, y, z$  sont des nombres naturels (voir, par exemple, [6]).

**Keywords:** Équation Diophantienne.

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**FIXED POINTS IN GENERALIZED METRIC SPACE AND THE STABILITY  
OF A QUADRATIC FUNCTIONAL EQUATION**  
**Liviu CĂDARIU**

**Abstract:** A fixed point method is applied to prove a Hyers-Ulam-Bourgin type stability theorem for the functional equation  $f(x + 2y) + f(x - 2y) - 4f(x+y) - 4f(x-y) + 6f(x) - 24f(y) = 0$ .

**Keywords:** quartic functional equation, fixed points, Hyers-Ulam-Rassias stability.

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**PARTICULAR SOLUTION OF VEKUA DIFFERENTIAL EQUATION BY  
USING MITRINOVIĆ METHOD**

**Miloš ČANAK, Ljubomir PROTIĆ and Liljana STEFANOVSKA**

**Abstract:** In many cases of solving Vekua complex differential equation it is possible to find a particular solution by using Mitrinovic method. The particular solution can be used for obtaining a general solution of a wider class of Vekua equations in final and closed form, that wasn't done in literature.

**Keywords:** Vekua equations.

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**ON SOME EXPONENTIAL DIOPHANTINE EQUATIONS**  
**Gheorghe M. TUDOR and Tudor BÎNZAR**

**Abstract:** In this paper, two types of exponential Diophantine equations are studied. It is shown that these equations have infinitely many solutions of positive integers described by families depending on two parameters.

**Keywords:** Exponential Diophantine Equations

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**ON THE CHANDRASEKHAR – GALERKIN METHOD IN A CONVECTION  
PROBLEM FOR A MICROPOLAR FLUID**

**Ioana DRAGOMIRESCU**

**Abstract.** The direct Chandrasekhar-Galerkin method is applied to solve a problem of convection for a micropolar fluid. For various unknown functions

different expansion functions were chosen such that all boundary conditions be automatically satisfied. Aproximate numerical evaluations of the Rayleigh number are obtained in the even and the odd case. These results agree very well with those obtained by us in [3], by Budianski-DiPrima method.

**Keywords:** stability, micropolar fluid, Rayleigh number.

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## *Physics*

### **ILLUSTRATING EINSTEIN’S SPECIAL RELATIVITY: A RELATIVISTIC DIAGRAM THAT DISPLAYS IN TRUE VALUES THE COMPONENTS OF A FOUR VECTOR**

**Bernhard ROTHENSTEIN, Ștefan POPESCU and George J. SPIX**

**Abstract:** After having shown that the corresponding components of a four vector transform via the same transformation factors as the space-time coordinates of the same event do, we design a relativistic diagram that displays in true values their components. One diagram works—for events generated by tardyons whereas a second diagram works for events generated by light signals or photons. We consider both approaching and receding tardyons respectively photons in each case. We also show how the relativistic diagram for radar and photographic detections of moving profiles.

**Keywords:** Relativistic diagram, Photographic detections

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### **DESIGN OF A KEPLER TELESCOPE PROVIDING AN ERRECTED IMAGE**

**Corina GRUESCU, Marius COSTACHE**

**Abstract:** The paper describes the methods for the design and analysis of the traditional and erected image Kepler telescope. The authors seek for diffraction limited systems, having a very good image quality. The design uses original software, conceived for synthesis. The analysis is performed automatically using the soft OSLO LT. The image quality is evaluated for each component as well as for the system objective-erector. The paper contains original elements concerning the design and the approach in image quality analysis.

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## IR ABSORPTION OF SOME $ME_2O_3$ OXIDES AND THEIR SOLID SOLUTIONS

Minerva CRISTEA

**Abstract:** The experimental results concerning the infrared absorption spectra ( $400-4000\text{ cm}^{-1}$ ) of the isomorphous oxides  $\alpha\text{-Al}_2\text{O}_3$ ,  $\alpha\text{-Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , that crystallize into the trigonal system with the space group  $D_{3d}$ , as well as of their ternary solid solutions with 10%  $\alpha\text{-Fe}_2\text{O}_3$  having the same type of structure, are presented and discussed.

The IR spectra were obtained by using powdered samples tablet – formed with KBr, at room temperature and the recordings for the whole field were performed with two spectrometers, Karl Zeiss type UR-10 and Specord 75 IR.

The spectra of the oxides and those of the ternary solid solutions exhibit two absorption bands below  $700\text{ cm}^{-1}$ . Taking into account the crystalline structure and the degree of covalence of the M-O bonds, an attribution model of these two IR absorption bands is suggested.

**Keywords:** infrared absorption spectra.

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## SOLUTIONS IN DILATON GAUGE OF GRAVITATION

Simona BABETI and G. ZET

**Abstract:** A deSitter gauge theory of gravitational field is developed using a spherical symmetric Minkowski space-time as base manifold. The gravitational field is described by gauge potentials and the field equations are derived from dilaton gravity, in the presence of a special combination of higher derivative terms in the integral of action associated to the gravitational gauge fields. Solutions without singularities are obtained and an example of such solution is given with its dependence on the cosmological constant. The calculations are performed using an analytical program conceived in GRTensor II for Maple 8.

**Keywords:** Minkowski space-time, gravitational field, gauge potentials.

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## A CENTURY OF QUANTUM PHYSICS

Bratislav S.Tošić

**Abstract:** In this paper we refer to the main aspects of the development of quantum mechanics during one century of the year foundation. We follow the main facts and experiments which have been constitute the foundations of quantum mechanics, as: the Planck’s hypothesis of quanta, the Einstein’s explanation of photoelectrical effect, the De Broglie’s theory referring to the wave-corpouscular dualism and so one.

All these and many other phenomena, theory have been made the quantum mechanics as the some fruitful theory of the XX century physics.

**Keywords:** Planck's hypothesis of quanta, Einstein's photoelectrical effect, De Broglie's wave-corpuscular dualism.

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## EXERGETIC ANALYSIS OF A FLAT-PLATE SOLAR COLLECTOR

Ioan LUMINOSU, Laurențiu FARA

**Abstract:** The solar-thermal energy efficiency increases without extremum points with the flow rate. The fluid outlet temperature increases with the collecting area. The absence of maximum points for the functions  $\eta_{en} = f(\dot{m})$  and  $T_{f,o} = f(A_C)$  has created difficulties in the design of flat-plate solar collectors. The exergy efficiency of a flat-plate solar collector,  $\eta_{ex} = f(\dot{m}, A_C)$  presents points of local maxima and a point of global maximum. The paper proposes an exergy analysis of a flat-plate solar collector. The method has proven valuable in the design of solar collectors for the specific climatic and insolation conditions of a certain region.

**Keywords:** Flat-plate solar collector.

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## THE QUANTUM STATISTICS OF THE CHEMICAL REACTIVITY. PART III: ELECTRONIC DENSITY REACTIVITY

Mihai V. PUTZ

**Abstract:** The main directions of the modern quantum physical chemistry are: the study of atoms in molecules, the defining of global reactivity indices of the multi-electronic systems within poly-nuclear fields, and the describing of the electronic distributions and bonds by the so called electronic localization functions. These researches lines are all on the electronic density based as the primer quantum variable. Therefore, the structural ensemble of the substances is represented through the hierarchy of the density functionals and electronic localization functions at various levels of matter organization. Still, the difficulties, sometimes astonished and the inherent errors, in computing electronic densities for the increased systems in poly -electronic and -nuclear complexity open the need for finding of the alternative schemes, based on the electronic density as well, but having an iterative character respecting the atomic basis. The present work show how the implementation and application on the nanosystems can be treated upon an unified quantum model of the chemical bonding nature based on the couple density functional electronegativity - Markovian electronic localization functions, due to the iterative character of the quantum electronegativity.

**Keywords:** Electronic localization, Markovian electronic localization.

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