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BOOK OF ABSTRACTS

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Investigation of some ecological factors by the use of mathematical methods

Aneliya Urumova, Mihail Kolev

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***Abstract**: The impact of scholars like Thomas Malthus, Charles Darwin, Pearl, Lotka, Volterra on the development of population ecology is briefly described. Some important features of agricultural soils and their dependence of climate change is considered. A related mathematical model as well as some numerical results are presented.*
***Keywords:** Mathematical model, soil, ecological factors*

Upper bounds for the number of contacts in hydrophobic-hydrophilic proteins structure prediction model

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***Abstract**: The properties of the proteins depend from their structure. Therefore, it is important to predict the proteins structures to understand their properties. One of the most widely studied models for protein structure prediction is the hydrophobic-hydrophilic (HP) model. To explain the hydrophobic interaction, HP model is tries to maximize the number of contacts between the hydrophobic amino acids. Although have been proposed a number of heuristics to find a strong lower bound for the number of contacts, these methods cannot guarantee the quality of the obtained solution since there is no information about the upper bound that can be obtained. This study is focused on identifying the effective computable upper bound.*
***Keywords:** HP model, protein folding, integer programing, mathematical model, linear relaxation*

Mathematical modeling of Torque-Velocity relationship with sigmoidal and polynomial curves

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***Abstract**: The polynomial functions are most frequently used in modeling of the torque-velocity relationship ((Ripamonti et al., 2008; Looft and Law, 2013). In this study, based on data measured by isokinetic dynamometer in healthy men, relationship was investigated comparatively with polynomial and sigmoid functions in flexors and extensors of the elbow joint (concentric and eccentric contractions in positive and negative velocities, respectively), and the models were assessed with information criteria Aikake (AIC) and Bayesian (BIC). It was established that the relationship is modeled optimally in both type of muscle contractions with: (1) sigmoidal function of the type BiDoseResponse, when concerns both type of contractions; and (2) polynomial functions of various orders, when the positive and negative velocities are modeled and assessed separately.*
***Keywords:** mathematical modeling, torque-velocity relationships, optimization criteria*

Students' readiness for mobile learning in Republic of Yemen – a pilot study

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***Abstract**: In this paper we present the results from a pilot study of students' attitude and readiness towards the implementation of mobile learning technologies in Republic of Yemen higher education. The results from the survey show that students are familiar with the use of smartphone facilities in daily activities, but they do not use smartphones for learning actively. Students have positive attitude towards the use of e-learning and m-learning, but the universities in the Republic of Yemen still do not offer enough e-learning and m-learning resources.*
***Keywords:** component; formatting; style; styling;*

Amantadine and rimantadine analogues - synthesis and biological activity

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Abstract: *Amantadine and rimantadine are oral antiviral drugs useful in the prophylaxis and treatment of influenza A virus infections. Both drugs provide therapeutic benefit if administered early in uncomplicated influenza, and studies are currently in progress to determine the effectiveness of oral rimantadine in preventing or treating the serious complications of influenza A virus infections.*
Our goal was to modify amantadine amantadine with various amino acids and investigate their antiviral activity against influenza virus A (H3N2). The structures of new analogues were confirmed by NMR and MS analyzes.
Keywords: *antiviral drugs, amino acids, analogues*

Anti-influenza drug derivatives with potential biological activity

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Abstract*: Influenza is one of devastating viral infectious diseases. During the 20th century it caused three pandemics, which had led to millions of human deaths. In the present time the continuing occurrence of seasonal epidemic outbreaks is a widespread concern regarding the eventual risk of influenza pandemic.*
Currently in combating influenza viral infection, two classes of antiviral drugs are approved - M2 blockers and neuraminidase inhibitors. However the effectiveness of those drugs often is inadequate due to the rapid appearance of resistant viral strains. The limitation of anti-influenza therapy with a single targeted compound highlights the urgency for a new and efficient strategy for the viral treatment. Furthermore, the design of hybrid molecules comprising of two distinct drug moieties is a promising modern approach to reach various therapeutic goals. In this regard, herein we report our results on the synthesis and biological activity of the newly synthesized derivatives of anti-influenza drugs.
Keywords: *anti-influenza drug derivatives, influenza virus, biological activity*

Proficiency testing (PT) - statistical approaches and criteria for evaluation of results

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***Abstract**: When organizing proficiency testing is necessary to establish two values that are used to evaluate the performance of each participant: assigned property value and standard deviation of the PT scheme. For this purpose are used generally accepted statistical approaches in accordance with the requirements of BDS EN ISO / IEC 17043, ISO 13528, Technical Report IUPAC, ISO Guide 35 and others.*

The presentation includes examples of organized PT schemes applying different statistical approaches for determination of the assigned value and standard deviation and the applicable criteria for assessing the performance as:

- Assigned value obtained as Certified reference value and consensus value on the base of all participants' results (or part of results);

- Standard deviation of PT on the base of the participant's results;

- Evaluation criteria of participants' performance - z and zeta-scores;

- Interpretation of data from PT provider, participants and end users of the measurement result.

***Keywords:** Proficiency testing, Assigned property value, Standard deviation of PT*

Influence of the physicochemical parameters on the electrical outputs of Sediment Microbial Fuel Cells

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***Abstract**: In this work, the impact of the sediment and water composition on the performance of sediment microbial fuel cells has been analyzed. The work of identical fuel cells has been compared over time in order to prove their reliability as a power source. Regression analysis on the data obtained was conducted in order to determine each factor's contribution.*

***Keywords:** Sediment microbial fuel cell, physicochemical parameters, electrical outputs, regression analysis*

Synthesis, spectral and quantum-chemical investigation of the Cu(II) complexes with monohydroxyflavones

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***Abstract**: The flavones are 2-(1'-phenyl)-benzopyran-4-ones of natural origin. They are mainly found in fruits, vegetables, and cereals. The interest in these compounds has grown in consequence of studies that have highlighted their numerous biological properties.*
The antioxidant activity of the flavones can be attributed to their radical-scavenging activity and to an inhibition of a generation of new radicals by chelation of Fe(II) and Cu(II) ions (and other transition metal ions). This is probably the way organisms regulate the activity of the ions.
In the frame of our investigation of monohydroxyflavones, we have synthesized different complexes of Cu(II) with 3-hydroxyflavone and considered their structure. IR and Raman spectra of the ligand and the complexes were taken as well as the quantum-chemical investigation were carried out. The structural differences discovered between free ligand and complexes quantum-chemically were correlated by the differences in their spectra.
The synthesis of the coordination compounds was fulfilled in ethanol in different proportions metal/ligand. Quantum-chemical investigation was performed by the three parameter hybrid DFT functional of Beke, Lee Yang u Par (B3LYP) and orbital basis 6-31G(d,p) in vacuum.
It is clear from spectral and theoretical investigation that a metal ion is chelated by the oxygens of the hydroxyl group at 3th and carbonyl group at 4th positions.
***Keywords:** flavones, Cu(II), coordination, IR and Raman spectra, quantim-chemical calculations*

Winter Activity of the Anurans (Amphibia: Anura) in Bulgaria

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***Abstract**: The aim of the report is to summarize the rather scanty available data of winter activity of anuran species in Bulgaria, and to present new records in southwestern Bulgaria. Different areas have been studied, mainly the region around the city of Blagoevgrad, in two winter months (January and February) of three consecutive years (2014-2016). The weather conditions (sunny, cloudy, rainy) have also been recorded, as well as the temperature of air, water and the ground surface. It has been confirmed the winter activity of 6 amphibian species. Many new specimens have been recorded. All 15 anurans distributed in Bulgaria have been classified according to their winter activity.*
***Keywords:** winter activity, Anura, Amphibia, Bulgaria*

Influence of the wind to development of convective flow above the area of forest fire

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***Abstract**: In a calm environment, fires spread in a vertical direction and can be viewed as a convective stream at an initial rate proportional to the power of fire. In case of wind is considered the most general case in which the convective flow spread at a certain angle α_0 towards the horizon.*
***Keywords:** fire, mathematical modeling, convective flow, numerical simulations, wind*

Students' brigades - benefits, opportunities and disadvantages

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***Abstract**: The report is based on a research conducted among 500 students and their families in the period 2011-2016 year, which studies the phenomenon of "international student labor migrations", also known as "student brigades." Large number of quantitative indicators is being studied by which different aspects of the phenomenon can be analyzed - benefit, cost, duration, workload and others. The survey also studies and some qualitative aspects of the phenomenon, associated primarily with the subjective impulses influencing the behavior of young people and influencing their decision-making.*
***Keywords:** students, migrations, mobility, cross-border, employment*

Municipalities Rila and Kocherinovo - zone shared gravity

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***Abstract**: Administrative - territorial division is a form of territorial organization of the state, based on which create regional and local authorities and self-government. Territorial communities are split apart in time administrative business units, which consist of hierarchically subordinate, complementary systems and components, connected by functional links and dependencies. They gravitate toward outspoken center. Centers and the territorial scope of administrative units are dynamic categories. The structuring of these units be made after consideration of complex factors - the natural geographical, economic, political, administrative, demographic, cultural and others. In administrative - territorial structure is essential territorial scope of each unit the maximum extent possible be aligned with the actual boundaries within which run economic and social processes.*
***Keywords:** administrative - territorial division, administrative centers*

Creation of maps compatible with Google maps

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***Abstract**: Web mapping is a new direction for the compilation and publication of maps and spatial information on the Internet. This report aims to show that the maps and the Internet play a leading role in modern geographical research. The different types of maps on the web, their advantages and disadvantages are described.*
The mapping service Google Maps, which is free and provides 2D and 3D maps through the internet browser, is considered. The possibility for introducing of own spatial information and it's visualization on the map is explored. As a result a thematic map is composed and shared on the Internet.
***Keywords:** Maps, Internet, Google Maps*

Diversity, distribution and conservation status of the Reptiles (Reptilia) in protected area „Oranovski Prolom – Leshko" (BG0001022), Bulgaria

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***Abstract**: The aim of the report is to supplement and summarize data about diversity, distribution and conservation status of the reptiles in Protected Area BG0001022 „Oranovski Prolom – Leshko". The reptilian species and localities were registered during field trips in the period June 1997 – May 2016. Totally 15 species (6 reported for the first time) have been found in the studied area till now – two tortoises, five lizards and eight snakes. All of them are protected according to the national and international legislation. The protected zone will be studied in details in the next two years. It is expected new species and many new localities to be registered.*
***Keywords:** diversity, Reptilia, Natura 2000, Bulgaria*

Opportunities to modernize the activities of waste management on the basis of cluster approach - Blagoevgrad region

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***Abstract**: The idea of creating cluster structures is not new-in 1890 Alfred Marshall has determined the cluster as a "concentration of specialized industries in certain locations." Currently prof. Michael Porter of Harvard University gives a broad definition - "A cluster is a group of geographically nearby companies and organizations with a particular activity, linked by commonalities and complementarities." Environmentally sound management of waste is a set of rights, obligations, decisions and activities that should ensure sustainable management through specialized forms of treatment and kontrol.Na this stage, Bulgaria apply waste disposal by landfill. To be effective and safe landfills must meet a number of requirements in the process of their design, construction, operation and zakrivane.Ministerstvo of Environment and Water has adopted an approach to build 55 new stores on a regional basis. The report has been viewed regional policy management of non-hazardous waste and Blagoevgrad Region retrospective of klasteriterizatsiyata in Bulgaria in order to attempt to create a cluster "waste" that has not been formulated in our country.*
***Keywords:** cluster, waste, regional waste landfill*

Creative Industry - essence and importance. EU policy on the creative economy. Good practices for promoting the creative industry

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***Abstract**: Since the late 90s of the last century, jobs in the manufacturing industries in the countries of EU and in Bulgaria have decreased by half. That is an illustration of the transformation of the economy from the traditional system of mass production to an economy based on knowledge and innovation, which increasingly relies on latest generation services and products that satisfy the increasingly fragmented tastes of the consumers. At the same time, the social and economic importance of the cultural and creative industry is constantly growing. The current study examines the nature and importance of the creative industry and analyzes existing policies and regulations in some member states of the European Union, as well as examples of good practice aimed at promoting the creative industry. The objectives are as follows: growth of the creative economy in Bulgaria, introduction of new activities, and revitalization of old activities.*
***Keywords**: innovation, creative Europe, creative growth, sustainable regional development, creative clusters, business incubators*

Importance of quaternary morphotectonic of the Rhodopean mountain massiff regarding of the regional endogenous risk processes

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***Abstract**: The aim of this study is the morphotectonic analysis of regional conditions for the Late Quaternary endogenous risk processes in the Rhodope Mountain, which is an attempt to build a general model of endogenous morphogenesis.*
To achieve the goal of the study are formulated following scientific tasks:
- clarifying the nature of the regional morphotectonic situation in the Rhodopean Mountain Massif from Quaternary until today;
- an analysis of the conditions for the occurrence and nature of manifestation of regional endogenous processes with risk character in the Rhodopean Mountain Massif;
- creating a generalized model of regional seismic hazard in the Rhodopes;
***Keywords:** endogenous, seismic hazard, Rhodopes, morphotectonics*

Research on the intensity of the implemented policy of sustainable regional development in Bulgaria

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***Abstract**: This study is focused on establishing a regional model analyzing the intensity, the result and the monitoring of the conducted policy of sustainable regional development in Bulgaria after its accession to the European Union. By distinguishing the concepts of "sustainable development" and "path to sustainable development" relationships in regional model are identified, analyzed, classified, grouped and indexed as well as their correlation interdependencies to the previous programming period 2007-2013. An intermodal forecast of the sustainability of regional development in the current programming period 2014 - 2020 is carried out.*
***Keywords:** students, migrations, mobility, cross-border, employment*

Age of glacial relief as an indicator of the intensity of tectonic movements in southwestern Bulgarian mountains

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Abstract: *Contemporary traces of Würm glaciation in Northeaster Pirin and Northeaster and Central Rila, proved to be a very important benchmark for intensity and character on orogenesis in easter part on the Balkan Peninsula.*
The young age of relict glacial forms in our highest mountains / no older since the Last glacial maximum/, and the almost complete absence of traces of ancient glacial landscape, talks about big activity of neotectonic processes and in favor of the assumption that the rise of the Rila-Rhodope Massif to the current heights happened quite later than geochronical perspective - probably throughout the last million years ago.
Keywords: *Glaciokarst, Würm glaciation, Continental collision*

Contemporary trends of anthropogenic influence in the Bulgarian part of Vlahina mountain

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Abstract: *The Vlahina mountain is situated between Southwestern Bulgaria and eastern part of Former Yugoslav Republic of Macedonia and it is a part of Osogovo-Belasitsa mountain range. Changes in trends of anthropogenic influence in the Bulgarian part of the mountain from 1989 until now are discussed in the article. Bulgarian part of Vlahina mountain is characterized as sparsely populated underdeveloped border region in socio-economic terms, but in the meanwhile it has significant untapped natural-resource potential. Main economic activities with valuable impact are forestry enterprise, extensive agriculture and mining. In many places human activity has led to negative changes in soils, vegetation and wildlife. Forest condition is defined as deteriorated. The soils are highly degraded. This in turn leads to the activation and progress of erosion and landslides. Nowadays human economic activity is declined. This leads to natural recovery of vegetation and calming down of erosion and soil degradation.*
Keywords: *Vlahina mountain, natural-resource potential, ecosystem services, anthropogenic influence, land use and land cover, CORINE Land cover data*

Comperative study of three cases of modern landslide activity in south-west Bulgaria

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***Abstract**: Detail description of the landslide morphology of three modern landslides in South West Bulgaria has been given. An attempt for classification of the types of landslide deformations, with relation to lithology and existing fault systems is made. Pictures with type of deformation related with the different destruction areas, as well as the main landslide's elements are presented. During the field researches to collect verbal information, about the starting point and the age of the destructive process, meetings with local inhabitants were made. As a risk manage tool a system for real time warning is presented.*
***Keywords:** Landslides, modern tectonics movements, hazards and risks*

Mapping the drainage density of small catchments along the Mesta River

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***Abstract**: Drainage density Dd. is one of the basic hydrographic indicators and it is determined by a complex of factors. Accurate mapping of Dd. is important for numerous geomorphological and hydrological applications. In this paper are presented different cartographic methods for mapping the drainage density of small catchments along the Mesta River. The author begins by clarifying the essence of some methods and then she analyzes their characteristics. Finally, an assessment of the degree of their applicability in various geographical conditions of catchment areas is proposed.*
***Keywords:** drainage density Dd., catchments, cartographic methods*

Didactic model for the development of students' cognitive skills in studying electromagnetic phenomena

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Abstract: *The report views opportunities for the development of some cognitive skills of students in the 9th grade while studying electromagnetism in the general course of education. It presents an author's didactic model based on four basic approaches – activity-oriented, intropersonal, interactive, interdisciplinary. The model has been implemented in school and has experimentally proven to be effective.*
Keywords: *Physics education, cognitive skills, electromagnetic phenomena, pedagogical approaches, motivation.*

Results of the implementation of educational tasks in the 10th grade chemistry class

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Abstract*: Nowadays the requirements for students' performance aimed to improve the students' scientific literacy. Educational tasks are especially suitable for teaching at 10th grade Chemistry class. For this aim are created working lists with tasks which required work with text, grafic, tables and images.*

For reporting of the efficacy of the implementation of these working lists have been performed outcoming tests, as the data is compared with the results of these students who have been working with the traditional way. The results showed that the students who resolved the educational tasks have better indications for selflearning. The skills for treatment and presentation of the data in different way also lead to increase the level of education, which showed that the implementation of the educational tasks in the Chemistry education helps for students' scientific literacy developing.
Keywords: *education in Chemistry, educational tasks, selflearning.*

Practical applications of information and computer technology in the teaching process of mathematics

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Abstract: *The use of information and computer technology (ICT) in Bulgarian schools is known for a fact. To this moment the question of "For or Against" their application has been answered, and they have been deemed a necessary tool in education. The questions of "When" and "How" they can be best applied await their answer next. Current study aims to find out, on the one hand, the frequency of use of ICT in teaching mathematics and the form it's been used under, and on the other hand to provide blueprints for their exact application. Aggregated data from student surveys shows that mathematics is one of the school subjects least prone to innovative methods of teaching. Reasons for that have been carefully singled out and analysed. MATEK - an equation solving software, has been precisely described. Multiple examples of when and how it can be utilized in the mathematics teaching process have been demonstrated. Pros and cons of its application have been assessed. Bottom-line is that ICT has its place in the teaching process in mathematics, and can therefore be used as a tool for carrying out of all fundamental educational activities.*
Keywords: *MATEK, mathematics, equations*

Curricular cuts options in teaching Informatics and Mathematics in secondary school

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Abstract*: An analysis of the Bulgarian state educational requirements in Computer studies and Mathematics in the secondary school is presented in this report as well as the possibilities of interaction between the subjects.*
The project of education curriculum in 8th grade is being established and according to it an additional analysis is shown. Specific examples are shown depicting the curricular cuts.
Keywords: *Mathematics, Computer studies, intersubjective connections*

Key factors for successful learning of mathematics in German language – preparatory course

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***Abstract**: Teaching mathematics in foreign languages has become a necessity due to the ongoing process of economic and cultural globalization. In this connection, the author is working on a dissertation "Methodological and language problems and their solutions in the learning of mathematics in German language at Bulgarian universities". It reflects the author's long experience at FDIBA, TU - Sofia. The data obtained from a pedagogical experiment has been processed statistically and the results are analyzed. Key factors that influence the learning outcomes of the students are identified. To achieve the learning objectives innovative methodological approaches as well as organizational improvements are proposed.*
***Keywords:** mathematics learning, foreign language, innovative approach*