Eight International Conference

"Modern Trends in Science"

FMNS-2019

26 - 30.06.2019, Blagoevgrad, BULGARIA

BOOK OF ABSTRACTS

Patronized by
Prof. Borislav Jurukov
Rector of South-West University

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Eight International Conference “Modern Trends in Science”
26 - 30.06.2019, Blagoevgrad, Bulgaria

Conference Program

Registration

26.06.2019 13:00 – 18:30
27.06.2019 08:00 – 10:30
University Conference Center “Bachinovo”

Opening Ceremony

27.06.2019
10:00 – 10:30
Central Auditorium of Conference Center
Chairman: Prof. Mario Mitov, PhD

Plenary Lectures
Central Auditorium of Conference Center

27.06.2019
10:30 – 11:10
Prof. Evelina Slavcheva - Chair of the General Assembly of Bulgarian Academy of Sciences
"On the Role of Electrocatalysis in the Green Hydrogen Energy Cycle"

11:10 – 11:50
Prof. Jesus Giraldo - Universidad Autonoma de Barcelona, Spain
"G Protein-coupled Receptor Oligomerization: Biological Complexity and Therapeutic Opportunity"

11:50 – 12:30
Prof. Plamen Atanasov - University of California, Irvine, USA
"New Generation Electrocatalysts for Fuel Cells"

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28.06.2019

10:30 – 11:10

Prof. Armen Sergeev - Vice-president of European Mathematical Society, Russia

"Mathematical Tomography"

11:10 – 11:50

Prof. German Perlovich - Institute of Solution Chemistry of Russian Academy of Sciences

“Solubility Improvement of Poorly Soluble Drugs”

11:50 – 12:30

Prof. Klaus Denecke - University of Potsdam, Germany

“Partial Clones of Terms”

Sessions (oral presentations)

27 - 28.06.2019

13:30 - 15:00

15:30 – 17:30

Conference Halls of Center “Bachinovo”

Poster Session & Welcome Party

27.06.2019

18:00 - 20:00

Lobby of Center “Bachinovo”

Official dinner

28.06.2019

20:00 – 23:00

Restaurant of Center “Bachinovo”

Social Program (Excursion)

29.06.2019

One day trip to Rila Monastery and Medi Valley winery

Eight International Conference "Modern Trends in Science"
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Section: Chemistry
Hall 3

Thursday, June 27

Chairman: ***Assoc. Prof. David Havlíček***

13:30-13:45 *Ivo Bardarov, Elitsa Chorbadzhiyska, Mario Mitov, Yolina Hubenova*
Novel carbon-based electrodes for Microbial Fuel Cell application

13:45-14:00 *Elitsa Chorbadzhiyska, Ivo Bardarov, Yolina Hubenova, Mario Mitov*
Modified graphite electrodes as potential cathodic electrocatalysts for Microbial Electrolysis Cells

14:00-14:15 *Desislava Apostolova, Elitsa Chorbadzhiyska, Ivo Bardarov, Yolina Hubenova, Mario Mitov*
Hybrid MFC-MEC systems: Principles and application

14:15-14:30 *Mira Jordanova, Dragomir Yankov, Stefan Stefanov, Elena Razkazova-Velkova*
Microbial Fuel Cell for Metal Sulfide Oxidation and Nitrate Reduction

14:30-14:45 *Elena Razkazova-Velkova, Stefan Stefanov, Tsvetomila Parvanova-Mancheva, Martin Martinov*
Wastewater Treatment of Sulfur and Nitrate Contaminated Fluxes into Fuel Cells

14:45-15:00 *Galin Borisov, Denis Paskalev, Evelina Slavcheva*
Non-noble membrane electrode assemblies for electrolysis cells with anion exchange membrane

Coffee break

Chairman: ***Assoc. Prof. Mitko Stoev***

15:30-15:45 *Vesselin Sinigersky, Hristo Penchev, Filip Ublekov,* Improving the mechanical properties and conductivity of ion conductive polybenzimidazole membranes

15:45-16:00 *Petranka Petrova, Maya Chochkova, Irina Karadjova, Metody Karadjov* Sorbents for separation and concentration of Pd (II)

16:00-16:15 *Stefan Stefanov, Mirena Dobreva, Velichka Andonova* Lipid nanoparticles – a novel approach for inclusion of hyperforin with improved chemical stability in topical formulations for wound treating

16:15-16:30 *Boyka Stoykova, Maya Chochkova, Katerina Ranchova, Iva Tsvetkova, Hristo Najdenski, Martin Štícha, Tsenka Milkova* Synthesis and antimicrobial activity of novel kojyl carbamates

Friday, June 28

Chairman: ***Assoc. Prof. Zhivko Velkov***

13:30-13:45 *Nadya Agova, Svetlana Georgieva, Stanila Stoeva, Silvia Stamova* HPLC method from analyse of new compound – analogue of antineoplastic drug

13:45-14:00 *Yana Koleva, Svetlana Georgieva, Nadya Agova* Probable skin metabolic activity of third generation retinoids and new synthesized derivatives of bexarotene

14:00-14:15 *Veselina Uzunova, Charo Del Genio, Vardis Ntoukakis* Computationally based selection of inhibitors for plant histone acetyl transferases

14:15-14:30 *Tatyana Dzimbova, Atanas Chapkanov, Simona Stoilova* Relationship between lipophilicity and protein binding of some potential ACE inhibitors

14:30-14:45 *Nikolay Lazarov, Zhivko Velkov, Antonio Rizakov*
QSAR analysis of Coumarins MAO Inhibitors

14:45-15:00 *Stela Ivanova, Petko Mandjukov*
Sampling Uncertainty of Dissolved Oxygen Concentration in Surface Water

Coffee break

Chairman: ***Assoc. Prof. Atanas Chapkanov***

15:30-15:45 *Radoslav Chayrov, Aleksandra Tencheva, Trayana Nedeva, Martin Štícha, Ivanka Stankova*
Synthesis and antimicrobial activity of memantine derivatives with peptidomimetics

15:45-16:00 *David Havlíček, Jiří Plocek*
Study of proton conductivity on powder samples using XRD

16:00-16:15 *Nurbol Appazov, Banu Diyarova, Olena Lygina, Anipa Tapalova, Kulbaram Saduakaskyzy, Assel Shuragaziyeva, Bulat Dzhiembaev*
Processing of rice husk and straw into active coal

16:15-16:30 *Jiri Plocek*
Copper dodecyl sulfate as a potential compound arising during artistic paints restoration

16:30-16:45 *Ivan Nemec, Irena Matulkova, Ivana Cisarova, Matous Kloda, Robert Gyepes*
Novel Molecular Materials for NLO Applications – Spectroscopic and Structural Aspects

16:45-17:00 *Mitko Stoev, Elitsa Chorbadzhiyska*
Water purification by RO and electrolysis for drinking and technical applications

17:00-17:15 *Mitko Stoev, Elitsa Chorbadzhiyska*
Preparing of environmentally friendly fuel from unleaded gasoline

Section: Ecology and Environmental Protection
Hall 4

Thursday, June 27

Chairman**: *Assoc. Prof. Lidia Sakelarieva***

13:30-13:45 *Piotr Ceryngier*
Contemporary changes in the ladybird beetle (Coleoptera: Coccinellidae) fauna in Poland

13:45-14:00 *Anna Augustyniuk-Kram, Eryk Czerwiński, Maciej Sierakowski*
Cultivation of industrial hemp for reclamation of post-mining areas - impact on physicochemical parameters and microbiological activity of soil

14:00-14:15 *Krassimira Ilieva-Makulec*
Nematodes as bio-indicators during the remediation of degraded land in the region of a lignite mine by cultivation of industrial hemp – a case study in west-central Poland

14:15-14:30 *Ralitsa Tsekova, Lidia Sakelarieva*
Diversity of earthworm communities (Lumbricidae) in the grounds of two liquidated uranium mines in Bulgaria

14:30-14:45 *Kamil Karaban, Aleksei Uvarov*
The impact of the earthworm community to organic matter content in forest soils - an experimental investigations

14:45-15:00 *Anita Kaliszewicz, Kamil Karaban, Magdalena Kur, Zuzanna Pyffel, Lawinia Wolny, Kacper Stęplowski, Karolina Jarząbek, Justyna Szymańska, Maciej Sierakowski*
Effect of a diet enriched with saturated and unsaturated fatty acids on growth and survival of invertebrates representing different feeding strategies

Coffee break

Chairman: ***Assoc. Prof. Krassimira Ilieva-Makulec***

15:30-15:45 *Jerzy Romanowski, Grzegorz Lesiński*
Diet of sympatric Long eared owl *Asio otus* (L. 1758), Barn owl *Tyto alba* (Scopoli, 1769) and Kestrel *Falco tinnunculus* L.: case study in central Poland

15:45-16:00 *Hristo Peshev, Emilian Stoynov, Dimitar Parvanov, Atanas Grozdanov*
Past and present state of the Griffon Vulture *Gyps fulvus* in Rila and Pirin National Parks and Rilski Manastir Nature Park

16:00-16:15 *Alexander Pulev, Lidia Sakelarieva, George Manolev, Krasimir Stoyanov*
Winter Activity of the Amphibians (Amphibia) in Bulgaria

16:15-16:30 *Lilia Philipova, George Manolev, Alexander Pulev, Lidia Sakelarieva*
Distribution of the Herpetofauna in the Bulgarian Part of Hadzhidimovo Gorge and the surrounding area (South-Western Bulgaria)

16:30-16:45 *Hristina Bancheva-Preslavska*
Opportunities for Further Qualification in Environmental Communication for Protected Areas

16:45-17:00 *Michail Michailov, Galina Bezinska, Veselina Dalgacheva*
The Demographic Structure of the Blagoevgrad District and the Challenges to the Protection of the Environment

17:00-17:15 *Stefka Tsekova, Nikolinka Atanasova, Veselina Dalgacheva*
Waste-cluster relationship on the example of Blagoevgrad regional waste landfill

Friday, June 28

Chairman**: *Assoc. Prof. Emilia Varadinova***

13:30-13:45 *Manfred Schuetze*
Modelling of water systems in a convenient way

13:45-14:00 *Yanka Vidinova, Violeta Tyufekchieva*
Species composition, seasonal dynamics and structure of bottom macroinvertebrate communities in the Ochushnitsa River (Maritsa River basin, South Bulgaria)

14:00-14:15 *Biljana Rimcheska, Violeta Tyufekchieva, Yanka Vidinova*
Composition and Zoogeographic features of the stonefly fauna (Insecta: Plecoptera) of mountain and semi-mountain streams in Aegean watershed (7th Ecoregion, Eastern Balkans)

14:15-14:30 *Gana Gecheva, Detelina Belkinova, Yordanka Hristeva, Rumen Mladenov, Plamen Stoyanov*
Phytoplankton and macrophytes in Bulgarian standing water bodies

14:30-14:45 *Luchezar Pehlivanov, Stefan Kazakov*
Ichthyofauna of the Iskar River section affected by the hydropower cascade „Middle Iskar"

14:45-15:00 *Stefan Kazakov, Luchezar Pehlivanov*
Remote sensing applicability in fishkills event: case study from Varna lake - Bulgaria

Coffee break

Chairman: ***Assist. Prof. Miroslav Ivanov***

15:30-15:45 *Miroslav Ivanov, Konstantin Tyufekchiev*
Remote Sensing Based Vegetation Analysis in Parangalitsa Reserve

15:45-16:00 *Nikolina Gribacheva, Gana Gecheva*
Monitoring ozone effects on vegetation: a review

16:00-16:15 *Dzoko Kungulovski, Natalija Atanasova-Pancevska, Violeta Boskovska, Ivan Kungulovski,*
Laboratory Effect of *Paenibacillus alvei* DZ-3 as Bio-fungicide on Control of *Botrytis cinerea* in Tomato (*Solanum lycopersicum* L.)

16:15-16:30 *Ivan Angelov, Venko Beschkov*
Biogas production from straw material by different methods of substrate treatment

16:30- 16:45 *Nikolai Mihailov, Lidia Sakelarieva*
Is a philosophy of ecology possible as a scientific method?

16:45- 17:00 *Gabriela Belova, Nikolay Marin*
Legal and ecological aspects of of illegal, unreported and unregulated fishing in the Black Sea

17:00- 17:15 *Georgi Kadinov, Dirk Schindler*
Quantitive Assessment of the Importance of the Atmospheric Environment on Air Pollutant Concentrations at Regional and Local Scales in Sofia

Section: Geography
Conference Hall 5

Thursday, June 27

Chairman***: Assoc. Prof. Emilia Patarchanova***

13:30- 13:45 *Kliment Naydenov*
The demographic potential of the Republic of Bulgaria in the 21st century and its impact on the opportunities for the development of a silver economy

13:45- 14:00 *Emilia Patarchanova, Gergana Nikolova*
Migration activity - building block for sustainable demographic and territorial development in Kyustendil district

14:00- 14:15 *Vladimir Karadzhov, Fatme Lyumankova*
Social vulnerability of the elderly population in the village of Ribnovo, Southwestern Bulgaria

14:15- 14:30 *Metodi Ivanov*
Contemporary challenges to the development of local self-government in Bulgaria

14:30- 14:45 *Mariya Grozeva*
Assessment of the significance of the land and river borders of the Republic of Bulgaria with the neighbouring countries

14:45- *Nikolay Katsarski*
15:00 Development of regional business in Bulgaria as a means to increase GDP in agriculture

Coffee break

Chairman: ***Assoc. Prof. Krasimir Stoyanov***

15:30- *Kalin Maeshki*
15:45 Factors influencing the development of mountainous areas in Blagoevgrad region

15:45- *Dragana Lazarova, Ivan Drenovski*
16:00 Natural and historical heritage in the Kyustendil region as a resource for tourism development

16:00- *Plamena Stoycheva, Ivan Drenovski*
16:15 Ecological and pilgrim tourism in Rila Monastery Nature Park

16:15- *Galina Bezinska, Vladimir Karadzhov, Feta Drenchev*
16:30 Mapping and spatial analysis of poverty in Bulgaria

16:30- *Krasimir Stoyanov, Galina Bezinska, Alexander Pulev*
16:45 Physical Geographic Characteristics of the Hadjidimovo Gorge (Southwestern Bulgaria)

Section: Mathematics
Conference Hall

Thursday, June 27

Special session on the occasion of the 75-th birthday of Prof. Klaus Denecke

Chairman: ***Assoc. Prof. Ilinka Dimitrova***

13:30- Congratulatory Addresses for Prof. Klaus Denecke
13:45

13:45- *Joerg Koppitz, Dara Phusanga*
14:00 Hypersubstitutions for algebraic systems

14:00- *Dara Phusanga,* Jintana Joomwong, Surapol Jino
14:15 All Idempotent and Regular elements in (HypG((2);(2)); og)

14:15-14:30 *Slavcho Shtrakov*
Subfunctions and minors in finite algebras

14:30-14:45 *Ivo Damyanov*
On the Canalyzing Minors of Boolean Functions

14:45-15:00 *K P Shum*
On Super Hamiltonian Semigroups

Coffee break

Chairman: ***Assoc. Prof. Slavcho Shtrakov***

15:30-15:45 *Vesna Celakoska-Jordanova*
Free power-slim groupoids

15:45-16:00 *Irena Stojmenovska, Donco Dimovski, Veno Pachovski*
Reductions for presentations of (n,m)-semigroups - overview, open problems and application possibilities

16:00-16:15 *Ilinka Dimitrova, Rumyana Yancheva*
Regularity of the semigroup of all order-preserving transformations on a finite crown

16:15-16:30 *Ilinka Dimitrova, Hristomir Dobrev*
Generating sets of the inverse semigroup of partial automorphisms on a finite crown

16:30-16:45 *Hamid Saati Shirvan, Javad Aghakazemi, Hossein Hasanpour, Sara Memayani*
Computing Some Topological Indices of some Fullerenes Linear and Cyclic(Cn)m and Symmetry Group In (Cn)m Fullerenes

16:45-17:00 *Violeta Angjelkoska, Donco Dimovski*
On a special case of Wilf’s conjecture for numerical semigroups

17:00-17:15 *Gjorgji Markoski, Ylldrita Seferi, Aleksandar Gjurchinovski*
Comparison of Different Numerical Methods for Fractional-Order Rössler System

Friday, June 28

Chairman: ***Prof. Klaus Denecke***

13:30-13:45 *Biljana Zlatanovska, Donco Dimovski*
Modified Lorenz system: obtaining and solving

13:45-14:00 *Biljana Zlatanovska, Boro Piperevski*
Dynamic analysis of Dual Lorenz system

14:00-14:15 *Vassil Grozdanov, Vesna Dimitrievska Ristovska, Tsvetelina Petrova*
On the (Vil$_B$;\alpha;\gamma)-diaphony of the net of type of Zaremba-Halton constructed in generalized number system

14:15-14:30 *Vassil Grozdanov, Maria Sevdinova*
On the (Vil$_B$;\alpha;\gamma)-diaphony of the Van der Corput sequence constructed in generalized number system

14:30-14:45 *Vassil Grozdanov, Tsvetelina Petrova*
One new complete orthonormal function system and applications in the theory of uniformly distributed sequences and Quasi-Monte Carlo integration

14:45-15:00 *Anka Markovska*
Mathematical Modeling of Adaptive Immune Response after Transplantation

Coffee break

Chairman: ***Assoc. Prof. Joerg Koppitz***

15:30-15:45 *Danjela Braho, Lorena Margo*
Statistical Convergence of Vector Valued Martingales

15:45-16:00 *Lorena Margo, Eljona Milo, Blerina Çeliku, Danjela Braho*
Parameter estimation in periodic time series data using block bootstrap procedures

16:00-16:15 *Irina Naskinova, Anka Markovska, Mikhail Kolev*
On a Mathematical Model of Bacterial Infection

16:15- 16:30 *Iveta Nikolova*
On stochastic models in biology

16:30- 16:45 *Liridon Zenku, Zoran Trifunov, Teuta Jusufi-Zenku, Stojan Kitanov*
Application of Newton's backwards interpolation using MATLAB

16:45- 17:00 *Julian Dimitrov*
Evaluation the Uncertainty in Numerical Models of Geo-mechanics

17:00- 17:15 *Ahmed Mahdi*
2-Dimensional manifolds with quadratic Ellipses

17:15- 17:30 *Iveta Nikolova, Anka Markovska, Mikhail Kolev*
A Computational Study of Autoimmune Disease Model

17:30- 17:45 *Tzanko Donchev, Nikolay Kitanov*
Nonlocal Riemann- Liouville Fractional Evolution Inclusions in Banach Space

Section: Informatics
Hall 8

Thursday, June 27

Chairman: ***Assoc. Prof. Irena Atanasova***

13:30- 13:45 *Aleksandar Stoimenovski, Irena Atanasova*
Text mining in distance e-learning

13:45- 14:00 *Blerina Çeliku, Lorena Margo, Danjela Braho*
Computational Cryptography and Cloud Computing Technology Potentially Using Homomorphic Encryption

14:00- 14:15 *Ivan Nedyalkov, Alexey Stefanov*
Software Platforms For Modeling Of Telecommunication Networks

14:15- 14:30 *Georgi Mitov*
Modeling of dynamic business processes

14:30- 14:45 Vladimir Vladimirov
Data Mining Trends and Research Frontiers

Coffee break

Section: Physics
Hall 11

Thursday, June 27

Chairman: ***Assoc. Prof. Ralitsa Stanoeva***

13:30- 13:45 *Sofia Milenkova, Maria Marudova*
Chitosan-alginate nanoparticles for curcumun immobilization and delivery

13:45- 14:00 *Andrey Zaitsev, Pavel I. Zarubin, Ralitsa Stanoeva*
The Hoyle State in Relativistic ^{12}C Dissociation

14:00- 14:15 *Asya Viraneva, Ivan Bodurov, Alexandar Grigorov, Temenuzhka Yovcheva, Tonka Vasileva, Veselin Bivolarski, Ilia Iliev*
Investigation of Chitosan/Xanthan and Xanthan/Chitosan Multilayers on Corona Charged Polylactic Acid substrates

14:15- 14:30 *Charo del Genio*
Molecular recognition in deep binding sites

14:30- 14:45 *Nurgul Shuyushbayeva, Mitko Stoev, Nazgul Tanasheva, Gulsinai Altayeva, Diana Sadvakasova, Akbota Meirmanova*
Study of the metal parts of the electrohydropulse drill

14:45- 15:00 *Lyuben Ivanov, Todor Cholakov*
Optical quartz fibers as non-linear media *R. Kozhabayev, Nurgul*

Coffee break

Chairman: ***Assoc. Prof. Lyuben Ivanov***

15:30-15:45 *Darina Kaisheva, Peter Petrov, Gizo Bokuchava, Igor Papushkin*
Study of residual stresses in electron beam welded constructive steel via neutron diffraction method

15:45-16:00 *Stanislava Rabadzhiyska, Maria Ormanova, Dimitar Dechev, Peter Petrov*
Influence of the substrate temperature on mechanical properties of VN deposited coatings by DC magnetron sputtering

16:00-16:15 *Sergey Mamilov, Sergey Esman, Alexander Gisbrecht*
Optical method for reduction of carbon monoxide intoxication

16:15-16:30 *R. Kozhabayev, N. Shuyushbayeva, N. Tanasheva, A. Meirmanova*
Modeling of light propagation in layered inhomogeneous medium

Section: Technical Sciences
Hall 11

Friday, June 28

Chairman: ***Assoc. Prof. Anton Stoilov***

13:30-13:45 *Kulzhan Shaimerdenova, Bekbolat Nussupbekov, Gulden Bulkairova, Mitko Stoev, Ayanbergen Khassenov, Dana Karabekova*
Electrohydropulse method for destruction of natural minerals

13:45-14:00 *Yerlan Oshanov, Mikhail Ovcharov, Bekbolat Nussupbekov, Mitko Stoev, Sagyndyk Shaltakov,*
Influence of the main properties of the liquid on the temperature indicators of the inertial heat generator

14:00-14:15 *Kulzhan Shaimerdenova, Amangeldy Satybaldin, Mitko Stoev, Dana Karabekova, Ayanbergen Khassenov, Zamzagul Aitpaeva, Ruslan Abilkap*
Thermodynamics of heavy oil activation process by means of a short pulse discharge

14:15-14:30 *Dimitre Dimitrov, Blagoy Blagoev, Dimitrina Petrova, Blagovest Napoleonov, Ina Angelova, Peter Ivanov, Vera Marinova*
Synthesis and characterization of Al-doped ZnO thin films

14:30-14:45 *Vera Marinova, Dimitrina Petrova, Jordan Mickovski, Tsvetelina Fidanova, Peter Ivanov, Dimitre Dimitrov*
Graphene: synthesis and characterizations for photonic applications

Coffee break

Chairman: ***Assoc. Prof. Dimitrina Kerina***

15:30-15:45 *Sagyndyk Shaltakov, Bekbolat Nussupbekov, Mitko Stoev, Dana Karabekova, Ayanbergen Khassenov, Yerlan Oshanov*
First principles calculation and simulation of correlation functions and functions of metal melts’ radial

15:45-16:00 *Snezhina Andonova*
Mathematical approach to sifting significant technological factors into the sewing industry

16:00-16:15 *Uliana Paskaleva*
Algorithms related to the operation of Intelligent Measurement Systems

16:15-16:30 *Emil Frenski*
Recursive sliding DFT of second kind

Coffee break

Section: Methodology in Education
Hall 9

Thursday, June 27

Chairman**:** ***Assoc. Prof. Radost Vassileva***

13:30-13:45 *Aneta Gacovska-Barandovska, Vesna Celakoska, Emilija Celakoska*
Evaluating the Results of Critical Thinking on a Dot Product Problem

13:45-14:00 *Jasmina Markoska, Irena Stojmenovska, Veno Pachovski, Adrijan Bozinovski, Biljana Stojcevska*
Visual approach to teaching basic function properties - composition of two functions and inverse of a function

14:00-14:15 *Kalin Angelov*
Psychology of heuristic methods for solving physics problems

14:15-14:30 *Magdalena Shekerliyska, Aleksandra Shekerliyska*
Formation of scientific competence in new curricula

14:30-14:45 *Magdalena Shekerliyska, Nadya Ivanova, Ivanka Galabova*
The soaps - science and attraction

14:45-15:00 *Radost Vassileva, Georgy Malchev*
Interdisciplinary Relations in Physics Education – an Important Factor in Improving Student Motivation

15:00-15:15 *Daniela Tuparova, Krista Mehandzhiyska*
Safe Internet – educational computer games for lower secondary school

Coffee break

Poster Session

Thursday, June 27

Chemistry

P-C-1 *Albena Aleksandrova, Maria Matrakova, Plamen Nikolov, Mitko Dimitrov*
Evaluation of separators influence on charge acceptance of negative plates of lead-acid batteries

P-C-2 *Maria Matrakova, Albena Aleksandrova, Plamen Nikolov, Ouarda Saoudi, Larbi Zerroual*
Electrochemical behavior of lead acid battery alloys in the presence of different surfactant additives in the electrolyte

P-C-3 *Maya Chochkova, Boyka Stoykova, Katerina Ranchova, Albena Alexandrova, Almira Georgieva, Elina Tsvetanova, Iva Tsvetkova, Hristo Najdenski, Yavor Mitrev, Martin Štícha, Tsenka Milkova*
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Plenary Lectures

PL-1

On the role of electrocatalysis in the Green Hydrogen Energy Cycle

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Abstract: The ongoing transformation from carbon-based to decarbonized world economy relies essentially on deployment of hydrogen technologies including production of “green hydrogen” through electrolysis of water using electricity from renewables, application of fuel cells and reversible hydrogen systems to produce CO_2-free electricity and heat, new hydrogen storage systems, and broad hydrogen filling stations infrastructure. All these systems are in a stage of intensive development – research in the field is blooming; the number of innovations is increasing; more and more demonstration projects are in progress; new products are released on the market. The predictions of the 20th century experts that 21st is going to be the Century of Hydrogen Economy gradually become a Reality!

Among the variety of different types of hydrogen energy systems developed and/or being under development, those working with polymer electrolyte membranes (PEM) are the most advanced, some of them being already commercial products. Advantages are clear - efficient, clean, and secure energy. What is still needed is a decrease of cost and longer service life which are the main driving forces for further research.

The reactions proceeding in PEM hydrogen energy systems include water, which splits to H_2 and O_2 in the PEMEC or is recovered as a side product in the PEMFC, where H_2 and O_2 react to produce electricity and heat ($2\ H_2O + \text{energy} = 2H_2 + O_2$). While the main and the partial electrode reactions are reversible and extremely simple,

very strict requirements are imposed toward the electrodes on which they proceed. Firstly, since the partial electrode reactions are heterogeneous electrocatalytic reactions, active and cost efficient electrocatalysts incorporated in the structure of the electrodes are needed.

The electrocatalytic efficiency in general, is determined by two major groups of factors: electronic factors affecting the surface-intermediate bonds strength and geometric factors related to the real active surface area of the electrode. The strength of the chemosorptive bonds of the intermediates depends on the chemical nature, respectively on the electronic density of states in the catalyst atoms. The increase in the electronic density of states increases the availability of metal valence electrons for formation of chemisorptive bonds. The result is weakening of the metal/electron donor bonds like M-H and strengthening of the metal/electron acceptor bonds such as M-O. The decrease in the electronic density of states has an opposite effect. Thus, the optimal electrocatalytic activity is achieved at neither too strong nor too weak but at moderate adsorption bonding. Secondly, within the electrodes, transport of gaseous species, ions, and electrons must all be facilitated, so that all three meet and react at the so-called triple-point boundary. Therefore, besides the activity and stability of the electrocatalyst, the structure of the electrode is critical for the performance of the system. In summary, the desirable characteristics of the electrodes include electrochemical activity, electronic and ionic conductivity, porosity, high surface area, as well as chemical and thermodynamic compatibility with the electrolyte, chemical stability under reducing (anode) or oxidizing (cathode) atmospheres, resistance to poisoning by impurities in the fuel or oxidant streams, and architectural stability over long periods of operation.

In this talk, the review of the current state-of-the art will be presented and all these factors determining the cost efficiency of the contemporary PEM hydrogen energy systems will be critically considered and discussed.

PL-2

G Protein-coupled receptor oligomerization: Biological complexity and therapeutic opportunity

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Abstract: G protein-coupled receptors (GPCRs) are integral membrane proteins that mediate multiple signaling pathways by transmitting into the cell the signals encoded in the molecular structure of neurotransmitters and hormones. GPCRs may interact with each other to form dimers and higher-order oligomers. Oligomerization enables the cell to make full use of receptor signaling, but the complexity involved in data analysis poses a great challenge to the scientific research into receptor function and drug development. Receptor hetero-oligomerization, in particular, has been postulated to be involved in many neurologic and neuropsychiatric disorders thus opening promising avenues for mechanism-based therapies.
Our group has tackled GPCR structure and function by a combination of mathematical and molecular modeling approaches. These approaches can be of help for developing a conceptual framework for assessing mechanism-based therapies in a receptor oligomeric context.

Keywords: GPCR, oligomerization, biased signaling, agonism, allosterism

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PL-3

New Generation Electrocatalysts for Fuel Cells

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Abstract: Platinum Group Metal-free (PGM-free) catalysts have been extensively developed for both Proton Exchange Membrane (PEM) and Alkaline Exchange Membrane (AEM) fuel cells aiming automotive, stationary and portable applications. In this lecture we will address the critical challenges that our team has faced on the way to practical application of such catalysts.

The team at the University of New Mexico (UNM) has developed the Sacrificial Support Method (SSM) as a main approach for templated synthesis of hierarchically structured electrocatalysts materials. In this method the catalysts precursors are being absorbed on, impregnated within or mechanically mixed with the support (usually mono-dispersed or meso-structured structured silica), thermally processed (pyrolyzed) and then the silica support is removed by etching to live the open frame structure of a “self-supported” material that consists of the catalysts only.

The makeup and structure of the active site/sites of the PGM-free ORR electro-catalysts, including geometry (coordination) and chemistry (composition and oxidation state) remain contentious even after 50 years of research. There is an emerging agreement that iron and nitrogen functionalities, displayed on the surface if the carbonaceous substrate/support, govern ORR activity. This is often combined with a broadly accepted hypothesis that micro-porous surface area plays a critical role forming the active site. Candidate structures participating in ORR include multitudes of nitrogen defect motifs in the carbon matrix of different degrees of graphitization, with metal incorporated as metal nano-particles, corresponding (native) oxides and/or as atomically dispersed, oxidized metal species, linked (coordinated) to

nitrogen defects in carbonaceous matrix in a variety of possible configurations. This lecture will attempt to address rational design metrics of M-N-C electrocatalyst based on a broad experimental set of data.

This lecture will review the applications of this new class of electrocatalyst across several fuel cell applications: from automotive to microbial and from regenerative electrolyzer/fuel cell units to water purification and desalination devices.

PL-4

Mathematical Tomography

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Abstract: Computerized tomography is one of the most impressive scientific achievements of XXth century. It had a revolutionizing impact on the whole medical science and physicists Allan Cormac and Godfrey Haunsfield were awarded in 1979 by the Nobel Prize for its invention. From mathematical point of view the reconstruction of a plane section of the body reduces to the reconstruction of a function on the plane from its integrals along straight lines. This classical problem was solved by Johann Radon in 1917 and is now called inverse Radon transform. In modern language it is based on the formula of decomposition of the delta-function into ''plane waves''. Apart from X-ray we shall consider also other tomographic methods such as ultrasound and nuclear magnetic resonance used in various applications. All of them use modern mathematics and advanced computational algorithms.

Keywords: X-ray tomography, Radon transform, ultrasound tomography, nuclear magnetic resonance

PL-5

Solubility improvement of poorly soluble drugs

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Abstract: One of the key goals in pharmaceutics is solving the problem of poor drug solubility. Solubility is a very important property of drug substances which determines both the optimal therapeutic doses and probable side effects. It is worth mentioning that the analysis of up-to-date data bases of drug compounds shows that biological activity properties and solubility values are inversely proportional. In other words, the substances highly affinitive to the receptors are very poorly soluble in aqueous solutions. Therefore, it is necessary to create well soluble forms in order to strengthen the position of the drug compounds on the market. There are a number of approaches to producing such forms. However, one of the most promising techniques is obtaining cocrystals and crystallosolvates/crystallohydrates in particular. In the presentation it will be considered the questions connected with design of pharmaceutical cocrystals and individual drug molecules.

Keywords: solubility, drugs, thermodynamics, molecular crystals

Acknowledgment: This work was supported by the Russian Scientific Foundation (№19-13-00017).

PL-6

Partial clones of terms

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Abstract: An automaton is a finite-state machine which can recognize words, i.e. sequences of letters from a given alphabet. Sets of words are called formal languages. The theory of formal languages studies properties of formal languages and the Galois connection between sets of automata and sets of languages which is given by the relation “an automaton recognizes a language”. Words can be regarded as elements of an algebraic structure, where the only binary operation is the concatenation, i.e. the combination of any two words to a new one. Since the concatenation operation is associative, this algebraic structure is a semigroup.

Tree languages are sets of terms and generalize formal languages. Terms are built up by variables and operation symbols and can be visualized by trees. Words are particular kinds of terms. Machines which recognize terms are called tree recognizer. A tree language is said to be recognizable if each of its elements is recognizable. Terms can be regarded as elements of algebraic structures where the operations are called superposition operations. The superposition operations satisfy the superassociative law which generalizes the associative law. These algebraic structures play an important role in Algebra and are called clones.

A term is said to be linear if variables occur only once. The superposition operations are not always defined if the domains are restricted to sets of linear terms, i.e. they are partial. The corresponding algebraic structures are called partial clones. We will prove some important properties of partial clones. If a recognizable tree language is

given, one may ask for mappings defined on sets of terms which preserve recognizability, i.e. which send this language to a recognizable tree language. It turns out that linear hypersubstitutions, i.e. mappings sending linear terms to linear terms and preserving arities have this property. The set of all linear hypersubstitutions of a given type forms a monoid with respect to composition of mappings. This result has several far-reaching consequences.

Keywords: automaton, formal languages, tree languages, partial clones, linear hypersubstitutions.

Oral Presentations

SECTION: CHEMISTRY **O-C-1**

Novel carbon-based electrodes for Microbial Fuel Cell application

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Abstract: In this study, carbon-based electrodes, modified with Fe_2O_3, Fe_3O_4, Mn_3O_4 and TiO_x, were made using a procedure closely resembling the method used for producing synthetic graphite. The produced materials were explored as anodes in single-chamber membrane-free microbial fuel cells using pure culture Desulfovibrio vulgaris. Titanium sheets with the same geometric area were used as counter electrodes and Ag/AgCl (3M KCl) as reference electrodes. Initially, the newly produced electrodes were poised at -0.4 V (vs. Ag/AgCl) for biofilm formation. Before and after poising they were characterized by means of cyclic voltammetry, differential pulse voltammetry and electrochemical impedance spectroscopy. Their electrocatalytic properties as bioanodes were tested by poising at +0.015 V (vs. Ag/AgCl). The electrochemical performance achieved with different modified materials was compared and discussed.

Keywords: graphite based modified electrodes, anodes, microbial fuel cell, Desulfovibrio vulgaris

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SECTION: CHEMISTRY **O-C-2**

Modified graphite electrodes as cathodic electro-catalysts for Microbial Electrolysis Cell

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Abstract: Microbial Electrolysis Cell (MEC) is an ecologically clean, renewable and innovative technology for hydrogen production. The development of cost-effective cathodes for near-neutral pH and ambient temperature conditions is the most critical challenge for the practical application of MEC technology. Modified carbon-based electrodes were made and investigated as cathodes for MEC. The morphology and the elemental content of the developed materials were analyzed by Scanning Electron Microscopy (SEM) and X-ray Diffraction (XRD). The corrosion stability and their electrochemical performance in neutral phosphate buffer solution (PBS) were investigated by means of Linear Sweep Voltammetry (LSV). The electrodes exhibit similar electrocatalytic activity towards hydrogen evolution reaction (HER), higher than that of bared graphite. This gives reason for further evaluation of the materials as cathodes in MECs.

Keywords: Microbial Electrolysis Cell, hydrogen production, modified graphite electrodes

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SECTION: CHEMISTRY **O-C-3**

Hybrid MFC-MEC systems: Principles and application

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Abstract: Microbial electrolysis cell (MEC) and microbial fuel cell (MFC) are emerging bioelectrochemical technologies, intensively investigated during last two decades. These two types of systems are originally developed for simultaneous wastewater treatment and hydrogen production or electric energy generation respectively, using microorganisms as biocatalysts. A different and attractive approach to improve the feasibility of these systems is to integrate MFCs with MEC. Such hybrid systems are still at an early stage of development. They have the ability to overcome the limitations of standalone bioelectrochemical systems. The principle and application of hybrid MFC-MEC systems and their constructional elements are reviewed and discussed.

Keywords: bioelectrochemical systems, hybrid MFC-MEC system, hydrogen production, energy generation.

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SECTION: CHEMISTRY **O-C-4**

Microbial Fuel Cell for metal sulfide oxidation and nitrate reduction

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Abstract: The aim of the present research is to determine proper conditions for the generation of energy from fuel cells, with simultaneous removal of some severe environmental pollutants. The strain of JCM 3863 Acidithiobacillus ferrooxidans is used for metal sulfide oxidation. The influence between immobilized and free cells on the obtained power of the fuel cell is provided. The rate of oxidation and reduction of the pollutants is also represented.

Keywords: Fuel Cells, Metal Sulfides Oxidation, Nitrate Reduction

Acknowledgements: This work has received funding from the National Research Program "Low Carbon Energy for the Transport and Household (E^+)" granted by the Bulgarian Ministry of Education and Science.

SECTION: CHEMISTRY **O-C-5**

Wastewater treatment of sulfur and nitrate contaminated fluxes into fuel cells

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Abstract: Fuel cells with microbial oxidation of sulphides and chemical denitrification and a fully microbial fuel cell were studied. A fuel cell with simultaneous presence of sulphide and nitrate ions in the anode compartment as well as the possibility of simultaneous removal of organic pollutants and sulphides in the presence and absence of nitrates is investigated. A comparison between the microbial and totally chemical fuel cells at the same conditions is also presented. A novel type of electrodes with pyrolized and activated carbon paddling is used for immobilization of the bacteria strain for sulfide oxidation. Pseudomonas putida 1046 is studied as a model strain for the anode compartment and Pseudomonas denitrificans into the cathode one.

Keywords: Fuel Cells, Sulfides Oxidation, Nitrate Reduction

Acknowledgements: This work has received funding from the National Research Program "Low Carbon Energy for the Transport and Household (E^+)" granted by the Bulgarian Ministry of Education and Science.

SECTION: CHEMISTRY **O-C-6**

Non-noble membrane electrode assemblies for electrolysis cells with anion exchange membrane

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Abstract: The AEM water electrolysis based on alkali-doped polymer electrolyte membrane is an efficient method to produce hydrogen with higher purity, which offers several advantages as higher current density, low ohmic resistance, possibility to operate at higher working pressure, as well as usage of platinum free electro catalysts. The technology still has some problems such as non-sufficient stability of the polymer electrolyte at elevated temperature, low conductivity of the commercially available membranes, and intensive corrosion on the gas diffusion electrodes and bipolar plates of the cell. This work presents a newly developed laboratory prototype of hydrogen generator, operating with anion exchange membrane (AEM) and temperature limit up to 95^{o}C. The device combines the advantages of the traditional alkaline and the contemporary polymer electrolyte membrane (PEM) water electrolysis. The electrodes for both partial reactions are carbon free 3 layers designed structures with active surface of 5 cm^{2}. The active materials for both partial reactions are Ni and Co (40% wt.) dispersed over the nonstoichiometric titanium oxide with excellent electrical conductivity and stable electrochemical behavior. A commercial AB-PBI polymer membrane was used as OH-conductive electrolyte, doped directly into the cell. It was found that the optimum doping time of the membrane varies from 30 min to 45 min at cell voltage of 30 V and temperature of 25 ^{o}C. After polymer membrane activation the hydrogen generation process runs at about 250 mA.cm^{-2} at increased temperature of 95^{o}C. The enhanced efficiency of the electrolysis is explained with the observed homogeneous distribution

of the nano-sized catalysts crystallites on the non-carbon carrier, combined with high anion conductivity of the used polymer electrolyte membrane.

Keywords: Hydrogen, AEM water electrolysis, Catalyst

Acknowledgments: This study was supported by the National Scientific Program “Low-carbon energy for transportation and household (E+)” – Contract D01-214/2018.

SECTION: CHEMISTRY **O-C-7**

Improving the mechanical properties and conductivity of ion conductive polybenzimidazole membranes

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Abstract: One of the best materials for preparation of high temperature ion conductive membranes for fuel cells and electrolysers is polybenzimidazole, usually denoted PBI. When treated with phosphoric acid (PA) it becomes proton conductive (process denoted as doping), while if potassium hydroxide (KOH) is used an anion conducting membrane is obtained. For attaining high conductivity high amounts of PA or KOH in the material is required. On the other hand very high dopant contents results in poor mechanical properties. The obvious answer is stabilization of the membrane. This can be achieved in two ways – by cross-linking of the polymer backbone or by the introduction of inorganic fillers. Here we report the preparation of different PBI membranes, stabilized by cross-linking or introduction of an inorganic filler - montmorillonite (MMT) and discuss some of their properties.

Both methods rendered very good results. The elastic moduli increase considerably, while elongation at break decreases. At very good mechanical properties, very high doping degrees (molecules dopant per PBI repeating unit) have been achieved. For the proton conductive membranes the conductivity exceeds 400 $mS.cm^{-1}$, while for the anion conductive ones it reaches 1400 $mS.cm^{-1}$.

SECTION: CHEMISTRY **O-C-8**

Sorbents for separation and concentration of Pd (II)

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Abstract: New chelating sorbents for noble metals separation and enrichment were synthesized and their extraction efficiency toward Pd (II) was studied by batch method. The role of various chemical parameters such as sample acidity, type and concentration of eluent, sample and eluent flow rates have been optimized for quantitative sorption of Pd (II). It was found that the synthesized sorbents demonstrate high selectivity toward Pd (II), quantitative sorption was achieved at high concentrations of HCl. Moreover, in acidic media the sorbents preserved their selectivity toward Pt(II) even in presence of significant amounts of base metals. Analytical procedure was developed for Pd determination in environmental and waste materials samples.

Keywords: noble metals, separation, enrichment, Schiff bases

SECTION: CHEMISTRY **O-C-9**

Lipid nanoparticles – a novel approach for inclusion of hyperforin with improved chemical stability in topical formulations for wound treating

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Abstract: Nanomedicine possesses inherent properties to overcome various issues regarding solubility, stability, permeation, absorption, localized drug delivery and toxicity. The use of nanostructures is rapidly emerging in the topical and transdermal delivery of drugs. Lipid nanoparticles are innovative drug delivery systems (DDS) developed for dermatological and cosmetic purposes owing to their remarkable properties such as physical stability, controlled release, and excellent tolerability. There are two types of lipid nanoparticles: solid lipid nanoparticles (SLNs) and nanostructured lipid carriers (NLCs). St. John's wort (Hypericum perforatum) is a plant with proven place in traditional medicine. Hyperforin is a polyprenylated acylphloroglucinol derivative from Hypericum perforatum. It exhibits antidepressant activity by a novel mechanism of action, antibiotic activity against gram-positive bacteria, antitumoral activity in vivo, good protective and potent antioxidant and antiinflammatory activity in topical applications. Furthermore, hyperforin administered orally doesn’t induce phototoxicity. It is well known that Hyperforin is practically insoluble in water and unstable in the presence of light and oxygen. In this conection the use of nanoparticulate carriers can overcome these drawbacks and to ensure its actual application in a num-

ber of diseases. SLNs and NLCs are characterized by indisputable biocompatibility, biodegradability and practically missing toxicity and they are suitable for improving the stability of Hyperforin. The use of lipid nanoparticles (LNs) in pharmaceutical technology is due to its important as “green” materials that can be very environmentally friendly.

Keywords: Antibiotic activity, Hypericum perforatum, Nanostructured lipid carriers, Phototoxicity, Topical applications

SECTION: CHEMISTRY **O-C-10**

Synthesis and antimicrobial activity of novel kojyl carbamates

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Abstract: Kojic acid (5-hydroxy-2-hydroxymethyl-4H-pyran-4-one) is a secondary metabolite produced by a variety of microorganism. Various derivatives based on its scaffold have emerged with a great diversity of biological activities- bacteriostatic, anti-inflammatory, insecticidal, antibiotic, cytotoxic and antitumour activities. Accordingly, we screened kojic acid derivatives of antiviral agents (amantadine, rimantadine and oseltamivir) for their antimicrobial activity. The newly kojyl carbamates were prepared by using EDC/HOBt method at pre-activation step of kojic acid with carbonyl diimidazole. The structures of the synthesized kojyl derivatives were confirmed by mp, UV, IR (ATR)umax, ESI-MS. The preliminary in vitro antimicrobial screening of compounds showed that kojyl carbamate of rimantadine possessed the highest antibacterial activity (MIC 31 μg.ml-1) against two Gram-positive- (Staphylococcus aureus, Bacillus subtilis) bacteria. The latter compound showed about four times weaker activity compared to the positive control tobramycin (MIC 15.6 μg.ml-1) against two Gram-negative bacteria tested (Escherichia coli, Pseudomonas aeruginosa). Amongst the examined synthesized compounds, the kojyl carbamate of rimantadine exhibited either the highest antifungal activity (Candida albicans).

Keywords: kojyl carbamates, rimantadine, amantadine, oseltamivir, antibacterial activity, antifungal activity.

Acknowledgments: The authors gratefully acknowledge financial support of South-West University “Neofit Rilski”, Bulgaria (project RPY-A3/19)

SECTION: CHEMISTRY **O-C-11**

HPLC method from analyse of new compound – analogue of antineoplastic drug

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Abstract: Over the past decade, there has been a significant increase in scientific knowledge in the field of oncology. This leads to increased interest in the discovery of new drugs and therapeutic approaches with the potential in oncology. Synthetic retinoid recently are use in oncology. Third generation retinoids – bexarotenen is clinical use in treatment cancer including cutaneous T-cell lymphoma, breast cancer, advance lung cancer, Kaposi sarcoma, prostate cancer and other. In literature, analyses of bexarotene include thin-layer chromatography. Moreover, gas chromatography-mass spectrometry was been used to determine compound and its metabolites. In previous work we synthase structure analog of bexarotene. The purpose of this work is describe develop and validation of HPLC method from analyze of new compound.

Keywords: oncology, HPLC analyze, third generation retinoids

SECTION: CHEMISTRY **O-C-12**

Probable skin metabolic activity of third generation retinoids and new synthesized derivatives of bexarotene

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Abstract: Synthetic third generation retinoid (bexarotene, adapalene, tazarotene, temarotene and mofarotene) can activate retinoid X receptors (RXR) which determines its various effects in the body. However, safety profile of both structures of the third generation retinoid and their metabolites are not yet fully understood. The aim of this work is to examine the probable skin metabolic activity of third generation retinoids (bexarotene, adapalene, tazarotene, temarotene and mofarotene) and five new synthesized derivatives of the bexarotene and to predict the protein and DNA binding of its metabolites by OECD (Q)SAR Application Toolbox. The data analysis of skin metabolic prediction of some retinoids of third generation shows that only adapalene and tazarotene have metabolic activation in skin (adapalene – 2 metabolites and tazarotene – 4 metabolites). They have no DNA binding but two of them have the ability to bind to proteins by Michael-type nucleophilic addition. The five new synthesized derivatives of bexarotene haven't metabolic activation in the skin.

Keywords: synthetic retinoids, bexarotene derivatives, metabolism, OECD (Q)SAR Application Toolbox.

SECTION: CHEMISTRY **O-C-13**

Computationally based selection of inhibitors for plant histone acetyl transferases

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Abstract: Histone acetyl transferases (HATs) in plant are an important part of the machinery regulation stress adaptation, and as such they are potential targets for novel herbicide development. Here, we present a computationally based design approach for new HAT inhibitor identification. We created homology-based models of two members of the Gnat enzyme superfamily, existing in Arabidopsis thaliana. The models were further subjected to extensive molecular dynamics (MD) refinement. Using molecular docking, we then screened the ChemBridge library, consisting of one million compounds, on the models. To filter the docking results, we created Sifter, a software that discriminates good binding candidates from bad ones using the interaction differences between the natural ligand and the synthetic ones. This produces a narrowed down list of candidates suitable for further refinement via tomographic docking, and for advanced MD simulations.

Keywords: inhibitors, histone acetyl transferases, chemical library screen, docking

SECTION: CHEMISTRY **O-C-14**

Relationship between lipophilicity and protein binding of some potential ACE inhibitors

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Abstract: Absorption, distribution, metabolism and elimination (ADME) properties play a critical role in clinical success of drug candidates. Lipophilicity is one of the most important properties that significantly influence drugs absorption, distribution, binding to plasma proteins and elimination due to hydrophobic interactions of the drug with biological targets and its penetration across biological membranes during transport. The aim of the presented study is to find relationship between lipophilicity of new analogues of His-Leu and their binding ability to angiotensin-converting enzyme (ACE). We found correlation between logP of the compounds and the total energies of their complexes with ACE (Pearson r = 0.83, p = 0.04). Combining docking and theoretical calculation of different features of the molecules could help in a faster and accurate design of new potential drug candidates.

Keywords: ACE inhibitors, logP, docking

SECTION: CHEMISTRY ***O-C-15***

QSAR analysis of Coumarins MAO Inhibitors

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Abstract: Neurodegenerative diseases usually cause loss of memory, motor functions and others disorders in elderly people. One of the reasons for that is the imbalance of monoamines, such as dopamine and serotonin. The enzyme Monoamine Oxidases (MAO) regulates their concentration in the body by the deamination. It is known that some coumarins are competitive inhibitors of MAO and by this way increase the amounts of monoamines in the body. In the present study, a correlation between the structures of a group of coumarins and their inhibitory activity against MAO was sought. Various structural descriptors are calculated using semi-empirical quantum-chemical and fully empirical methods embedded at HypeChem Professional 8.0. Interesting correlations have been found using quantum-chemical and spatial descriptors that could help in finding more active inhibitors.

Keywords: Coumarin, QSAR, MAO, Neurodegenerative diseases

SECTION: CHEMISTRY ***O-C-16***

Sampling uncertainty of dissolved oxygen concentration in surface water

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Abstract: The amount of dissolved oxygen is directly related to the quality of the water. Oxygen enters the water through air diffusion, aeration and as a residual product of photosynthesis. Normally, the oxygen concentration should be measured directly on site in the water body studied. If this is not possible, the measurement can be carried out immediately after sampling in a Biological Oxygen Demand (BOD) incubation bottle. Quality and purity of the sampling vessel is of fundamental importance.In case of measurement after sampling the uncertainty of measurements is always increasing. It can be estimated by the duplicate sampling method. This is a general empirical method for estimation of the uncertainty arising from sampling. It is possible to define the general uncertainty source type, such as random or systemic effects. In order to distinguish between uncertainty contributions originated from the sampling and the analytical process, the analysis of variations (ANOVA) is applied.

Keywords: Sampling uncertainty, dissolved oxygen analysis, duplicate sampling method, ANOVA.

SECTION: CHEMISTRY ***O-C-17***

Synthesis and antimicrobial activity of memantine derivatives with peptidomimetics

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Abstract: Neonatal sepsis and meningitis (NSM) remains a leading cause worldwide of mortality and morbidity in newborn infants despite the availability of antibiotics over the last several decades. E. coli is the most common gram-negative pathogen causing NSM. Memantine is approved in the US and the EU for the treatment of patients with moderate to severe dementia of the Alzheimer's type. Memantine could very efficiently block E. coli-caused bacteremia and meningitis in a mouse model. A series of memantine derivatives incorporating peptidomimetics have been synthesized for the first time and their antimicrobial effects against in vitro have been studied. The bacteria used in the investigations are the following Gram-positive bacteria: Staphylococcus aureus, Bacillus megaterium, Staphylococcus epidermidis and following Gram-negative bacteria: Escherichia coli, Salmonella enterica, Pseudomonas aeruginosa.

Keywords: memantine, peptidomimetics, antimicrobial activity

SECTION: CHEMISTRY ***O-C-18***

Study of proton conductivity on powder samples using XRD

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Abstract: The study of proton conductivity is important in many different fields and disciplines, like materials for so called “Proton Exchanging Membranes” (PEM) in hydrogen fuel cells or “Solid Oxide Fuel Cells” (SOFC). The large family of proton conductors includes also salts of oxoacids, which have been studied in our department for several years. The conductivities, whilst not high, were still several orders of magnitude higher than for insulators. We have prepared and described these new compounds, studied their structural properties by single crystal X-ray and neutron diffraction and measured proton conductivity. We were able to define the direction of conductivity in these crystals.

Proton transfer could occur via either the vehicle mechanism or the Grotthus mechanism. In anhydrous salts, the lack of water molecules excludes application of vehicle mechanism. But the application of Grotthus mechanism should cause disorders of the ions through which the protons are transferred at the conditions of proton conductivity.

For the first information, about existence of proton conductivity in any compound, we have tried to study this property by measurement on powder samples. The results are given in this presentation. Among our (mostly first prepared) samples we have also studied well known proton conductor $CsHSO_4$. This sample exhibit proton conductivity in powder form, and the value is comparable with measurement on single crystal. We have adapted our sample holder to be possible

to keep the sample under high voltage (DC) during measurement. On approx. 60 % diffraction lines we have observed broadening and in some cases also the significant shift of diffraction lines both to higher and smaller angles. The analysis of such pattern can show, which lines are affected by proton transfer and define the “direction” of conductivity in the crystal, even the measurement is made on powder sample.

Keywords: proton conductivity, powder samples, in situ XRD measurement

SECTION: CHEMISTRY ***O-C-19***

Processing of rice husk and straw into active coal

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Abstract: A method for processing of rice wastes (husk, straw) into activated carbon was proposed. The thermolysis of raw material and the activation of carbonizate were carried out at 500°C and 800°C temperatures respectively. The properties of obtained activated carbon are determined by standard methods. The porous structure of obtained carbon have been studied under scanned electronic microscope. According to the results of experimental studies, activated charcoal obtained from rice husks corresponds to the WAC brand, activated charcoal obtained from rice straw corresponds to BAU-A grade. The research will allow rational use of agricultural waste in order to obtain useful secondary adsorbent products intended for adsorption and liquid media.

Keywords: carbonization, rice husk and straw, activating of carbonizate, sorbent, activated carbon.

SECTION: CHEMISTRY ***O-C-20***

Copper dodecyl sulfate as a potential compound arising during artistic paints restoration

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Abstract: Each artworks, especially paintings, degrade in time. The degradation is, among others, caused by depositing of impurities. One of the restoration steps is to remove these impurities. Various microemulsions, most often based on sodium dodecyl sulfate, are currently very often used as effective cleansers. So far, however, there is no study on sodium dodecyl sulfate interactions with the pigments in the paintings. Our study describes the basic chemical and physical properties of copper dodecyl sulfate potentially arising from restoration of paintings using sodium dodecyl sulfate-based microemulsion cleaners.

Keywords: Copper dodecyl sulfate, crystal structure, microemulsion, artworks

SECTION: CHEMISTRY ***O-C-21***

Novel molecular materials for nlo applications – spectroscopic and structural aspects

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Abstract: The whole class of hydrogen-bonded molecular crystals can be considered as a successful result of crystal engineering of novel materials for nonlinear optics (NLO). These materials are based on properly arranged organic molecules (carriers of NLO properties) interacting with selected inorganic or organic anions/molecules. The energy of formed hydrogen bonds positively influences not only crystal packing but also their chemical and physical properties.

This contribution deals with characterization of selected molecular crystals based on salts and cocrystals of pyrimidine derivatives by the combination of experimental (i.e. vibrational spectroscopy, XRD and calorimetry) and theoretical (solid state quantum-chemical calculations) methods. Especially results of temperature-dependent vibrational spectroscopic and XRD methods related to potential phase transformations will be discussed.

This work was supported by OP VVV "Excellent Research Teams" (Project No. CZ.02.1.01/0.0/0.0/15_003/0000417 - CUCAM).

Keywords: nonlinear optics, crystal structure, vibrational spectroscopy, phase transformations

SECTION: CHEMISTRY ***O-C-22***

Water purification by RO and electrolysis for drinking and technical applications

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Abstract: The critical points of the communal surface water purification systems and impurities in tap water coming from water supply tubes are shown. The concentration of aluminium according EC requirements after application of aluminium sulfate as a coagulant and aluminium electrodes for electrolysis of hard water is critically discussed. The purification of tap water for drinking and technical application by 7-stages RO system is demonstrated. The decrease of water hardness by electrolytic treatment with aluminium electrodes for technical applications is presented.

Keywords: water hardness, reverse osmosis, electrolysis, drinking water, technical water

SECTION: CHEMISTRY ***O-C-23***

Preparation of environmentally friendly fuels from unleaded gasoline

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Abstract: The unleaded gasoline E10 is widespread as an ordinary automobile fuel from a petrol station. It is a main source for environmentally friendly fuels preparation for flame burning in lighter, gasoline stoves, lanterns and no flame catalytic burning in a Zippo hand warmer. The laboratory preparation of alternative fuels by fractional distillation of unleaded gasoline, removing the toxic components of gasoline, the effects of bioethanol, removing of water by anhydrous inorganic salts, purification of kerosene from aromatic compounds as an additive and optimization of the composition of alternative fuels are discussed. The new advanced PC on-line temperature monitoring system for Zippo hand warmer is presented for testing the blended alternative fuels by no flammable catalytic burning. The nature and concentration of a heavy fraction as a kerosene in alternative fuels are discussed. The cost benefit of alternative fuels compared with expensive branded fuels is presented.

Keywords: alternative fuels, rectification, unleaded gasoline, catalytic burning, PC on-line temperature monitoring system

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-1**

Contemporary changes in the ladybird beetle (Coleoptera: Coccinellidae) fauna in Poland

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Abstract: I analyze contemporary changes in the fauna of Coccinellidae within the area delimited by the present-day borders of Poland. Based on the available literature and unpublished data, I have gathered and compared the records on the occurrence of individual ladybird species in two time intervals: 1830-1980 (150 years) and 1981-2018 (38 years). In the first period, the occurrence of 72 species was confirmed in the analyzed area, while in the second period 71 species were found. Altogether, in both periods, 75 species were recorded. Four of them (Coccinella saucerottii, Hyperaspis erythrocephala, H. quadrimaculata, Scymnus silesiacus) were reported only in the first period, and three (Harmonia axyridis, Scymnus doriae, Scymnus femoralis) only in the second period. Additionally, some other species have clearly extended their range in Poland and have become much more abundant in the second period, while the range and abundance of others declined. I discuss possible reasons of the observed changes.

Keywords: Coccinellidae, fauna, Poland, range shifts

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-2**

Cultivation of industrial hemp for reclamation of post-mining areas - impact on physicochemical parameters and microbiological activity of soil

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Abstract: The open cast mines have a significant impact on the environment and the landscape, in particular on the soil environment. The process of returning of agricultural value of the degraded soil involves the reclamation by improving the physicochemical and biological properties of soil. In the presented studies cultivation of industrial hemp (giving big amounts of biomass) in combination with alfalfa (able of fixing nitrogen) in crop rotation were used for reclamation of post-mining land in the region of Lignite Mine "Konin" (Poland). During the two growing seasons the soil samples were taken to determine the microbial activity and selected physicochemical properties of the soil under reclamation. The obtained results indicate that the method of reclamation of post-mining areas for agricultural use, generally improves the quality and fertility of the soil, mainly by increasing the activity of microorganisms and soil enzymatic activity and increase the content of organic matter.

Keywords: post-mining areas, reclamation, industrial hemp, soil quality

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-3**

Nematodes as bio-indicators during the remediation of degraded land in the region of a lignite mine by cultivation of industrial hemp – a case study in west-central Poland

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Abstract: The study concerns the use of nematodes as indicators of soil recovery during the reclamation of post-mining areas (region of lignite mine Konin, west-central Poland) by cultivation of industrial hemp in rotation with alfalfa and then plowing the obtained plant biomass in order to accelerate the restoration of the humus layer in the soil. It is worth emphasizing that this is a new reclamation method proposed by the Institute of Natural Fibres and Medicinal Plants in Poland. Soil samples for nematode analysis were collected twice in the growing season in 2018 from the alfalfa and hemp crops, as well as from nearby non-reclaimed area. We studied the abundance, diversity and trophic structure of nematode communities 6 years after the reclamation have started. The results showed that the total abundance of nematodes was significantly higher in the soil of both crops in comparison to non-reclaimed area. Bacterial- and fungal-feeding nematodes dominated in the soil under the reclamation which indicates that the high organic matter content incorporated in the soil, guaranteed nematode fast colonization and development.

Keywords: nematode communities, succession, reclamation, industrial hemp

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-4**

Diversity of earthworms (Lumbricidae) in the grounds of two liquidated uranium mines in Bulgaria

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Abstract:The soil earthworm’s diversity (Lumbricidae) in the abandoned uranium mines Senokos and Eleshnitsa, located in the southwestern part of Bulgaria, was studied in 2011 – 2016. The sampling areas have been polluted to varying degrees with heavy metals and radionuclides, and disturbed by different mining and reclaiming activities. The species structure of the earthworm’s communities has been determined by a number of diversity indices (species richness, evenness, dominance, total diversity). The number of taxons in the sample sites is equal (Eleshnitsa mine) or higher (Senokos mine) than the one in the control sites. The number of individuals is always higher in the control areas.

Keywords: earthworms, diversity, uranium mines, Bulgaria

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-5**

The impact of the earthworm community to organic matter content in forest soils - An experimental investigations

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Abstract: Earthworms play important role in the soil system, e.g. they effectively control activities of microorganisms, accelerate turnover and decomposition rates of organic matter (OM). The diverse earthworm effects depend on species, biotope, environmental conditions, soil horizon, etc., but also on the structure of their associations and interactions between them. The significance of this latter aspects is underestimated and has rarely been addressed experimentally. In a semi-natural experiment, decomposition rates of organic matter loss in a forest soil, as affected by earthworm density and interactions in multispecies associations, were investigated. The experiments were conducted in large mesocosms (10L of soil covered with 100 g of leaf litter) exposed for 5 months (July - November 2006) in a mid-European beech-oak forest (Mikolajki Hydrobiological Station PAS, Poland). The mesocosms were populated by various associations of common lumbricids representing three ecological groups: (1) epigeic (Dendrobaena octaedra, Lumbricus rubellus), (2) endogeic (Allolobophora chlorotica, Aporrectodea caliginosa), and (3) anecic (Lumbricus terrestris). In the experiment, all possible spectrum of earthworm associations was modelled. After the final sampling OM content in the litter and soil samples was determined by burning in a muffle oven, and OM decomposition rates were evaluated. Our results revealed

that the organic matter loss in different horizons of soil profile depended on the earthworm species. Positive effect of the earthworm presence on the rates of OM loss in the whole soil systems (litter+soil) was significant for all the species tested, except for Ap. chlorotica (which showed a nearly significant effect only in the soil). The composition of earthworm associations significantly affected organic matter loss in a forest soil. Interestingly, interactions between species significantly affected OM decomposition rates.

Keywords: Earthworms, Organic matter, Forest soil

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-6**

Effect of a diet enriched with saturated and unsaturated fatty acids on growth and survival of invertebrates representing different feeding strategies

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Abstract: The importance of fatty acids in the diets of vertebrates and invertebrates, such as crustacean aquaculture has been widely studied. However, little is known about the role of a diet enriched with fatty acids in growth and survival of invertebrates grouped due to their feeding strategies. We investigated the effect of diets enriched with saturated and unsaturated fatty acids on survival and growth of predatory hydras, omnivorous crayfish and fungal feeding springtails. We found that unsaturated omega-3 α-linolenic acid, essential for many animals, negatively impacted survival and asexual reproduction of the brown hydra (Hydra oligactis) but had positive effect on growth and survival of crayfish Procambarus clarkii. The positive effect was also observed for the saturated palmitic acid. In turn, unsaturated omega-9 oleic and omega-6 linoleic acids and the saturated stearic acid positively affected growth and reproduction of springtails Folsomia candida and Lepidocyrtus lignorum. The results of our study indicated that the role of fatty acids cannot be considered separately from the

feeding strategy of the studied animals. The fatty acids that positively affected the life-history traits of the particular species are not beneficial for other invertebrates.

Keywords: diet supplementation, fatty acids, live-history traits, aquatic and terrestrial invertebrates

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-7**

Diet of sympatric Long eared owl *Asio otus* (L. 1758), Barn owl *Tyto alba* (Scopoli, 1769) and Kestrel *Falco tinnunculus* L.: case study in central Poland

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Abstract: According to basic ecological principle, species sharing niche do not occur in the same area, and the sympatry of two or more such species provides an interesting field for the analysis of inter-specific competition. We studied the diet of three sympatric avian predators that prey on colonial Microtus rodents at one locality in Złaków Kościelny in central Poland. The study site is located in agricultural landscape, composed of crop fields, as well as meadows and pastures located within Słudwia river valley. The pellets of Asio otus, Tyto alba and Falco tinnunculus were collected from the church building and in the 750 m^2 area surrounding it in 2016 and 2017. The analysis of pellets provided data on total of 4128 vertebrate prey individuals (1914 from T. alba, 1749 from A. otus, and 465 from F. tinnunculus). The most important prey group of three predators were mammals, constituting over 90% of prey items. The most frequently preyed species was Microtus arvalis, that made up 72% of vertebrate prey of A. otus, 59% - of F. tinnunculus and 53% - of T. alba. Altogether 14 species of mammals were registered in the prey. In spite of general similarity in the diet composition of the predators studied,

there were distinct differences in the contribution of several prey species (e.g. Soricomorpha and Rattus norvegicus) and diet diversity between the predators. We conclude that the ecological niches of sympatric species studied differ in several dimensions, including diel activity and selection of local habitats.

Keywords: niche segregation, competition, predation, Microtus arvalis

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-8**

Past and present state of the Griffon Vulture *Gyps fulvus* in Rila and Pirin National Parks and Rilski Manastir Nature Park

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Abstract: Widespread in the past, the griffon vulture has disappeared in most of Europe (including Bulgaria) in the twentieth century. Although it was reported from Southwestern Bulgaria from the area of Rila and Pirin it became locally extinct and in the end of XX Century was breeding only in Eastern Rhodopes. With the local reintroduction of the species in Kresna Gorge since 2010 the high mountain pastures and cliffs were again started to be refuge where the griffon vulture is present mainly in summer. We report on territory use (e.g. home range) and seasonal presence of the species in the Rila National Park, Pirin National Park and Rilski Manastir Nature Park. The new development of the population of the species and its presence in the mentioned above protected territories is a reason for future introduction of activities for conservation as well as panning of such to be incorporated in the management plans and related documents. Both Rila and Pirin national parks as well as Rilski Manastir Nature park is recommended to be managed under the Vulture Safe Areas concept in future.

Keywords: local extinction, reintroduction, conservation, Gyps fulvus, summer pastures, Vulture Safe Areas.

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-9**

Winter Activity of the Amphibians (Amphibia) in Bulgaria

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Abstract: The aim of the report is to summarize the available data about the winter activity of the amphibian species in Bulgaria, and to present new records from south-western Bulgaria. The winter activity of many amphibians has been confirmed, and for some species such activity has been registered for the first time in the country. According to their activity in winter all the amphibians in Bulgaria have been classified into three groups: species with regular winter activity, species with unusual winter activity, and species without winter activity. An attempt has been made to explain the reasons for this activity.

Keywords: Amphibia, winter activity, phenology, Bulgaria.

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-10**

Distribution of the Herpetofauna in the Bulgarian Part of Hadzhidimovo Gorge and the surrounding area (South-Western Bulgaria)

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Abstract: The study aims to ascertain the precise taxonomic composition and distribution of the herpetofauna in the Bulgarian part of Hadzhidimovo Gorge and the surrounding area (Mesta River valley, south-western Bulgaria). Many new spot localities of the known species, and the occurrence of some new for this territory (unpublished till now) amphibians and reptiles have been registered. The field records for all new species as well as for some of the known species interesting from zoogeographic point of view are specified and mapped. The species composition of the herpetofauna is compared with that of Kresna Gorge (Struma River valley).

Keywords: Amphibia, Reptilia, distribution, Hadzhidimovo Gorge, Bulgaria.

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-11**

Opportunities for further qualification in environmental communication for protected areas

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Abstract:Environmental communication is a nature conservation tool that uses communication approaches, principles, strategies and techniques, involving different social and age groups. The interaction with people is essential for efficient environmental protection and prevention, thus practitioners more often need to communicate environmental problems and solutions with children, adults, citizens and the society as a whole.

In this regard, the study aims to identify opportunities for further qualification of university students and to verify an environmental communication training program for protected areas. Based on a literature research, a training program was developed, implemented and evaluated in “Vrachansky Balkan“ Nature Park with a group of 18-29 years old youngsters.

The results show demand for environmental communication skills and confirm the potencial of the training program. Young people share that the acquired competences open new perspectives for their professional development. The study underlines the importance of such qualification for environmentalists and recommends its integration in their curriculum, its provision from nature and national park administrations, regional inspectorates of environment and water, centers of continuing education.

Keywords: environmental communication, protected areas

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-12**

The demographic structure of the Blagoevgrad district and the challenges to the protection of the environment

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Abstract: Demographic problems are at the root of the various challenges in terms of the environmental protection. That is why the prospect of developing all kinds of activities in this direction requires much more serious analysis and evaluation. According to these reasons, an analysis of the available information on the demographic structure of the Blagoevgrad region, it is offers a specific commentary and forecast of the prospects for the future activities for of the environmental protection.

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-13**

Waste-cluster relationship on the example of Blagoevgrad regional waste landfill

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Abstract: Bulgaria is facing serious challenges about environmentally friendly way of waste management. Commissioning of the Regional Waste Management System - Blagoevgrad is going to ensure their environmentally friendly utilization and disposal, which is in close relation with the defined hierarchy in Bulgarian Waste management act - prevention, utilization, final disposal. The attempt to be created relation between regional waste management and cluster policy, is related to the development of a cluster model, named "Waste utilization and mitigation of climate change”.

The implementation of the model will contribute to sustainable and efficient waste management in Blagoevgrad region, as well as in the territory of Bulgaria, in relation with the requirements of European legislation. In other side this contributing to the realization of the main Community priorities for Cohesion Policy: sustainable development and increasing the attractiveness of regions, by improving accessibility, ensuring adequate quality and level of services and preserving their environmental potential.

Keywords: regional waste management, cluster model, resource utilization, climate change, mitigation

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-14**

Modelling of water systems in a convenient way

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Abstract: Protection of water resources requires many decisions, which, in turn, can be aided by a model of the respective water system. Such a model then can be used, for example, for the analysis of various scenarios (of external forces) and various action options (which can be influenced). On the other hand, modelling often is perceived as something hard or laborious to do (and often, it is). The conference contribution presents some examples of modelling concepts and of their implementation in an easy-to-use simulator, focusing on water-balance models, assisting in the management of availability and demand of water resources, whilst, at the same time these can be coupled with dynamic system models, representing the biochemical process equations of water quality processes in a river. The contribution presents examples from Colombia, Vietnam, Israel.

Keywords: availability, demand, modelling, river water quality, simulator water resources

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-15**

Species composition, seasonal dynamics and structure of bottom macroinvertebrate communities in the Ochushnitsa River (Maritsa River basin, South Bulgaria)

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Abstract: Non-influenced sites in the upper course of the Ochushnitsa River were sampled in spring and autumn within the period 2014 – 2018 in order to study species composition and structure of benthic macroinvertebrate communities. A total of 145 taxa, belonging mostly to Ephemeroptera (28), Diptera (25), Trichoptera (24), Coleoptera (16), Plecoptera (13) and Odonata (12) were recorded. Another 11 systematic groups were presented with less than 10 taxa. A dominant analysis based on 18 samples was performed. In order to characterize the communities’ structure, the individual species diversity (H), total species diversity (d), species evenness (e) and index of dominance (c) were calculated. The minimum-variance clustering (Ward’s method) based on Squared Euclidean distances confirmed well pronounced seasonal nature of the communities’ composition.

Keywords:
Benthic macroinvertebrates, diversity, dominant analysis, community structure, Bulgaria

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-16**

Composition and Zoogeographic features of the stonefly fauna (Insecta: Plecoptera) of mountain and semi-mountain streams in Aegean watershed (7th Ecoregion, Eastern Balkans)

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Abstract: This work summarise 22 species and 5 subspecies stoneflies established during sample periods, Autumn 2017 and Spring 2018 at 38 mountain and semi-mountain streams from Bulgaria and North Macedonia. The species are relatively estimated by the dominant analysis. The Plecoptera fauna belongs to 4 zoogeographical complexes and 7 zoogeographical categories. Moreover, eighteen taxa are European species and three (Brachyptera beali beali (Navás, 1923), Leuctra hirsuta Bogoescu & Tabacaru, 1960, Isoperla pesici Murányi, 2011) are subendemic species. Furthermore, Amphinemura sulcicolis (Stephens, 1836) and Isoperla pesici Murányi, 2011 were recorded at North Macedonian fauna only. Among the total of 20 stoneflies species that have been recorded in Bulgaria, 6 taxa are classified as Vulnerable (VU) according to the Red Data Lists of threatened species.

Keywords: stoneflies, distribution, dominant analysis, Bulgaria, Macedonia

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-17**

Phytoplankton and macrophytes in Bulgarian standing water bodies

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Abstract: The current status of a lake can be evaluated via monitoring based on biological quality elements. Reference aquatic flora communities reflect pristine situations that exist or would exist with no or very minor disturbances from anthropogenic pressure. Phytoplankton and macrophytes were studied in all national lake types (except transitional waters). Type-specific taxa and groups character in reference and near reference conditions were described. Abiotic parameters (water chemistry) were also discussed.

Keywords: lakes, reservoirs, phytoplankton, macrophytes, reference conditions

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-18**

Ichthyofauna of the Iskar River section affected by the hydropower cascade „Middle Iskar”

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Abstract: The study aimed to assess the impact of a cascade of 5 small hydropower plants on the composition and structure of the recent fish communities in the affected area of Iskar River. The field surveys cover the river sections up- and downstream the 5 dams, the dam lakes and the fish passes of the dams. Fourteen fish species were recorded in the dam lakes. Limnophylous and eurytopic species predominate the communities. The high species richness and the presence of large-size fishes can be considered as an indirect indication of relatively stable conditions in the dam lakes. Ten fish species including were found in the studied river stretches. The ecological status of these river sections assessed by standardized fish indices were determined as Good and High. Both the abundance and size-age composition of some type-specific species correspond to “favourable conservation status”. Totally 8 fish species were recorded to migrate up- and downstream through the fish passess. The most intensive upstream migration was found at the end of May when 2 to 5 species migrated through different dams.

Keywords: Fish communities, Iskar River, Dams, Fish passes, Ecological state

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-19**

Remote sensing applicability in fishkills event: case study from Varna lake - Bulgaria

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Abstract: On the morning of 16 and 17 August 2016 on the southern coast of Varna lake a fish kills occurred. The quantity of the dead fish in the coast area was estimated approximately at about 2.79 tons. Over 90% of the recorded dead fish were benthic species from family Gobiidae. Oxygen concentration in the water indicated acutely expressed hypoxia. Oxygen depletion in the coastal zone continued at least 36 hours, with an average oxygen concentration of 1.93 mg/l (SD ± 0.75). The suspected cause was an algal bloom. Chlorophyll a concentration was in situ measured, indicating 11.43 mg.m^3 (SD ± 1.15). Moreover, satellite data from Sentinel 2 MSI images were processed in SeNtinel Application Platform (SNAP, v 6.0). Remote sensing data retrieved average chlorophyll a concentration of 20.02 mg.m^3. Contrary, satellite data from image sensed 10 days before the event occurrence registered four folds higher average concentration of chlorophyll a with 77.58 mg.m^3, indicating the peak of the summer algal bloom. Adverse weather conditions (decrease in sunshine and temperature) were the supposed key factor of algae degradation and respective oxygen consumption. The results confirm the possibilities of the remote sensing (i.e. applied Sentinel 2 data) as an essential tool in detecting casual environmental events.

Keywords: fishkills, Sentinel 2 MSI, chlorophyll a, hypoxia.

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-20**

Remote sensing based vegetation analysis in Parangalitsa preserved area

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Abstract: In the last decade the remote sensing and the Unmanned Aerial Vehicles (UAV) become a very popular technology for observing the spatial distribution of different objects and processes. Generating a point cloud, extracting DSM and DTM from a photogrammetric mosaic and analyze the change of the canopy are the main features of the remote sensing ground monitoring applications. This study is focused on the feasibility and adaptability analysis of the UAV techniques and the satellite images processing software in interpretation of the vegetation state. The study area that is subject of investigation in this research is situated in South-West Bulgaria and represent the Parangalitsa preserve area. To analyze the canopy in the reserve have been used two types of remote sensing information the first one is a rapid eye satellite picture with a 5 m spatial resolution as the second one is a photogrammetry mosaic extracted with a fix wing E-bee UAV equipped with a high resolution 20 MP S.O.D.A camera. The main idea of this study was to use the high resolution images captured by the UAV as a benchmark and to extract the DN values of the pixels that represent a vegetation in very bad shape and after that to search for pixels with the same DN values on the low resolution satellite images in order to find areas on the satellite pictures with a death or dying vegetation.

Keywords: Remote sensing, Satellite images, NDVI, Vegetation

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-21**

Monitoring ozone effects on vegetation: a review

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Abstract: One of the most phytotoxic air pollutants is ozone, which can cause considerable damage to vegetation: visible leaf injury, reduction in yield quantity and quality and reduction in photosynthesis, alterations to carbon allocation, and altered sensitivity to biotic and abiotic stresses. Ozone is a secondary pollutant and prevailed at high concentrations over rural regions. Moreover, ozone concentrations are expected to increase in the future and will continue to be a serious threat to crop productivity. This paper aimed to review the undertaken studies of ozone's impacts on crops and natural ecosystems.

Keywords: Ozone, Monitoring, Plants, Crops

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-22**

Laboratory effect of *Paenibacillus alvei* DZ-3 as bio-fungicide on control of *Botrytis cinerea* in tomato (*Solanum lycopersicum L.*)

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Abstract: Tomato (Solanum lycopersicum Linnaeus) is one of the most common horticultural crops and cultivated throughout the world. It can be grown in a wide range of climates from tropical to temperate; it also can be cultivated under cover conditions when outdoor temperatures are not favorable. However, the commercial production of tomato has been hindered by many fungal, bacterial, viral and nematode diseases.

Botrytis cinerea is a fungus that causes gray mold on many fruit crops.

This study aims to investigate and evaluate the role of Paenibacillus alvei DZ-3 as biofungicide to counteract gray mold decays caused by B. cinerea in Solanum lycopersicum L.. Our findings showed significant antagonism of Paenibacillus alvei DZ-3 to Botrytis cinerea, so we can say P. alvei DZ-3 possesses great potential as a possible biocontrol agent against B. cinerea pathogenic infections..

Keywords: biocontrol, gray mold, diseases, antagonism

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-23**

Biogas production from straw material by different methods of substrate treatment

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Abstract: Biogas is considered as alternative to conventional fuels. It is produced by anaerobic digestion of different organic materials. Generally those mate-rials include mostly manure and municipality waste. Our research focuses on the possibility to utilize new types of organic materials in combination with the traditional ones. We believe that adding new materials, as well as choosing the best methods of treatment and optimal conditions will enhance the process of producing biogas and will contribute to higher range of waste treatment. The final product is biogas with higher methane content, which makes it usable for heat and power generation. Therefore we are focused on utilizing of straw (as a new plant material) by mixing it with other organic materials, different methods of treatment and conditions in anaerobic digestion reactor.

Keywords: biogas, straw, waste treatment, biotechnology, thermophilic digestion

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION **O-E-24**

Is a philosophy of ecology possible as a scientific method?

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Abstract*:* The advancement of science and the change of moral norms in a market-driven society not only generates prosperity but also challenges the future of mankind. Much of the changes in the environment can be anticipated if we turn to the knowledge that ecology gives us as a biological science. But it is no less important that this knowledge should be rationalized in accordance to values and moral norms - in terms of a philosophy that explains the meaning of the technologically changing world and the consequences for the future.

Keywords: ecology, philosophy, ethics, science, environment

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION O-E-25

Legal and ecological aspects of illegal, unreported and unregulated fishing in the Black Sea

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Abstract: Illegal, Unreported and Unregulated fishing still represents an issue for the Black Sea region. The article is dedicated to some specifics of IIU fishing in the Black Sea despite the efforts of the European Commission made since 2007 when Bulgaria and Romania became the first EU Member States with the access to the Black Sea coast. The authors pay attention to the FAO's 2017 newest document supporting the port state measures to combat illegal, unreported and unregulated fishing as a part of a global development. The authors also stressed the importance of the Declaration against unregulated fishing and 10-year commitment to rebuild fish stocks, adopted at the meeting in Sofia in June 2018 which EU Commissioner for the environment, maritime affairs and fisheries as well as *S*ecretary General of the Permanent International Secretariat of the *O*rganization of the Black Sea Economic Cooperation had attended.

Keywords: Illegal, unreported and unregulated fishing; Black Sea

SECTION: ECOLOGY & ENVIRONMENTAL PROTECTION O-E-26

Quantitive Assessment of the Importance of the Atmospheric Environment on Air Pollutant Concentrations at Regional and Local Scales in Sofia

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Abstract: The study was carried out on the territory of the city of Sofia because of its high building density, intensive traffic and specific relief together forming preconditions for high levels of air pollutants. The study comprises data processing of 1-hour concentrations of NO, NO_2, O_3, and PM10, as well as meteorological data as temperature, relative humidity, global solar radiation and wind speed for 2009 – 2015.The results underline the local character of the air pollutants in the area of “Kopitoto” locality which is confirmed by the value of R – coefficient (R = -0.04 ÷ 0.12). For the other observed areas, the regional impact on the occurrence of the air pollutants is stronger or less pronounced R = (0.81 ÷ 0.96). The sole exception is „Druzhba“ district where the measured concentrations of PM10 expressed strong local influence (R = - 0.36) and 3/4 of the ozone concentrations have a regional influence of their occurrence (R = 0.76).The meteorological variables have the strongest impact on the monthly concentrations of NO, NO_2, and PM10, respectively (47.5%), (54.2%) and (49.1%), whereas O_3 concentrations expressed the strongest dependence on meteorological variables at diurnal scale (68.3%).The text should be between 10 and 15 lines long, Arial 11 pt, single line spacing, justified.

Keywords: NO, NO_2, O_3, PM10, air pollution, meteorological variables

SECTION: GEOGRAPHY **O-G-1**

The demographic potential of the Republic of Bulgaria in the 21st century and its impact on the opportunities for the development of a silver economy

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Abstract: The rapid aging of the population transforms societies and calls into question the existing approaches to economic development and sustainable growth. The "silver economy" can be defined as economic opportunities stemming from public and consumer spending associated with population aging and the specific needs of the population over 50 years of age. This part of the economy refers to all economic activities related to the needs of the elderly - from healthcare to nutrition, to leisure, from finance, transport and housing to education and employment. Europe and Bulgaria are experiencing a major societal challenge in the form of a rapidly aging population. Adapting to an aging society requires increased independence and social inclusion. By 2060, the number of people over the age of 65 is expected to increase further in our country. The European Union is dealing with the demographic challenge called the 'silver economy strategy'. Stimulating the market for products and services geared to the needs of older people can have a huge impact on existing or emerging markets in Bulgaria.

Keywords: silver economy, demographic change, education, employment

SECTION: GEOGRAPHY **O-G-2**

Migration activity - building block for sustainable demographic and territorial development in Kyustendil district

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Abstract: In the recent years in our country migration management is becoming a de-cisive factor in the demographic development of the country. Internal migra-tion needs to be studied, because the problems it caused by demographic, social and economic factors affecting an increasing part of the population and territory of our country, as determined the general demographic situa-tion. The migrations are an essential component in demographic develop-ment in the studied area and are of great importance to the territorial distribu-tion of the population.

Migration activity of the population with its natural reproduction identifies current trends in demographic development of the territory. Internal migra-tion processes have considerable influence on social and economic devel-opment of the territory. The current migration activity of the population will determine the future demographic and social situation. Population migration is a natural process of the movement and freedom of choice of residence, work, learning and life. Migrations have a significant direct impact on natural reproduction, age structure, employment, marriage and the diligence.

Keywords: migratory activity, demographic resources, territorial, social and economic development

SECTION: GEOGRAPHY **O-G-3**

Social vulnerability of the elderly population in the village of Ribnovo, Southwestern Bulgaria

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Abstract: The deepening demographic crisis in Bulgaria and the gradual aging of the population, with no prospects for improving the demographic situation and increasing birth rates, will exacerbate the pressure on the country's social security system. This means - the pensions will continue to be very scarce compared to the salary received before retirement. This brings the adult population a number of problems - restrictions on access to medicines, quality food, traveling and meeting with relatives, thus creating a feeling of hopelessness and lack of decent old age, when a person is weak and life is most difficult. The prospects for the near years and even decades are not at all optimistic. This makes the subject particularly acute for current workers because, in the vast majority of cases, it forms the conditions of life in which they will fall in the near future after retirement.

Keywords: pensions, social vulnerability, elderly population, villages

SECTION: GEOGRAPHY **O-G-4**

Contemporary challenges to the development of local self-government in Bulgaria

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Abstract: This article will attempt to outline the contemporary challenges faced by local authorities in Bulgaria. On the one hand the processes of globalization intensify migration processes in the local common-ness, which is why the majority of small municipalities in Bulgaria are threatened by depopulation, which requires in the coming years agenda appears the issue of new territorial-administrative division of the country. Furthermore, by defining the contemporary challenges of the municipal government, the areas of competence and the powers of local authorities, will be determined and the distribution of responsibilities between local and central government in the search for opportunities to address the modern challenges of the 21st century.

Keywords: local self-government, regional development, regional economy, spatial planning, local government

SECTION: GEOGRAPHY **O-G-5**

Assessment of the significance of the land and river borders of the Republic of Bulgaria with the neighbouring countries

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Abstract: The national geographic space of each country is directly related to the neighbouring countries. Hence the importance of geographic proximity, which has an important geo-economic and geopolitical dimension.

The report uses a method for assessing the significance of the state borders, created by Simonov (1970). The modified version of this method is applied by Kolev (2008). The emergence of the new state of Kosovo changed the border between Serbia and Macedonia (now Northern Macedonia).

The report presents new assessments of the significance of the state borders of the Republic of Bulgaria as well as assessments of their significance for each of the neighbouring countries.

Keywords: national geographic space, state borders, geographical neighborhood

SECTION: GEOGRAPHY **O-G-6**

Development of regional business in Bulgaria as a means to increase GDP in agriculture

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Abstract: The Bulgarian economy in 2018 is developing at a moderate rate of evidence of low unemployment and rising basic monthly wages. But this does not apply to all regions of Bulgaria. Concentration in major cities is becoming more and more tangible, and the depopulation of regions from all over the world is increasingly visible. Deserted lands and lack of development in the agriculture sector have the least impact on two aspects. At first, the villages are depopulated by the lack of a policy on agriculture in general. On the second place, the imports undercut the prices of the Bulgarian producers and the small number of processing enterprises. In this respect, the state can use its (restrictive and regulatory) functions in relation to the agricultural sector, and in turn to increase the production of agricultural produce. The realization of Bulgarian production, its export and its intra-community supply will increase the gross domestic product of Bulgaria.

Keywords: GDP, agriculture, regional business, GDP, business development

SECTION: GEOGRAPHY **O-G-7**

Factors influencing the development of mountainous areas in Blagoevgrad region

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Abstract: Mountain areas represent a very fragile and dynamically changing system. Their significance as ecological, social and economic environment, as well as their sensitivity to change, create the need to be thoroughly studied. The report examines the factors influencing the development of the mountainous regions in the Blagoevgrad region. A brief overview of their impact on their socio-economic development is also made.

Keywords: Mountain areas, factors, Blagoevgrad

SECTION: GEOGRAPHY **O-G-8**

Natural and historical heritage in the Kyustendil region as a resource for tourism development

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Abstract: The report attempts to assess the natural and historical heritage in the Kyustendil region as a prerequisite for the development of tourism. There is a favorable combination of relief, climate, water wealth, rich mountain flora and fauna, as well as many preserved cultural and historical sites. This complex of factors creates conditions for development of different types of tourism - balneological, spa, cultural, pilgrim, cognitive, ecological, hunting, winter, etc. The attraction of investment in the construction and improvement of tourism infrastructure is directly related to sustainable regional development.

Keywords: natural and historical heritage, tourism, Kyustendil region

SECTION: GEOGRAPHY **O-G-9**

Ecological and pilgrim tourism in Rila Monastery Nature Park

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Abstract: The report attempts to assess the natural and cultural heritage for the development of ecological and pilgrim tourism in Rila Monastery Nature Park. Within the territory of its 25 253 hectares, are situated glacial relief forms, high peaks, preserved forest ecosystems such as centuries-old forests and mountain meadows, as well as over 28 high-mountain lakes. Here is the most significant monument of Bulgarian culture and spirituality - Rila Monastery, included in the list of the World Natural and Cultural Heritage of UNESCO. The combination of natural and anthropogenic tourism resources makes the Rila Monastery Nature Park a preferred destination and a second-visited protected territory in Bulgaria.

Keywords: natural and cultural heritage, ecological and pilgrim tourism, Rila Monastery Nature Park

SECTION: GEOGRAPHY **O-G-10**

Mapping and spatial analysis of poverty in Bulgaria

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Abstract: Measuring poverty has always been an important responsibility for each country and its consideration of various disciplines over the past 100 years has made it a key activity for countries and regions. Poverty is a multifaceted concept that can include social, economic and political elements. Absolute poverty, extreme poverty or poverty refers to the complete lack of resources needed to meet basic personal needs such as food, clothing and shelter. The main purpose of this paper is to map and analyse poverty in Bulgaria and to identify demographic and economic factors for the emergence of poverty in Bulgaria. A review of all concepts of poverty as a social phenomenon has been made. The results are presented in several thematic maps.

Keywords: mapping, spatial analysis, poverty, people in risk and social inclusion

SECTION: GEOGRAPHY **O-G-11**

Physical geographic characteristics of the Hadjidimovo Gorge (South-Western Bulgaria)

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Abstract: The Hadzhidimovo gorge is a cross-border gorge situated on the territory of Southwest Bulgaria and Northern Greece in the Mesta river valley. So far, no detailed geographical description has been made. The primary objective of this study is to make a geographical characterization of the Bulgarian part of the gorge, which is the largest.

The boundary of the Hadzhidimovo Gorge has been identified and the particular features of its natural components have been examined. For detailed analysis of the hydromorphometric parameters, a DEM presented as GRID with a pixel size of 30 m / 30 m has been created. The morphometric maps of the gorge area were developed and analysed.

Keywords: Mesta River, Hadzhidimovo Gorge, Physical Geographic Characteristics

SECTION: MATHEMATICS **O-M-1**

Hypersubstitutions for algebraic systems

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Abstract: We introduce a canonical concept of a hypersubstitution for algebraic systems which extends the concept of hypersubstitutions of universal algebras. We define an associative operation on the set of hypersubstitutions for algebraic systems in the same matter as for hypersubstitutions for universal algebras and obtain a monoid of hypersubstitutions for algebraic systems. We will present some properties of this monoid.

Keywords: algebraic systems, hypersubstitutions, monoid

SECTION: MATHEMATICS **O-M-2**

All Idempotent and Regular elements in (HypG((2);(2)); og)

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Abstract: We will present the concept of generalized hypersubstitution for algebraic systems which was extended from concept of generalized hypersubstitution for universal algebras. The concepts of idempotent and regular elements are important role in semigroup theory. In this paper, we characterize idempotent and regular elements of the set of all generalized hypersubstitutions for algebraic systems of type ((2),(2)).

Keywords: algebraic system, term, formula, generalized hypersubstitution

SECTION: MATHEMATICS **O-M-3**

Subfunctions and minors in finite algebras

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Abstract: We discuss on the maximal complexity of functions, induced by different data structures for representing, as truth tables, formulas, term operations, ordered decision diagrams, minor decision diagrams etc. The results are presented in terms of Multi-Valued Logic circuits (MVL- circuits) and finite-valued logic.

When assigning values to some variables in a function the resulting function is a subfunction, and when identifying some variables the resulting function is a minor. We investigate the most complex representatives with respect to these two reductions of the functions in finite algebras. These methods provide a detailed classification of functions with small values of their arity and range.

Keywords: subfunction, identification minor, minor decision diagram, minor complexity.

SECTION: MATHEMATICS **O-M-4**

On the canalyzing minors of Boolean functions

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Abstract: C. Waddington introduced the term canalization to describe the ability of a genotype to yield the same phenotype despite variations in the environment. Later, the concept of canalyzing functions was introduced by S. Kauffman to reflect the behavior of biological systems. In the present paper, a canalization concept is extended by applying it to variables identification. We define α-canalyzing minors and β-canalyzing minors. We discuss the number of identification minors needed to determine a Boolean function. Representation of a Boolean function with its identification minors is derived as a formula. An evaluation of the maximum number of canalyzing minors for the Boolean functions is presented as well as the number of the functions having canalyzing minors.

Keywords: Boolean functions, Subfunctions, Identification minor, Canalyzing functions

SECTION: MATHEMATICS ***O-M-5***

On Super Hamiltonian semigroups

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Abstract: The concept of Super Hamiltonian semigroups will be introduced and some of their properties will be investigated and discussed. As a consequence, we will prove that the semigroup is a super hamiltonian semigroup if and only if it is a strong semilattice of quasi-groups.

Keywords: Super Hamiltonian semigroup, strong semilattice, quasi-groups.

SECTION: MATHEMATICS **O-M-6**

Free power-slim groupoids

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Abstract: A groupoid (an algebra with one binary operation) is said to be slim groupoid if it satisfies the identity x(yz)=xz. A power-slim groupoid is a groupoid that has the property: each of its mono-generated subgroupoids is a slim groupoid. It is shown that the class Vs of slim groupoids is a proper subclass of the class Ps of power-slim groupoids, and that Ps is a variety. A canonical description of free objects in Vs is presented in order to obtain a suitable form of groupoid powers that are used for the canonical description of free objects in Ps. It is shown that a groupoid **H** in Ps is Ps-free if and only if **H** satisfies the following two conditions: (i) H is a Ps-injective groupoid and (ii) the set of prime elements in **H** is nonempty and generates **H**. Then the set of prime elements in H is the unique Ps-free generating set of **H**. It is also shown that the class of Ps-free groupoids is a proper subclass of the class of Ps-injective groupoids and that both classes of Ps-free and Ps-injective groupoids are hereditary.

Keywords: slim groupoid, mono-generated subgroupoid, power-slim groupoid, free groupoid, injective groupoid.

SECTION: MATHEMATICS **O-M-7**

Reductions for presentations of (n,m)-semigroups - overview, open problems and application possibilities

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Abstract: Fnding a satisfactory combinatorial description of an (n,m)-semigroup given by its (n,m)-presentation <B; Δ> is a quite difficult issue. The common approach is to manage to construct a good reduction for <B; Δ> (if possible), a task that is usually complicated to achieve. The majority of results obtained so far relate to a special class of presentations of (n,m)-semigroups called vector (n,m)-presentations of (n,m)-semigroups. The main reason is that they are closely related to binary semigroup presentations <B; Λ>. Thus, the question of existence of a good combinatorial description for the (n,m)-semigroup <B; Δ> converts to a question of existence of a good combinatorial description for the corresponding binary semigroup <B; Λ>. An overview of the obtained results is given. Additionally, we classify condition(s) on <B; Λ> under which a good combinatorial description for <B; Λ> implies solvability of the word problem for <B; Δ>. The conclusion is that the existence of a good combinatorial description for <B; Λ> not necessarily implies existence of a good combinatorial description for <B; Δ> (except in the case when B is finite). But, does the solvability of the word problem for <B; Λ> always imply solvability of the word problem for <B; Δ>? We give an answer to this question for the case when B is finite, as well as our expectations when B is

infinite. We also define a couple of closely related open problems. Finally, we explore ideas for the possibility on finding application of the obtained results and we open a wider discussion on the application of the combinatorial theory of (n,m)-semigroups in general.

Keywords: (n,m)-semigroup, (n,m)-presentation, reduction, word problem

SECTION: MATHEMATICS **O-M-8**

Regularity of the semigroup of all order-preserving transformations on a finite crown

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Abstract: Let n be an even number and let X = {1,2,3, . . . , n} be a finite set. The crown is the partial order on X where the only comparabilities are $1 < 2 > 3 < 4 > \ldots < n > 1$.

Every element in a partially ordered set X is minimal or maximal. We consider the semigroup EndCn of all full transformations which preserve the crown. In this paper we investigate algebraic properties of the semigroup EndCn in order to obtain more essential information about its structure. The semigroup EndCn is not regular. We characterize all regular elements and determine particular regular subsemigroups.

Keywords: transformation semigroups, crown, idempotents, regular elements.

SECTION: MATHEMATICS **O-M-9**

Generating sets of the inverse semigroup of partial automorphisms on a finite crown

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Abstract: Let n be an even number and let X = {1,2,3, . . . , n} be a finite set. The crown is the partial order on X where the only comparabilities are 1 < 2 > 3 < 4 > ... < n > 1.

Every element in a partially ordered set X is minimal or maximal. We consider the inverse semigroup PAutCn of all partial automorphisms on a finite crown. In this paper we investigate algebraic properties of the semigroup PAutCn in order to obtain more essential information about its structure. We characterize the generating sets for the semigroup PAutCn.

Keywords: inverse transformation semigroups, crown, generating sets.

SECTION: MATHEMATICS **O-M-10**

Computing some topological indices of some fullerenes linear and cyclic(Cn)m and symmetry group in (Cn)m fullerenes

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Abstract: Topological indices are a numerical invariant of a chemical graph. In this paper, we apply the action of the symmetry group of a fullerenes molecule Cyclic and linear $(C_n)_m$ on the set of its chemical bonds to compute the PI and Szeged indices of $(C_n)_m$. This is an efficient method that can be applied for other classes of fullerenes.

Keywords: Topology, PI, SZ, Fullerene, Symmetry Group, Lattice, Graph

SECTION: MATHEMATICS **O-M-11**

On a special case of Wilf’s conjecture for numerical semigroups

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Abstract: Let $G=[n,\{i_1,i_2,...,i_k\},\{a_{i_1},a_{i_2},...,a_{i_k}\}]$ be a numerical semigroup with embedding dimension $ed(G)=k+1$, minimal set of generators $\left\{m_{i_r}\,\middle|\, m_{i_r}=na_{i_r}+i_r, 1\le r\le k\right\}\cup\left\{m_{i_0}=n\right\}$, , Frobenius number F, multiplicity n and genus g. In this paper we prove that Wilf’s conjecture i.e. the inequality

$$\frac{F+1}{F+1-g}\le ed(G).$$

holds for G when $\{i_1,i_2,...,i_k\}$ is a basis for $\mathbb{Z}_n$.

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Keywords: transformation semigroup, partial transformations, zig-zag order, idempotents, generators, relative rank, Wilf’s conjecture, numerical semigroups, basis

SECTION: MATHEMATICS **O-M-12**

Comparison of different numerical methods for fractional-order rössler system

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Abstract: In this paper, we numerically study the chaotic behaviors in the fractional-order Rössler equations, by comparingAdams-Bashforth-Moulton method (FABM) and Fractional Multistep Differential Transformation method (FMDTM). The fractional derivatives are described in the Caputo sense. FABM method acts like a predictor-corrector pair compared with FMDTM, which is a semi-numerical method that exploits the power series representation of the solution. The system is shown to display interesting dynamical behavior depending on the system parameters, such as a chaotic behavior, as well as stabilization towards regular periodic motion or equilibrium points. Numerically obtained results are analyzed to compare various integration algorithms.We quantify the distinction between the integration methods by depicting the time series of the absolute difference for different system parameters and initial conditions.The results demonstrate reliability and efficiency of the algorithm developed.

Keywords: Fractional-order Rössler system, Adams-Bashforth-Moulton method, Fractional Multistep Differential Transformation method, system parameters, numerical results.

SECTION: MATHEMATICS **O-M-13**

Modified Lorenz system: obtaining and solving

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Abstract: A Modified Lorenz system is a system of three differential equations where the third differential equation in the Lorenz system is replaced with a homogeneous linear differential equation from the fifth order with constant coefficients. By using the Lorenz system of differential equations and the systems of differential equations from the papers [1], [2] and [3] which approximated the Lorenz system, we obtained a modified Lorenz system. The explicit solutions of the Lorenz system are not known, but the Modified Lorenz system can be solved. Its solving depends on a homogeneous linear differential equation from the fifth order with constant coefficients. By using the solution of the canonical differential equation of second order and a homogeneous differential equation of second order with variable coefficients, we solved the homogeneous linear differential equation from the fifth order with constant coefficients.

Keywords: Modified Lorenz system, system of differential equations, solutions, homogeneous linear differential equation of fifth order with constant coefficients, explicit solutions.

Mathematical Subject Classification: 34A34, 34A05.

SECTION: MATHEMATICS **O-M-14**

Dynamic analysis of Dual Lorenz system

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Abstract: A Dual Lorenz system as an autonomous system of three differential equations is obtained by using the Lorenz system of differential equations in the paper [1]. In this paper, we will do a comparison of the Dual Lorenz system with the Lorenz system for different values of parameters. The dynamic analysis of its behaviour will be done. The basic properties of the Dual Lorenz system are analyzed by means of symmetry of the system, dissipativity the system, Lyapunov function, a behaviour of the system in the neighbourhood of fixed points etc. By using mathematical software Mathematica, we will give a graphical visualization of the Dual Lorenz system for some values of parameters via examples.

Keywords: Lorenz system, Dual Lorenz system, dynamic analysis, graphical visualization.

Mathematical Subject Classification: 34A34, 37C10, 37C37.

SECTION: MATHEMATICS **O-M-15**

On the $(Vil_{B_2}; \alpha; \gamma)$ −diaphony of the nets of the type of Zaremba-Halton constructed in generalized number system

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Abstract: We consider the so-called $(Vil_{B_2}; \alpha; \gamma)$ −diaphony as a quantitative measure for the distribution of nets. A class of two-dimensional nets $Z_{B_2}^{\mu}$ of type of Zaremba-Halton is constructed and the $(Vil_{B_2}; \alpha; \gamma)$ −diaphony of the nets of this class is studied. The influence of the exponential parameter α to the exact order of the $(Vil_{B_2}; \alpha; \gamma)$ −diaphony of the nets $Z_{B_2}^{\mu}$ is shown.

Keywords and phrases: $(Vil_{B_2}; \alpha; \gamma)$ −diaphony; Nets of type of Zaremba-Halton; Exact orders.

AMS 2000 Classification: Primary: 11K06; Secondary: 11K31; 11K36; 65C05.

SECTION: MATHEMATICS **O-M-16**

On the $(Vil_B; \alpha; \gamma)$ −diaphony of the Van der Corput sequence constructed in generalized number system

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Abstract: We investigate the one-dimensional sequence of Van der Corput ω_B constructed in generalized B-adic number system. As a suitable tool for study of this sequence the so-called $(Vil_B; \alpha; \gamma)$ −diaphony is used. The definition of the $(Vil_B; \alpha; \gamma)$ −diaphony is based on the Vilenkin functions constructed in the same B-adic number system.

The influence of the exponential parameter α to the exact order of the $(Vil_B; \alpha; \gamma)$ −diaphony of the sequence ω_B is shown. When $\alpha = 2$ the exact order is $O(\frac{\sqrt{\log N}}{N})$ and when $\alpha > 2$ the exact order is $O(\frac{1}{N})$.

Keywords and phrases: $(Vil_B; \alpha; \gamma)$ −diaphony; Sequence of Van der Corput constructed in generalized number system; Exact orders.

AMS 2000 Classification: Primary: 11K06; Secondary: 11K31; 11K36; 65C05.

SECTION: MATHEMATICS **O-M-17**

One new complete orthonormal function system and applications in the theory of uniformly distributed sequences and Quasi-Monte Carlo integration

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We introduce new complete orthonormal function system Γ_{B_S}constructed in generalized number system. Our main purpose will be to show some applications to the theory of uniformly distributed sequences and Quasi-Monte Carlo integration in reproducing kernel Hilbert spaces. The criterion of Weyl in the terms of the functions of the system Γ_{B_S} is shown. The notion of the so-called $(\Gamma_{B_S};\alpha;\gamma)$ −diaphony is introduced and it is proved that this new kind of the diaphony is a quantitative measure for the irregularity of the distribution of sequences. The computing complexity of the $(\Gamma_{B_S};\alpha;\gamma)$ −diaphony is shown. By using the system Γ_{B_S} a new reproducing kernel Hilbert space $H_{\Gamma_{B_S};\alpha;\gamma}$ is introduced and an exact formula for the worst-case error of the integration in the space $H_{\Gamma_{B_S};\alpha;\gamma}$ is obtained. The $(\Gamma_{B_S};\alpha;\gamma)$ −diaphony of the net of the nodes of the integration and the worst-case error of the integration in the space $H_{\Gamma_{B_S};\alpha;\gamma}$ are connected.

Keywords: The system Γ_{B_S} ; $(\Gamma_{B_S};\alpha;\gamma)$ −diaphony; Uniformly distributed sequences; Weyl criterion; Reproducing kernel Hilbert spaces.

AMS 2000 Classification: Primary: 65C05; Secondary: 11K31; 11K36; 11K06

SECTION: MATHEMATICS ***O-M-18***

Mathematical modeling of adaptive immune response after transplantation

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Abstract: A mathematical model of adaptive immune response after transplantation is formulated by five nonlinear ordinary differential equations. Theorems of existence, uniqueness and non-negativity of solution are proven. Numerical simulations of immune response after transplantation without suppression of acquired cellular immunity and after suppression were performed.

Keywords: Mathematical model, ordinary differential equations, numerical simulations.

SECTION: MATHEMATICS **O-M-19**

Statistical convergence of vector valued martingales

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Abstract: Since statistical convergence is a generalization of the usual notion of convergence that, for real-valued sequences, it is developed parallel to the usual theory of convergence. This concept was further extended on vectorial spaces such as in case of Banach space. Finally, statistical convergence has been discussed in L_p spaces. Statistical convergence is used to obtain some new results on vector valued martingales of statistical Bochner integrable functions in a Banach spaces. The main purpose of this paper is to present the new results we have arrived related to the statistical convergence of martingales of statistical integrable functions in reflexive Banach spaces.

Keywords: statistical convergence, statistical integrable, martingale

SECTION: MATHEMATICS **O-M-20**

Parameter estimation in periodic time series data using block bootstrap procedures

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Abstract: Periodic time series, bootstrap procedures and missing values have been a main focus of many studies and researches nowadays. We are interested in studying altogether the performance of block bootstrap procedures in periodic time series data that have missing values in simulation cases and also real data time series. We conducted simulations using bootstrap replications and Monte Carlo trials in constructing interval estimations for the seasonal means in simulated periodic time series. Bootstrap point and interval estimations of seasonal means are obtained using the block bootstrap procedures proposed and the performance is compared in the case of completing missing values in a real data time series. Based on the results, we notice a good performance of bootstrap procedures even in the case of time series with missing values. The results obtained sustain the good performance of the chosen block bootstrap procedures in periodic time series studied.

Keywords: Block bootstrap, time series, periodicity, missing data, estimation.

SECTION: MATHEMATICS **O-M-21**

On a mathematical model of bacterial infection

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Abstract: Various bacteria are able to infect human organisms and to induce less or more dangerous diseases. In response to them the human immune system is usually activated. In addition medical therapies to the patients can be applied. One of the most popular approaches is the use of various antibiotics. However, some bacteria are able to develop resistance against the applied antibiotics. Various approaches to study these phenomena are proposed in the literature, among them tools for big data analysis, machine learning, mathematical modeling etc. In our paper we consider a mathematical model describing the interactions between immune cells, bacteria and antibiotics. We study the properties of the model. We propose numerical scheme for obtaining the approximate solutions to the model system for various values of parameters and initial conditions.

Keywords: bacterial infections, mathematical models, numerical simulations

SECTION: MATHEMATICS **O-M-22**

On stochastic models in biology

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Abstract: The presentation is devoted to some stochastic models of various phenom-ena in biology, in particular the role of genetic factors for specific features or disease. Stochastic models along with deterministic models are successfully used for mathematical description of biological processes. They apply knowledge from probability theory and mathematical statistics to analyze specific characteristics of living systems. Fundamental laws of genetics can be used to describe and study mathematically such phenomena as domi-nance, segregation and independent assortment of genetic material and their influence on phenotype of organisms. Basic concepts, methods and examples are presented and discussed.

Keywords: mathematical models, Mendel's genetic laws, genotype, phenotype

SECTION: MATHEMATICS **O-M-23**

Application of Newton’s backward interpolation using MATLAB

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Abstract: Interpolation is one of the most basic and most useful numerical techniques. It constitutes an irreplaceable tool during work with tabular or graphical functions. The Newton’s backward interpolation is one of most important numerical techniques which have huge application in mathematics, computer science and technical science. This paper provides an analytical description of Newton's backward interpolation and how MATLAB software can be used to solve the problems from Newton's backward interpolation.

Keywords: Interpolation, MATLAB, application.

SECTION: MATHEMATICS **O-M-24**

Evaluation the uncertainty in numerical models of geomechanics

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Abstract: The applied models in geomechanics are characterized by large errors of the parameters. So for compressive strength of the rock the error is up to 20%, for the linear dimensions - 5%, for top pressure on pillars and support from 50% to 100%. However, these models are presented by continuous dependencies. The uncertainty principle is a fundamental concept in the context of signal and image processing. The article discusses a method for valuation of the functional dependencies. With this method were received important conclusions for the ability of the geomechanical models to deal with uncertainty in data process.

We establish necessary conditions (condition for recoverability) for measurement the uncertainty. For optimal evaluation of the dependencies, we use relative distance in space of input parameters, calculations with semi-logarithmic derivative ensuring accordance with the relative distance and we establish relevant properties. A valuation is applied for the analytical expressions in a geomechanical model.

Keywords: evaluation of the dependencies, uncertainty principle in numerical models, relative distance, semi-logarithmic derivative, geomechanical model

SECTION: MATHEMATICS **O-M-25**

2-Dimensional manifolds with quadratic Ellipses

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Abstract: We prove that hyperbolas is quadratic curves on every 2-dimenional Riemannian manifold of constant curvature. We formulate a conjecture, that the only 2-diminsional Riemannian manifolds where the hyperbolas are quadratic curves, are that of constant curvature. We provide examples supporting this conjecture.

Keywords: Quadratic curve, 2-dimenional Riemannian manifold and constant curvature.

SECTION: MATHEMATICS **O-M-26**

A Computational Study of Autoimmune Disease Model

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Abstract: Nowadays autoimmune diseases are widely distributed. More than 80 illnesses are included into this group of conditions. Their causes are not clear exactly, but it is believed that among them are genetic factors, viral infections, socio-economic conditions etc. We propose a new mathematical model describing a general autoimmune disease in order to analyze some mechanisms of autoimmune disorders. The model is a system of integro-differential equations of kinetic type. We perform preliminary qualitative analysis of the model as well as propose an algorithm for numerical simulations. Some results of our numerical experiments are presented and commented from biological point of view.

Keywords: kinetic models, autoimmune disease, numerical analysis

SECTION: MATHEMATICS **O-M-27**

Nonlocal Riemann- Liouville Fractional Evolution Inclusions in Banach Space

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Abstract: In this paper we study the existence of solutions for nonlocal semilinear fractional evolution inclusions involving Riemann-Liouville derivative in a general Banach space. The fixed point theorem for contractive valued multifunction is used. Illustrative example is provided.

Keywords: Fractional inclusions, Riemann-Liouvill derivative, Mild solutions, Measure of noncompactness.

SECTION: INFORMATICS **O-I-1**

Text mining in distance e-learning

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Abstract: In modern education, different information systems are used to support educational processes. Nowadays, in every university, administrative information systems collect information about students, their enlistment notably programs and courses, such as realization like examination grades. Also, information about lectures, study programs, instructors and courses is collected permanently. The gathered data can be analyzed on some diverse levels. So we can make data analysis to improve the used distance e-learning methods to be more efficiently and effectively to the students.

Keywords: Data Mining, e-learning, distance e-learning, education

SECTION: INFORMATICS **O-I-2**

Computational cryptography and cloud computing technology potentially using homomorphic encryption

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Abstract: In today's era, we communicate with each other, more than ever electronically through various applications, services and distributed systems using internet. In this context, one of the most critical issues we have to resolve is to ensure the confidentiality of our data. Applied cryptography is very common and such a discussed topic according to information security. With the growing rate of many threats and attacks protecting data efficiently is becoming a real challenge. Encryption as a known protection technique has to be efficient according to different scenarios in processing data. Homomorhic encryption can perform arbitrary computations on the enciphered data without revealing the original message. One of the new emerging technologies nowadays is about cloud computing. There are so many cloud storage systems in use therefore the study of homomorphic encryption schemes and their potential use with other cryptographic algorithms becomes crucial and probably the most efficient one according to computational metrics.

Keywords: Security, Cloud Computing, Homomorphic Encryption

SECTION: INFORMATICS **O-I-3**

Software platforms for modeling of telecommunication networks

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Abstract: In the paperwork, a review of programs used to model communication networks has been made. The review is divided into three major groups: programs for modeling of IP-based networks, programs for modeling of any telecommunication networks, and programs for modeling of cloud infrastructures. For each of the three groups one program is proposed, indicating why it is selected. The chosen programs are: GNS3 (IP network simulator); Riverbed Modeler academic edition (Telecommunication network simulator) and GreenCloud (Cloud infrastructure simulator). With each of the proposed programs, simulation models of communication networks have been developed. Some of the results and capabilities of each of the three programs are shown.

Keywords: GNS3, GreenCloud, Modeling, Riverbed Modeler, Telecommunication networks

SECTION: INFORMATICS **O-I-4**

Modeling of dynamic business processes

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Abstract: The study examines the main points in building business models and the possibilities for their information provision. The current modeling mechanisms for business processes and the impact of the model on the implementation of software projects in the field of business management are examined. The problems of the software development of dynamic business structures, generated by the application of the existing modeling and programming technologies, are analyzed.

The study aims to find new approach of creating business processes which are evolving over time using non relational data bases with external logic. This type of data bases can provide flexibility and ability to make changes easily and without consequences for the data integrity. As a result we can achieve an easily maintained business object which is sustainable to drastic changes and manipulations in the course of time.

Keywords: Business process

SECTION: INFORMATICS **O-I-5**

Data Mining Trends and Research Frontiers

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Abstract: One of the most widely used methods to extract data from different sources and organize them for better usage is data mining. The data segmentation to identify various trends and patterns, detect variations, and predict the probabilities of various events happening are possible thanks to complex algorithms form the basis for data mining. There are a number of commercial data mining system available today and yet there are many challenges in this field. To stay updated and to do well in the industry and overcome challenging competition, companies need to keep track of the latest data mining trends.

Keywords: data mining, trends, predict, patterns

SECTION: PHYSICS **O-P-1**

Chitosan/alginat nanoparticles for curcumun immobilization and delivery

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Abstract: In this study an investigation of the properties of polyelectrolyte complexes will be presented. Namely, chitosan and alginate, which both are biopolymers, were used to form nano-sized complexes. These complexes are used as a drug delivery matrix in order to enhance the process of intake of the drug and it's bioavailability. The aim of this research is to show different types of drug systems made of chitosan and alginate and to investigate their properties as morphology using AFM, the changes in the spectrum of the complexes after loading the drug using FTIR, medium sizes of the complexes before and after loading the drug, loading capacity and to examine the release of the drug from the system.

Keywords: drug-loading, nano-sized polyelectrolytes, chitosan, alginate

SECTION: PHYSICS **O-P-2**

The hoyle state in relativistic ^{12}c dissociation

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Abstract: Production of α-particle triples in the Hoyle state is revealed in by the invariant mass approach in dissociation of ^{12}C nuclei at 3.65 and 0.42 A GeV in nuclear track emulsion. An estimate of the Hoyle state contribution to the dissociation $^{12}C \rightarrow 3\alpha$ is (13 ± 2) %. Reanalysis performed on this basis of existing data on coherent dissociation $^{16}O \rightarrow 4\alpha$ at 3.65 A GeV is revealed contribution of (22 ± 2) % of the Hoyle state.

Keywords: Hoyle state, relativistic nuclei, nuclear track emulsion

SECTION: PHYSICS **O-P-3**

Investigation of Chitosan/Xanthan and Hanthan/ Chitosan multilayers on corona charged polylactic acid substrates

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Abstract: In the present paper polyelectrolyte multilayers (PEMs) deposited on polylactic acid substrates were investigated. The substrates were charged in a corona discharge system, consisting of a corona electrode (needle), a grounded plate electrode, and a metal grid placed between them. Positive or negative 5 kV voltage was applied to the corona electrode. 1 kV voltage of the same polarity as that of the corona electrode was applied to the grid. Time dependences of the normalized surface potential of PLA substrates were investigated. Layer-by-layer (LbL) deposition technique was applied for multilayer build-up. The LbL deposition was done with the first built-up layer always possessing an electric charge opposite to that of the substrate. In the polyelectrolyte multilayers obtained were immobilized enzyme β-Galactosidase. The biochemical characteristics of β-Galactosidase and trans-galactosidase activity were investigated.

Keywords: polylactic acid, corona discharge, polyelectrolyte multilayers, immobilized enzymes, β-Galactosidase

SECTION: PHYSICS **O-P-4**

Molecular recognition in deep binding sites

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Abstract: Molecular recognition of small organic compounds by target proteins is of central importance for biological processes. Ligand binding is often characterized by a high degree of selectivity, both on the side of the ligand and on the side of the receptor. An important aspect of the recognition process is the depth of the binding site, which can cause the failure of traditional computational methods used to investigate such systems. Using the plant hormone auxin as a prototypical system, I will review my recent results on the topic, illustrating a framework of new numerical approaches that can be used to study the biophysical mechanisms responsible for recognition. These methods yield robust predictions and are applicable to any system with deep binding pockets, providing vital data for the rational design of new bioactive compounds and drastically reducing the cost of drug discovery.

Keywords: Molecular dynamics; Binding mechanism; Computational simulations

SECTION: PHYSICS **O-P-5**

Study of the metal parts of the electrohydropulse drill

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Abstract: We consider the changes and the quality of the surface of the electrode system of the drill after electrohydraulic pulsed treatment. Spectral analysis of the microstructure of melted regions of the drill electrode surface, formed as a result of action of a spark discharge, is performed. The regularities of erosion wear of the electrodes depending on the energy parameters and the number of electrohydraulic pulses are established experimentally. This study is devoted to the method of electrohydraulic well-drilling based on the unique phenomenon of direct conversion of the electric energy into the mechanical energy of shock waves that effectively crush rocks in a bounded spatial volume in the well bottom.

Keywords: Electrohydraulic pulse, erosive of the electrodes, high-voltage.

SECTION: PHYSICS **O-P-6**

Optical quartz fibers as non-linear media

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Abstract: Because of their ability to maintain high energy density over long distances due to the small cross section and low optical losses the fused quartz fibers are very appropriate media for observation of nonlinear optical effects. In this article is examined the possibility by using nonlinear optical processes occurring in the fused quartz fibers to determine their geometrical parameters. Non-linear optical frequency-resolved method is proposed to determine simultaneously most of the important fiber parameter, without accounting for the specific refractive index profile and is experimentally demonstrated. The ac-curacy of the obtained data is satisfactory.

Keywords: non-linear optics, optical fibers, four-photon mixing

SECTION: PHYSICS **O-P-7**

Study of residual stresses in electron beam welded constructive steel via neutron diffraction method

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Abstract: In this work non-destructive neutron diffraction method was used to determine the residual stress distributions in the gear wheel car transmission manufactured from alloyed steel and welded by electron beam. The residual stress in electron beam welded plates from the same steel is investigated. Time of flight neutron diffraction experiments were performed on FSD diffractometer at IBR-2 fast pulsed reactor in JINR (Dubna, Russia). The neutron diffraction method allowed evaluating the stress distribution in the radial and axial components of the shaft gear with welded disk. It was found that the residual stress level is quite low in welding joint. The maximal stress level is varying in the range from 150 MPa to 500 MPa. The structure of material in welded seam and heat affected zone is also examined.

Keywords: Electron beam welding, Residual stress, Neutron diffraction

SECTION: PHYSICS **O-P-8**

Influence of the substrate temperature on mechanical properties of VN deposited coatings by DC magnetron sputtering

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Abstract: The single VN ceramic coatings are widely used for cutting and forming tools and other components operating in an abrasive wear environment, having high hardness and good wear resistance.

The VN coatings were deposited on stainless steel substrates at different temperatures by Direct Current (DC) magnetron sputtering.

The structure, morphology and chemical composition of the obtained layers were investigated by X-Ray Diffraction, Scanning Electron Microscopy and Energy-Dispersive X-Ray Spectroscopy. Atomic Force Microscopy was assessed for evaluation of the coatings roughness.

The mechanical and tribological properties were measured by using Nanomechanical tester and “pin-on-disk” method, respectively.

The obtained results demonstrate the possibility of formation of hard and wear resistant coatings of VN. It was proved that the temperatures variation due to the technological process effects significantly on the ceramic coatings mechanical and tribological properties.

Keywords: DC magnetron sputtering, VN coatings, mechanical and tribological properties

SECTION: PHYSICS **O-P-9**

Optical method for reduction of carbon monoxide intoxication

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Abstract: The efficiency of the laser radiation effect on the carboxyhemoglobin (HbCO) in blood vessels and its dependence on the wavelength and the power of the irradiation are investigated. In vivo experimental measurements of the quantum yield of the laser-induced photodissociation of HbCO in cutaneous blood vessels in the visible and near IR spectral range are presented. Arterial HbCO concentration was measured by a method of fingertip pulse oximetry. It is shown that there is a decrease in HbCO concentration in the blood under the influence of the transcutaneous laser irradiation. Three maxima (at 525, 600 and 850 nm) in the spectral range are observed, wherein the decrease in the HbCO concentration exceeds 50 %. Irradiating HbCO at the spectra maximum, we measured a considerably high photodissociation yield of nearly 75%, which ensures high efficiency of photodecomposition of the HbCO in the blood. The obtained results can be used in the clinical phototherapy practice for effective treatment of carbon monoxide intoxication.

Keywords: carboxyhemoglobin, quantum efficiency, photodissociation

SECTION: PHYSICS **O-P-10**

Modeling of light propagation in layered inhomogeneous medium

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Abstract: The article considers the possibility of modeling the propagation of light in a layered inhomogeneous medium. The knowledge of students in the field of mathematics and informatics makes it possible to organize a new kind of educational activity, like mathematical and computer modeling, while studying the phenomenon of light propagation in a layered heterogeneous medium.

Keywords: optics, layered-heterogeneous medium, Snell’s law, mathematical and computer modeling

SECTION: TECHNICAL SCIENCES **O-TS-1**

Electrohydropulse method for destruction of natural minerals

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Abstract: The Republic of Kazakhstan has large reserves of mineral raw materials, but most of them are used in the production of ordinary construction materials, and only a small part is used in high-tech industries. In technological processes, the most popular minerals are quartz and wollastanite ores. In practice, the crushed mineral in the form of certain sized fractions is used in refractory, ceramic, chemical, electrical engineering, glass, construction and metallurgical industries.
The process of mineral destruction consists of several stages: screening, crushing, grinding, etc. The paper presents the results of a study of the aspects of the electro-hydraulic method for mineral destruction, in order to obtain powders of certain fractions. In the experiments, the degree of mineral grinding increases with an increase in the specific energy supplied to the discharge channel. The increase in the degree of grinding is due to the fact that first a network of microcracks is formed on the path of the shock wave, which creates a continuous stress state. As a result of the impact of pulse series on the solid fractions of minerals, at the initial stage plastic deformations accumulate, which, on the one hand, increase the strength of the minerals, and in the structure imperfection areas stresses destroying minerals arise. The results of the study of the chemical composition showed that after processing using the electrohydraulic method, the composition of the minerals does not change as compared with the starting material. In general, the materials studied are highly siliceous quartzites with a very small amount of impurities.

Keywords: natural mineral, quartz, wollastanite, electric discharge, pulse technology

SECTION: TECHNICAL SCIENCES **O-TS-2**

Influence of the main properties of the liquid on the temperature indicators of the inertial heat generator

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Abstract: Traditional types of heat energy production, in addition to meeting the needs of mankind, cause tremendous harm to the environment. In order to solve environmental problems associated with energy production, everywhere they seek to adapt renewable energy to local conditions. Along with the use of alternative energy sources for space heating, thermal installations are being developed based on previously known positions of heat engineering and hydraulics. These include the inertial heat generator, which uses the principle of throttling the liquid to heat it.

In the investigated inertial heat generator, the electric motor imparts rotational motion of the heated fluid, causing centrifugal forces that move it in the radial direction and create increasing pressure at the periphery of the rotor cavity. The rotor is installed above the surface of the liquid and is made in the form of a hollow cylindrical drum with a conical skirt. A part of the conical skirt is constantly in the liquid, and on the periphery of the drum there are chokes with calibrated holes. When throttling fluid pressure drops, which contributes to an increase in its temperature. Experiments have shown that the increase in the temperature of the working fluid is influenced not only by the angular velocity of rotation of the rotor and the area of the orifices of the chokes, but also by its basic properties. This is due to the fact that their density, specific gravity, viscosity are different.

Keywords: inertia, heat generator, throttling, pressure, temperature

SECTION: TECHNICAL SCIENCES **O-TS-3**

Thermodynamics of heavy oil activation process by means of a short pulse discharge

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Abstract: Creating an environmentally friendly production of synthetic liquid fuels involves improving the process technology of high-viscosity oil refining. To solve this problem, along with experimental studies, thermodynamic analysis of various ways of purifying high-viscosity oil is necessary.

To increase the yield of the light and medium fractions, the effects of short-pulse discharges on oil from the Karazhanbas field were investigated. Hydrogen derivative of tetralin was used to activate the hydrogen donator.

To calculate of thermodynamic functions (ΔCp, ΔH, ΔS, ΔG, ΔΦ) of the organic mass of heavy oil from the Karazhanbas field, the data of the elemental composition of heavy oil after treatment using short pulse discharges. The values of the thermodynamic function showed that an increase in the processing time from 2 to 10 minutes, results in an increase in the heat capacity Cp from 6396.579 J/mol·K to 7309.395 J/mol·K and a change in the entropy value within the temperature range from 300 K to 1000 K.

Thus, the thermodynamic functions of the organic mass of heavy oil and hydrogenates are calculated as a function of temperature and duration of exposure using short pulse discharges.

Keywords: oil, pulse discharge, organic mass, heat capacity

SECTION: TECHNICAL SCIENCES **O-TS-4**

Synthesis and characterization of Al-doped ZnO thin films

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Abstract ZnO layers doped with Al (AZO) were synthesized by Atomic Layer Deposition (ALD) technique. Optical properties, photoluminescence and electrical measurements were performed and discussed. Based on obtained characteristics, AZO layer were successfully applied as transparent conductive electrodes in liquid crystal display devices, which open great potential for the next generation Indium Tin Oxide (ITO)-free opto-electronics.

Keywords: nanolayers, ALD techniques, optical and electrical analysis, LC display

SECTION: TECHNICAL SCIENCES **O-TS-5**

Graphene: synthesis and characterizations for photonic applications

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Abstract: Graphene was grown using Chemical Vapor Deposition (CVD) technique. Its quality was characterized by Raman analysis, optical, photoluminescence and electrical measurements. Based on performed characteristics, several graphene-based Polymer Dispersed Liquid Crystal (PDLC) devices have been fabricated and their laser-induced characteristics and response time were measured and compared with conventional Indium Tin Oxide (ITO) -based PDLC devices.

Keywords: graphene, CVD, optical transmittance, sheet resistance

SECTION: TECHNICAL SCIENCES **O-TS-6**

First principles calculation and simulation of correlation functions and functions of metal melts' radial distribution

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Abstract: Majority of technological processes in metallurgy are based on extensive use of gases, liquids and granular material. From this point of view, the viscoelastic theory, which is based on one of the most important melting process's feature, that is establishment of proximity of the liquid state to the crystalline state near the melting point, is of interest. Development of given theory allows to establish and predict metal melts properties, based on interparticle interactions. Theoretical descriptions of processes occurring in melts are based on the Stokes – Kirchhoff theory, which, within the frame of classical hydrodynamics, revealed phenomenological connections between molten systems kinetic properties. Nowadays, the viscoelastic theory is widespread, distinguishing feature of which is a unified description of the liquid and solid states, that is, proximity of the liquid state to the crystalline state near the melting point. In the frame of hydrodynamic method for solving a system of equations, only specifically existing initial conditions are possible, and its asymptotic solution is possible only in the large times limit. The results show that knowledge of correlation functions necessary for the calculation of a whole row of metal melt thermodynamic properties. Methods of quantum statistical physics allow us to express coefficients of shear and bulk viscosities using correlation functions. This makes it possible to discover matter construction's physical nature through secondary quantization operators, thereby a powerful apparatus of quantum physics can be connected for research.

Keywords: density, correlation function, molten metal, hydrodynamics

SECTION: TECHNICAL SCIENCES **O-TS-7**

Mathematical approach to sifting significant technological factors into the sewing industry

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Abstract: The paper deals with damp – heating processing (DHP) in sewing industries. DHP is essential for quality and productivity in the manufacture of clothing. This process is a complex process where heat and mass transfer in ironing is realized through application a plurality of physical processes like convection, radiation, and diffusion. Their joint impact on DHP in steam-presses is not sufficiently revealed. From this point of view, we can conclude that our object of investigation appears to be a virgin land, thus the main goals should include application of statistical methods.

The goal of this paper is to investigate the importance of factors influencing the quality criteria (the shrinkage of textile materials after ironing with a steam-press), then to select the most significant factors, and finally to sort out the factors of their degree of influence on the quality criterion. To achieve these goals we make use of a specialized statistical method - the method of classifying correlation.

Keywords: sewing industries, statistical methods, quality

SECTION: TECHNICAL SCIENCES **O-TS-8**

Algorithms related to the operation of Intelligent Measurement Systems

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Abstract: This paper presents a method for calibrating measuring channels by spline-functions under IMS (Intelligent Measurement Systems).

Correction algorithms for static and dynamic mode of intelligent metering systems have been developed, which enables the improvement of the metrological features of IMS.

The basis for the construction of a suitable correction algorithm is the representation of ordinary differential equations in the state space. The metrics presented in the article improve the metrological provision of IMS.

Here are short Virtual Instruments, the conception for Virtual Instrument (VI) and now already wide used in practice. This idea is a natural evolution of computer - based measurement systems and a consequence of the increasing of the computer hardware power and the new technique of programming. Very often used program environments are: LabVIEW, DIAdem, Lab Window (National Instruments). The means of environment are: graphic programming by graphical language G with functional blocks and VI, and s.o.

There are also some problems regarding the reliability and metrological provision of the measuring instruments.

Some experimental data relating to the metrological failures of the measuring instruments are presented.

Keywords: measurement systems, Virtual Instruments, metrology, calibration.

SECTION: TECHNICAL SCIENCES **O-TS-9**

Recursive sliding DFT of second kind

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Abstract: Many digital signal processing applications, like speech processing, medical imaging, communication systems, etc., use frequency-domain algorithms for processing signals. The standard method for spectrum analysis is the Discrete Fourier transform (DFT), typically implemented using a Fast Fourier transform (FFT) algorithm. The FFT calculates the frequency components in a window, on a block-by-block basis. If that window is move by one sample, it is obvious that most of the information will remain the same. An algorithm called Sliding Discrete Fourier transform (SDFT) is used for the purpose. It has been noted that the decimation in time radix-2 FFT structure has property which makes it efficient when the input data is sliding one sample at a time and the transformation has to be performed after the arrival of every new sample of input. In the current literature, the term running DFT has also been used for this purpose. In the other hand, the recursive Sliding Discrete Fourier Transformation (rSDFT) is a technique for calculating the Fourier coefficients with a computational complexity proportional to the O (N) for every input sample. This can be achieved by using a set of parallel recursive digital filters. There are two expressions for the recursive algorithm. The first is often considered in the special literature. The second expression is especially popular for hardware solutions. This article shows the relation between the rSDFT of first and second kind.

Keywords: recursive sliding discrete Fourier transform, Fast Fourier transform (FFT).

SECTION: METHODOLOGY IN EDUCATION **O-ME-1**

Evaluating the results of critical thinking on a dot product problem

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Abstract: In this talk we present the results of an experiment conducted among first year mathematics university students. Our objective is to evaluate critical thinking skills upon a simple dot product problem. Even though students have enough theoretical knowledge, i.e. they know the geometric definition of the dot product along with the dot product formula for any two vectors in terms of the coordinates of two- and three-dimensional vectors, and enough practice in solving dot product problems, it appears that they have issues analyzing arguments and making reasonable deductive conclusions when the solution does not "add up". It is clear that background knowledge is a necessary but not a sufficient condition for enabling critical thinking. Is extensive exercise of selected problems in vector algebra enough to achieve better critical thinking? We suspect that there might be a wide-ranging pedagogical and social-psychological issue in the teacher-student communication and attitude toward errors in the prior secondary and/or even elementary education. There is also the problem regarding the application of formally adopted knowledge. In that case, the circumstances require larger interdisciplinary study of the problem.

Keywords: dot product, reasoning, problem solving.

SECTION: METHODOLOGY IN EDUCATION **O-ME-2**

Visual approach to teaching basic function properties - composition of two functions and inverse of a function

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Abstract: We believe that the common teaching approach of introducing the composition of two functions might lead to confusion and misunderstanding of the concept in general. This can generate mistakes in the further education process, starting from basic calculus problems (e.g. finding a domain/range of a function), application in calculating derivatives via the chain rule, etc. As a possible solution to remedy the situation, we suggest using an Applet in Geogebra for visualizing the process of finding a composition of two functions, that would hopefully get the whole concept closer to students. Furthermore, it provides a geometric interpretation of the standard algebraic method for determining a composition of functions and contributes to deeper understanding of the meaning of inverse of a function (as a graph) as well.

Keywords: composition of functions, inverse function, Geogebra

SECTION: METHODOLOGY IN EDUCATION **O-ME-3**

Psychology of heuristic methods for solving physics problems

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Abstract: Overview of heuristic methods for solving physics problems. Qualitative, psychological analysis of heuristic abilities and methodology for their evaluation. Described are opportunities for heuristic training.

Keywords: Heuristics, heuristic problems, physics problems, physics, mathematics, methodology of physics education, pedagogy, psychology, cognitive science

SECTION: METHODOLOGY IN EDUCATION **O-ME-4**

Formation of scientific competence in new curricula

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Abstract: In recent years, the trend in education has been to shape and develop competencies. They are necessary for the quality development of young people.

Changes in newly introduced curricula are aimed at raising the level of Bulgarian education. The expected results are focused on the formation and development of competencies. The whole of which lead to the formation of scientific literacy.

Keywords: chemistry, scientific literacy, students

SECTION: METHODOLOGY IN EDUCATION **O-ME-5**

The soaps – science and attraction

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Abstract: The chemical experiment with real application in practice is an opportunity to increase the interest of the students in science chemistry. A possibility of experimental work in a real environment is the synthesis of alkaline salts of higher fatty acids (soaps). The ability of students to make glycerin soaps themselves is an interesting challenge for them.

By participating in experimental work, students develop chemical literacy, laboratory skills, teamwork skills, logical and critical thinking when dealing with concrete laboratory tasks. Students learn to link chemistry to real life by solving laboratory problems.

Keywords: chemistry, scientific competence, students

SECTION: METHODOLOGY IN EDUCATION **O-ME-6**

Interdisciplinary relations in physics education – an important factor in improving student motivation

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Abstract: The paper deals with the problem of improving the motivation of high school students as an important condition for achieving the established education goals and underscores the use of interdisciplinary relations in education as a possible approach to the solution of this problem. A particular variant of a physics and astronomy lesson for the 10th grade is proposed basing on the interdisciplinary relations: physics – Russian language – information technology. The practical realization of the lesson is traced in both organizational and technological aspect elucidating the importance of such type of motivating education for the development of various skills (research, linguistic, digital, etc.).

Keywords: motivation, physics education, interdisciplinary relations, Russian language, information technology.

SECTION: METHODOLOGY IN EDUCATION **O-ME-7**

Safe Internet – educational computer games for lower secondary school

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Abstract: XXI century is a century in which the access is easier than has ever been. For sure the more we increase the access to internet, the more dangerous the internet would be. In the article is presented an educational computer game "Safe in the Internet". The game is consisted by 4 mini games (Situations, Let's Save Polly, Who wants to be a millionaire, Let's make the puzzle) in field of Safe Internet. Main aim of the games is to check how the students will react in different type of dangerous realistic situations in the Internet, if they know the rules for safe Internet. The games are suitable to educational curricula of ICT school subject. The target group of the games is students between 5-th and 7-th grade. The levels of the different grades are separated and the games could be used and played with all the 3 grades in order to introduce the rules of safe browsing and reminding them as well.

Keywords: safe internet, educational computer games, lower secondary school, ICT

Poster Presentations

CHEMISTRY **P-C-1**

Evaluation of separators influence on charge acceptance of negative plates of lead-acid batteries

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Abstract: The aim of present investigation is to evaluate the influence of two types separator on the charge/discharge performance of the negative plates in a lead acid battery. Two types of separators are investigated, denoted as AGM (Absorbent Glass Mat) or PE (polyethylene) separator. AGM separator has very low internal resistance, high liquid absorptive, high chemical purity. PE separator material is characterized by high puncture strength, good oxidation resistance, and excellent flexibility.

The test cell used comprises a flat pure lead working electrode and two symmetrically placed pure lead counter electrodes. All electrodes are enveloped in separators of the respective type. The electrolyte is 1.28 g cm^{-3} sulfuric acid water solution. Linear sweep voltammetry measurements are conducted to characterize the behavior of the Pb electrodes between the hydrogen evolution and oxygen evolution reactions. Potentiostatic reduction experiments are performed to test the reactivity of lead sulfate deposits. X-ray diffraction analysis and scanning electron microscopy are used to cha-racterize the surface of the electrodes.

Keywords: lead-acid battery, separators, linear sweep voltammetry

CHEMISTRY **P-C-2**

Electrochemical behavior of lead acid battery alloys in the presence of different surfactant additives in the electrolyte

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Abstract: The focus of present study is to elucidate the basic effects of sodium dodecyl sulfate(SDS), cetyltrimethylammonium bromide(CTAB) and sodium tripolyphosphate (STPP) as electrolyte additives on the electrochemical reactions proceeding on a lead electrode immersed in 4.5M H_2SO_4 solution by applying linear sweep voltammetry (LSV) measurements in the $PbSO_4$ / PbO_2 potential region. The lead electrodes are manufactured from pure Pb (99.99%), Pb-Ca-Sn, Pb-Sb or Pb-Sb-Se alloys. Addition of SDS or CTAB to the electrolyte seems to improve the discharge capacity of the anodic layer whereas STPP molecules are adsorbed on the surface of the electrode and inhibit almost completely the oxidation reaction of $PbSO_4$ to PbO_2, thus confirming previous studies on the influence of phosphoric acid as electrolyte additive in lead acid batteries.

Keywords: lead acid battery, lead electrode, surfactant, linear sweep voltammetry

CHEMISTRY **P-C-3**

Substituted cinnamic acid amides of 4-Aminoantipyrine: Synthesis and biological activities

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Abstract: Antimicrobial resistance continues to be an increasingly serious threat to global public health. Therefore, the necessary of the development of novel antimicrobial agents is of great importance.
In our work a series of *N*-cinnamoyl amide of 4-aminoantipyrine was synthesized in moderate yields. The stuctures of synthesized compounds were confirmed by IR, ESI-MS, ^{1}H- and ^{13}C-NMR spectral methods. Further, the amides were screened *in vitro* for their antibacterial (*Staphylococcus aureus, Escherichia coli*) and antifungal activities (*Candida albicans*). The results revealed that the synthesized compounds displayed not so good antimicrobial activities against the tested strains compared to the used references (antibiotic tobramycin and the antifungal drug ketoconazole). The evaluation of antioxidant activity is *in progress*.

Keywords: cinnamoyl amides, 4-aminoantipyrine, antioxidant activity, antimicrobial activity

Acknowledgments: The authors gratefully acknowledge financial support of South-West University "Neofit Rilski", Bulgaria (project RPY-A3/19)

CHEMISTRY **P-C-4**

Enhanced photosynthetic properties of aquatic plants used as biocatalysts in Plant-MFC

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Abstract: In our previous studies, we have demonstrated for the first time that higher aquatic plants *Lemna minuta* and *Lemna valdiviana* can be used as biocatalysts in the so-called Direct Photosynthetic Plant Fuel Cell (DPPFC). The aim of this study was to verify the possible utilization of another duckweed species - *Wolffia globosa*, as a plant fuel cell biocatalyst. After three days of adaptation, stable current density outputs between 160-180 mA/m^2 were achieved and the OCV reached maximal values of 670 mV. Besides the DPPFC performance, the intracellular changes in the plants as a result of polarization were also examined. An increase in the carbohydrates content and the specific amylase activity in the organelle fraction is established. Intensified phosphorous metabolism and increased plant biomass have been also observed under polarization.

Keywords: duckweeds, Wolffia globosa, Direct Photosynthetic Plant Fuel Cell, electricity generation, intensified metabolism

Acknowledgments: This study was supported by the National Scientific Program "Low-carbon energy for transportation and household (E+)" – Contract D01-214/2018.

CHEMISTRY **P-C-5**

Mathematical modeling of drying kinetics of *Morchella esculenta* mushroom, Bulgaria

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Abstract: Drying kinetics of *Morchella esculenta* mushroom slices (2 mm) in a fan oven was studied at air temperatures of 35, 45 and 55°C. Drying of Morchella esculenta mushroom slices occurred in two falling rate periods for each of the pointed temperatures. In order to select a suitable drying curve, eleven thin layer-drying models were fitted to the experimental moisture ratio data. All the models were compared using statistical parameters: coefficient of determination (R^2), sum square error (SSE), root mean square error (RMSE), reduced chi-square (χ^2) and mean bias error (MBE). The best one among the mathematical models investigated was resolved describing the drying behaviour of Morchella esculenta mushroom slices with high (R^2) values and low SSE, RMSE, χ^2 values. The effective moisture diffusivity (Deff) of Morchella esculenta mushroom increased as the drying air temperature increased.

Keywords: moisture diffusivity, mathematical model, Morchella esculenta mushrooms

CHEMISTRY **P-C-6**

Activity concentration of Cs-137, Cs-134, Th-234 and K-40 in wild edible mushroom gathered 32 years after the Chernobyl power plant accident in Batak Mountain, Bulgaria

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Abstract: The aim of this study was to evaluate Cs-137, Cs-134, Th-234 and K-40 activity concentrations and effective doses in Hydnumrepandum, Suillus luteus and Morchella esculenta mushroom gathered in Batak Mountain, between April 2018 and November 2018. The time interval is chosen purposely as 2016 marks 30.17 years elapsing from the Chernobyl nuclear disaster, equal to the half-life of Cs-137. Thus, the difference between laboratory and real conditions will be evaluated. The Hydnum repandum mushroom was chosen as it is present in the Rapid Alert System for Food and Feed database for excessive radioactive contamination and substantial accumulation of Cs-137, Cs-134, Th-234 and K-40. Mushrooms Suillus luteus and Morchella esculenta are characterized by low and medium levels with Cs-137, Cs-134, Th-234 and K-40.

Keywords: Cs-137, Cs-134, Th-234 and K-40, effective dose, wild edible mushrooms, Bulgaria

CHEMISTRY **P-C-7**

The trace elements content in Wild Edible Mushrooms samples and econometric modelining data

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Abstract: The concentrations of trace elements (Pb, Cd, Co, Mn, Cu, Zn and Fe) in the wild edible mushrooms, samples collected from the Batak mountain, Bulgaria have been determined by flame and graphite furnace atomic absorption spectrometry AAnalyst 800. The samples were digested in a microwave closed system Multiwave 3000. All elements concentrations were determined on a dry weight basis. Good accuracy was assured by the analysis of standard reference materials. In all cases, quantitative analytical recoveries ranging from 97.2 to 104% were obtained. We was used ordinary least squares multiple linear regression model to identify the dependences of trace elements in wild edible mushroom samples. All statistical computing, analysis and all chartings were performed with the Statistical software R program.

Keywords: atomic absorption spectrometry, trace elements, wild edible mushrooms

CHEMISTRY **P-C-8**

Sample preparation for nutritional analysis of Wild Edible Mushrooms, Bulgaria

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Abstract: Bulgaria has a very rich fungal flora due to its phytogeographical position. The screening of chemical content and active substances of mushrooms becomes an important subject not only for Bulgaria but also for all over the world. Samples were collected from the Batak Mountain, Bulgaria. The aim of this study was to perform analysis of the content of fatty acid and phospholipids, in wild edible mushroom Amanita caesarea The content of Saturated fatty acids consisted of 25.4%. Unsaturated fatty acids in the oil from mushroom 74.6% and the content of monounsaturated fatty acids consisted of 60.8%. On the other hand, the amount of monounsaturated fatty acids was lower 13.8%. In the phospholipid fraction from mushrooms, there dominated phosphatidylcholine 10.5% and phosphatidylethanolamine 10.5%, as a major components, followed by phosphatidylinositol 9.7%. The quantities of lysophosphatidylcholine and lysophosphatidylethanolamine in the phospholipid fraction were from 8.2% to 8.5%.

Keywords: Fatty acid, Phospholipids, Mushroom (Amanita caesarea), Bulgaria

CHEMISTRY **P-C-9**

Impact of molecular weight of polyvinyl alcohol on the quality of filaments for Three Dimensional (3D) Printing

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Abstract: Three Dimensional (3D) Printing is an innovative technology of creating objects layer by layer according to a computer model, which has increasing popularity in the personalized medicine. Fused deposition modelling (FDM) is a printing technique which is of particular interest for the pharmaceutical technology in terms of producing patient-specific dosage forms. In this method the source material is in the form of thermoplastic filament, which is processed through a heated nozzle.

The filaments are produced via hot melt extrusion (HME) of thermoplastic polymers, polyvinyl alcohol (PVA) being among the widely used ones. In this study has been investigated the suitability of different grades of PVA for production filaments, with focus on the degree of polymerization and the degree of hydrolysis. The influence of additional plasticizer has also been considered.

Keywords: 3D printing, Fused Deposition Modelling, polyvinyl alcohol, pharmaceutical technology

CHEMISTRY **P-C-10**

Comparatative study of the catalytic and non-catalytic oxidation of sulphide from model solutions of sea water

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Abstract: Oxidation of sulphide ions from model sea water solutions with and without a catalyst has been investigated. The catalyst used is zirconium dioxide (ZrO_2) incorporated in activated carbon matrix, the surface of which is characterized by adsorption to iodine. The experiments were conducted at different initial sulphide ion concentrations and temperatures and two modes of operation - continuous aeration and stirring at constant speed. The rate of oxidation in continuous aeration processes is twice as high as that of constant rate stirring processes without aeration. In the presence of a catalyst and a continuous aeration process, the sulfide ions are oxidized for 1 hour at 60 °C and 2 hours at 20 °C with the reaction products being 90% sulfate ions relative to the starting sulfide. At the same temperatures and concentrations, but in the non-aeration-stirring processes, a significant amount of intermediate compounds - resistant reducers - are obtained, and therefore this option is ecologically unacceptable. The oxidation rate of the processes carried out without a catalyst is 50-80% lower in both modes of operation.

In order to increase the active surface, the catalyst is incorporated into pyrolyzed and activated carbon paddling. Comparative experiments were carried out with paddling with and without a catalyst as well as non-pyrolized paddling are conducted. The number of cycles in which paddling can be used is studied.

Keywords: sulphide ions, oxidation, ZrO_2 catalyst, sea water

Acknowledgements: This work has received funding from the National Research Program "Low Carbon Energy for the Transport and Household (E^+)" granted by the Bulgarian Ministry of Education and Science.

CHEMISTRY **P-C-11**

Non-carbon supported Ir-based catalyst for OER in PEMWE

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Abstract: The water electrolysis with polymer electrolyte membrane is the most attractive technology for producing pure hydrogen powered by electricity generated from renewable sources (e.g., sunlight, wind, etc.). It is a zero emission environmentally friendly process. The choice of efficient catalysts dispersed on high surface area stable catalytic supports has important role for the reliable operation and durability of the membrane electrode assembly (MEA) - the main PEMWE component where the energy conversion (electrical to chemical) takes place.

The present research has been focused on the reduction of Ir noble metal loading by its deposition on different non-carbon catalytic supports. A series of catalysts having different supports and different noble metal loading have been synthesized as nanoparticles using the well-established sol gel technique and characterized in terms of structural (XRD) and morphological (TEM) features. Their electrochemical behavior has been investigated by cyclic voltammetry and steady state polarization techniques in 0.5M H_2SO_4. The most active catalysts have been integrated as anode in a membrane electrode assembly (MEA) and investigated in a PEMEC at elevated temperatures. MEA demonstrated high activity during repetitive potential cycling and sustainable performance. The best performed catalyst in PEMEC operated at 80 ^{O}C ensures intensive and sustainable oxygen evolution with current density reaching 170 mA cm^{-2} already at 1.45 V.

Keywords: Oxygen evolution reaction, Non-carbon catalytic supports, Montmorillonite, Iridium, Tin

Acknowledgments: This study was supported by the National Scientific Program “Low-carbon energy for transportation and household (E+)” – Contract D01-214/2018.

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-1**

Impact of seasonality on the ecological status/potential assessment of the standing waters determined by biological quality element macrozoobenthos

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Abstract: The development of an appropriate ecological status/potential assessment metric based on a biological quality element macrozoobenthos has its importance in the context of the specifics of the standing aquatic ecosystems as well as the anthropogenic pressure on them. It is essential to take into account the seasonal fluctuations of the environmental factors and their impact on the composition of the bottom invertebrate fauna and, accordingly, on the assessment of the status/potential of the different types of standing water bodies. The aim of the study is to make a comparative analysis of the estimates based on different indices during different seasons of the study along the vegetation period. The study was carried out on the basis of studies in 13 representative types of standing water reservoirs (lakes and dams) situated in Ecoregion 7 Eastern Balkans. Methods applied for the purposes of biological monitoring in Bulgaria and for the reporting of the state of standing waters to the European Environment Agency were used. An analysis of the similarity in the taxonomic composition of the macrozoobenthos was made in three different seasons (summer 2018, autumn 2018, and spring 2019) of a study. The changes in the ecological quality ratio assessment were identified and the natural and anthropogenically induced causes of these changes in the studied water bodies were analysed.

Keywords: standing water bodies, macrozoobenthos, ecological status/potential

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-2**

Development of macroinvertebrate communities under different hydrological conditions of the ripal zone of the Bulgarian stretch of Danube River

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***Abstract**:* Distribution and abundance of macroinvertebrates in the ripal zone of rivers can be strongly affected by the changes in the hydrological conditions. A dramatic drop or a sharp increase of the water level can cause an alteration of the suitable habitats thus making it difficult for the more sensitive taxa to adjust. The relationship between macroinvertebrate abundance and distribution and fluctuation of the water level was studied at several sampling sites along the Bulgarian ripal zone of the Danube River. The representatives of Turbellaria, Hydrobiidae and Chironomidae as well as *Lithoglyphus naticoides* (C. Pfeiffer, 1828), *Corbicula fluminea* (O. F. Muller, 1774), *Unio tumidus* Philipson, 1788 and *Unio pictorum* (Linnaeus, 1758) were more sensitive to the water level fluctuation and prefer a more stable conditions. On the other hand, with the rising of the water level representatives of Hydra, Chironomidae and Hydropsychidae, *Corbicula fluminea* and *Caenis macrura* Stephens, 1835 decreased their abundances while other taxa of Tubificidae family and the snail *Physella acuta* (Draparnaud, 1805) found good conditions for development. A comparison of macroinvertebrate communities was also made between the extremely low water year 2013 and the extremely flooded year 2014.

Keywords: macrozoobenthos, water level fluctuations, ripal, Danube River

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-3**

Current ecological status of lotic ecosystems in Vitosha Mountain Reserves (Torfeno Branishte and Bistrishko Branishte)

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Abstract: The national legislation on surface waters characterization (Ordinance N4/2012) was applied for the physicochemical and biological (macrozoobenthos) quality elements (WFD 60/2000) of the rivers in Torfeno Branishte (Vladayska and Boyanska Rivers) and Bistrishko Branishte Reserves (Bistritsa and Yanchovska Rivers) in view of ecological status assessment. Water samples were collected and analysed both for physicochemical elements (pH, dissolved oxygen, conductivity, biological oxygen demand, nitrate and ammonium nitrogen, chlorides, sulphates) and macrozoobenthos (by calculating the regulated indices Total number of taxa and Biotic index). The analysis of leading Biotic index and the supporting physicochemical parameters show a "good" ecological status for all studied rivers. The results obtained for the representative surveyed river sites, can be utilized in decision-making process to insure the relevant measures for prevention the anthropogenic pressure and further maintaining the high water quality of the aquatic ecosystems in the studied reserves.

Keywords: macrozoobenthos, physicochemical elements, rivers, ecological status

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-4**

Distribution and activity of Caspian Whip Snake, *Dolichophis caspius* (Gmelin, 1789) (Reptilia: Colubridae), in South-Western Bulgaria

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Abstract: The purpose of the study is to supplement, summarize and analyze data about the distribution of the Caspian Whip Snake (*Dolichophis caspius*) in south-western Bulgaria. An attempt has been made to characterize the species seasonal and 24-hour activity. Many new individuals in many new localities have been recorded and the distribution of the species in this part of the country has been specified and mapped. It spreads northward throughout Zemen Gorge in the Struma River valley, and northward throughout Momina Klisura Gorge in the Mesta River valley. It has been determined that the species is active from the end of March till the beginning of November. The diurnal activity of the snake has been confirmed completely.

Keywords: *Dolichophis caspius*, distribution, activity, biogeography, Bulgaria.

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-5**

Distribution of Cat Snake, *Telescopus fallax* (Fleischmann, 1831) (Reptilia: Colubridae), in South-Western Bulgaria

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Abstract: The aim of the report is to supplement and summarize the data about the spread of the Cat Snake (*Telescopus fallax*) in south-western Bulgaria. Many new localities have been registered in the Struma River valley. To the north, the distribution of the species reaches the city of Blagoevgrad and its surroundings. The role of the Cat Snake for a future zoogeographical subdivision of Bulgaria is defined as significant. The species can be used as an indicator taxon as its range delineates very well the boundaries of the Mediterranean area in the country.

Keywords: *Telescopus fallax*, new locality, distribution, SW Bulgaria.

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-6**

Breakthrough in anti-poison struggle after introduction of intensive satellite tracking of Griffon Vultures in Balkans

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Abstract: At present poison baits use to control predators is illegal in Europe, including the Balkans, but it is still in use by local people as a quick and affordable "solution" for resolving the conflicts with carnivores and other wildlife. Many different approaches and activities were implemented in the last two decades to combat poisoning in Balkans, but the problem is still out of control with repeating episodes of catastrophic events for vultures in the region. We introduced patagial transmitter, which in the case of the griffon vulture, being more exposed to the sun, provides for better load of the batteries through the solar panel, and thus possibility for frequent and abundant data load. A GPS fix may be obtained as less as every 1 minute and data load as less as every 10 minutes. This intensity of tracking the vultures is a good tool to control their whereabouts in real time. This is essential advantage or even a breakthrough in anti-poison struggle. We report on the methodology developed and the first results introducing an early warning system for wildlife poisoning and poaching control and monitoring.

Keywords: wildlife poisoning, GPS transmitters, conservation, Gyps fulvus, Vulture Safe areas

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-7**

Past and present state of the Cinereous Vulture (*Aegypius monachus*) in Bulgaria

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Abstract: Widespread in the past, the cinereous vulture has disappeared in most of Europe (including Bulgaria) in the twentieth century. Surviving nucleus remained only in Spain, Greece, Ukraine and the Caucasus. The species is considered extinct as nesting in Bulgaria yet within the Red Data Book in 1985. Despite occasional observations in the country and frequent presence and even sporadic nesting of solitary pairs in Eastern Rhodopes, the cinereous vulture's Balkan Peninsula population (only one colony of 20-30 pairs in NE Greece) shows inability to increase further, disperse and reestablish naturally. This justifies the need to assist creation of new and more nesting sites to ensure long-term conservation of the species, based on local reintroduction in Bulgaria. After the success with the local reintroductions of the griffon vulture since 2010 in the Kresna Gorge and different places along the Balkan Mountains the conservation community in Bulgaria was encouraged to further proceed with the exploration and planning of reintroduction and conservation activities for the cinereous vulture.

Keywords: local extinction, reintroduction, conservation, Aegypius monachus, Gyps fulvus

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-8**

Conservation threats for wildlife in Eastern Sofia plain

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Abstract: Sofia plain is one of the most human-influenced regions in Bulgaria, with the highest concentration of population and infrastructure, related to the situated here capital city of Sofia. The present research was conducted for a period of two years with identified transect, covered two times per month by members of students of club Skorec, Faculty of biology. As a result of the observations a variety of conservation threats were identified. We observed roadkills, consisting of bird and mammal species - Columba livia domestica, Pica pica, Sturnus vulgaris, Asio otus, Canis aureus, Vulpes vulpes, Sylvaemus sylvaticus, Mustela nivalis, Erinaceus concolor, Rattus norvegicus, Meles meles, Martes foina, Lepus europaeus. The disturbance was highly concentrated in the area of Ognyanovo dam, where the human presence was significant for at least 8 months per year. Habitats destruction was identified near town of Elin Pelin, where a riverbed was highly modified for safety reasons.

Keywords: conservation threats, wildlife, Sofia plain

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-9**

Determination of the concentration of particulate matters in the air in Blagoevgrad Municipality

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Abstract: At present, Bulgaria is in the process of punitive procedures due to long-term, periodic registration of excessive levels of fine particulate matter, mainly due to the use of local solid fuels for heating and the old car fleet. Fine particulate matter is a serious problem for air quality in major cities in our country, including in Blagoevgrad, and poses a potential risk to the health of the exposed population. The aim of the study is to register the concentrations and outline the trends in the change of the concentration of fine particulate matter in representative monitoring stations on the territory of Blagoevgrad Determination of the concentration of particulate matters in the air in Blagoevgrad municipality. Different points according to the degree of loading/pollution including industrial-oriented, transport-oriented, urban and suburban were selected. The points are positioned outside the officially designated by the respective authorized institutions. The results were compared with the normative requirements in the national legislation in the field of air cleanliness. Hot spots with critical exceedances of the surveyed indicators were recorded. The study is pilot and is the beginning of systematic observations for future trend reporting, and development of forecasting models and measures to improve the air quality in Blagoevgrad municipality.

Keywords: particulate matters concentration, Blagoevgrad municipality

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-10**

Evaluation of the risk of Pb and Cd deposition on Bulgarian forests using a critical load Approach

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Abstract: The current study was designed to calculate the critical loads of lead (Pb) and cadmium (Cd) for forests in different mountainous sites in Bulgaria and to assess a risk of damage caused by these metals for 2017 year. Steady-state mass balance model for input and output metal fluxes from an ecosystem was applied, based on the criterion for ecotoxicological protection. These mass fluxes were calculated based on measured data. The value of critical load for Cd was considerably lower than those for Pb. That means all forest ecosystems were more sensitive to the Cd deposition compared to the Pb one. It was found that the critical load for Pb and Cd for coniferous stands was higher than those for the deciduous one. Exceedances of critical loads of Pb and Cd for four study sites during the 2017 year were calculated and used as a criterion for risk assessment against heavy metal pollution. Exceedances of critical loads for both metals were found, e.g. a real risk of the harmful effect of Pb and Cd for all study sites.

Keywords: Critical loads, Heavy metals, Risk assessment, Forest ecosystems, Lead and Cadmium

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-11**

Modeling the behavior of natural radionuclides and environmental risk in the sites from the mining uranium ore in Bulgaria

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Abstract: In the article are included some parts of the results of modeling of technogenic soils formed after underground and open uranium ore extraction and zonal soil types in the area of 30 sites in the forests of Bulgaria (Stara Planina massif, Rila-Rhodope massif and Transko Kraishte).

The modeling performed is based on the established strong positive linear relationships between the studied radionuclides and the pH. When reducing the acidity with one pH unit – the prognosis is for increasing the content of radionuclides (^{232}Th - section "V shaft" mine, 238U - "Ribaritsa" mine, ^{40}K, ^{232}Th - Yavorovets mine, ^{40}K, ^{232}Th, ^{226}Ra, ^{238}U - "Selishte" mine, ^{226}Ra, α-activity - "Zdravetz" mine).

The environmental risk is significant due to stimulation of the processes of weathering and release of pollutants. In conclusion, the good practice examples have been proposed as opportunities for the environmental risk reduction, following the recultivation of the Kurilo mine - Iskra section and the V shaft section. The technologies used in the recultivation are developed on the basis of the specific activity of ^{226}Ra in the soil. These technologies can be used in sites with a similar activity of ^{226}Ra in the soil.

Keywords: model, radionuclides, mining uranium ore

ECOLOGY & ENVIRONMENTAL PROTECTION **P-E-12**

Intraindividual variations in antioxidant defense response of the common Black sea mussel

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Abstract: The mussel Mytilus galloprovincialis Lam. is a notorious sentinel species often serving as pollution indicator in monitoring programs. Recently, a number of antioxidant biomarkers were proposed for evaluation of biological effects of different contaminants. The present study aims to assess the individual reactions of mussel tissues towards the environmental pressure indicated by oxidative stress markers. Mussel specimens were collected from the coastal zone of the Southern Bulgaria Black Sea. The hepatopancreas, gills and foot were used for spectrophotometric determination of lipid peroxidation (LPO) and glutathione levels, and the activity of the antioxidant enzymes catalase, superoxide dismutase, glutathione peroxidase, glutathione reductase, glucose-6-phosphate dehydrogenase. The gills and the digestive gland seemed to be the more reactive tissues showing low glutathione and high LPO levels. Statistical analysis (Wilcoxon test), revealed significant difference between the oxidative stress reaction in the digestive gland compared to the gills, and difference of both from the foot.

This work was supported by grant КП-06-Н21/7 of National Science Fund, Bulgaria.

Keywords: lipid peroxidation, antioxidants, Mytilus galloprovincialis

MATHEMATICS **P-M-1**

Geometric characteristics and properties of a three-parametric family of lie groups with almost contact B-metric structure of the smallest dimension

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Abstract: Almost contact B-metric manifolds of the lowest dimension 3 are constructed by a three-parametric family of Lie groups. Our aim is to determine the class of considered manifolds in a classication of almost contact B-metric manifolds and their most important geometric characteristics and properties. It is established also the type of the constructed Lie algebras in the Bianchi classication.

Keywords: almost contact B-metric manifold, Lie group, Lie algebra, indenite metric

MATHEMATICS **P-M-2**

The components of the structure tensor of five-dimensional almost contact B-metric manifolds

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Abstract: Almost contact B-metric manifolds of the dimension 5 are considered. Our aim is to determine the corresponding components of the structure tensor of these manifolds. Some known examples of almost contact B-metric manifolds are commented.

Keywords: almost contact manifold, Norden metric, B-metric, structure tensor

INFORMATICS **P-I-1**

Modeling and optimization of ligand binding to CBR2

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Abstract: In the last few years there has been a growing interest in the modeling and optimization of the ligand binding to cannabinoid receptor type 2, named CB2. It is G protein coupled receptor which is predominately expressed in the immune system. The article represents the structure-activity relationship between the model of the human CB2 receptor with crystal structure (PDBid:5zty) and a series of cannabinoid ligands. Analysis of ligand binding to the receptor provide important insight into the activation mechanism of CB2. The findings suggest that this could be useful for rational drug design toward precise modulation of the endocannabinoid system.

Keywords: modelling, CB2 receptor, docking, scoring functions, ligand-receptor interactions

Acknowledgments: This work is partially supported by the project of the South-West University "Neofit Rilski", Blagoevgrad, Bulgaria: "Modeling the structure-activity relationship between cannabinoid ligands and cannabinoid receptors".

PHYSICS **P-P-1**

Applications of nuclear track emulsion technique

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Abstract: Application of the nuclear track emulsion technique (NTE) in radioactivity and nuclear fission studies is discussed. It is proposed to use an automated microscope to search for collinear tripartition of heavy nuclei implanted in NTE. Calibrations of α-particles and ion ranges in a novel NTE are carried out. Surface exposures of NTE samples to a ^{252}Cf source started. Planar events containing fragments and long-range α-particles as well as fragment triples only are studied. NTE samples are calibrated by ions Kr and Xe of energy of 1.2 and 3 A MeV.

Keywords: nuclear track emulsion, radioactive nuclei, dissociation

PHYSICS **P-P-2**

Dissociation of relativistic ^{10}B nuclei in nuclear track emulsion

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Abstract: Progress in the study of nuclear clustering in the relativistic ^{10}B nuclei dissociation in nuclear track emulsion is presented. Recent findings related with the unstable ^{8}Be nuclei in the coherent dissociation (“white” stars) are highlighted. The contribution of them to the structure of the nucleus in question is determined on the basis of measurements of the emission angles of relativistic He and H fragments.

Keywords: radioactive nuclei, dissociation, nuclear track emulsion

PHYSICS **P-P-3**

Some preliminary results on the similarities in the relative distribution of mass densities of the studied aerodispersed systems of limited volume and liquids

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Abstract: In this work a comparison between the relative distribution of mass density of aerodispersed systems of limited volume (aerosols of high concentration) and some liquids was made. The array of data used for the aerosols was obtained in an experimental setup based on laser light scattering. The data used for the liquids was taken from the reference literature. The collected data is approximated using Gaussian curves and presented graphically. The appliedstatistical analysis showed significant correlation between therelative distribution of mass densities of the studied aerodispersed systems of limited volume and that of the corresponding liquids.

Keywords: aerodispersed systems of limited volume, liquids

Acknowledgement: The present work reveals the grace of the National Program "Young Scientists and Postdoctoral Students" - National Strategy for Scientific Research in the Republic of Bulgaria 2017-2030.

PHYSICS **P-P-4**

Study on development orodispersible films producing apparatus-prototype for pediatric and geriatric care

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Abstract: Present work reveals approach on development prototype of device for preparation of orodispersible films, known also as oral films, buccal strips/films, based on biodegradable, natural polymers for prospective utilization in pediatric and geriatric care. Orodispersible films appear to be an innovative system for delivering APIs to the human body. They are compromising APIs (drug/s) and excipients, most often natural or synthetic polymers, plasticizers, surfactants, flavor enhancers, sweeteners, excipients stimulating saliva, colorants, etc. Various approaches are applied for preparation of orodispersible films: casting on evaporation of the solvent; casting in semi-solid state; hot melt extrusion at high or low pressure; cold-forming extrusion, rolling extrusion method and nebulization/spray method.

Keywords: orodispersible films, pediatrics, geriatrics, biodegradable natural polymers, children care

Acknowledgement: The present work gives gratitude to the National Program "Young scientists and postdoctoral fellows" - National strategy for development of scientific research in Bulgaria 2017-2030

PHYSICS **P-P-5**

Preparation and optimization of polymer compositions containing nanofillers for FDM extrusion, prospective applicable in 3D printing of personalized formulations for medicine and pharmacy

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Abstract: The present work focused on process of optimization of polymer compositions for extrusion of filaments, potentially applicable in 3D printing of personalized formulations for medicine and pharmacy. There are a number of difficulties in making filaments applicable in 3D printing. The main problems are associated with uniformity mixing of the composites into extruder, the proper calibration of the filament during extrusion, viscosity of the finished filament in subsequent plasticization in the 3D printer extruder head, etc.

The utilization of a flexible 3D design for printing individualized doses and pharmaceutical forms combining multiple APIs in one formulation is potential advantage of this technology. Such approach gives also possibility to combine IR/ MR release of APIs in just one tablet. This, in turn, allows less frequent administration of the drug. Patients will be able to take the medicine at a convenient time (for example just once per day) and place. In such way, the quality of life of the patients will be improved.

Keywords: 3D printing, nanocomposites, FDM extrusion, personalized medicine, natural polymers

Acknowledgement: The present work gives gratitude to the National Program "Young scientists and postdoctoral fellows" - National strategy for development of scientific research in Bulgaria 2017-2030

TECHNICAL SCIENCES **P-TS-1**

The importance of biochemical tests for pathogens in sectors and products to korca poultry

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Abstract: Today, food safety is the main priority for health of consumers. Recently, there is increasing in the consume of the poultry product in the World and European market. Groups of populations that consume poultry products industry searching them safety and guarantee. The contamination of fresh and packaged poultry meat and other poultry products derives from the environment and from the operating procedures applied by the companies of the production. The main objective of scientific research work is to reduce in the area of poultry sectors the degree of resistance of pathogens and their distribution. Methodology of this study is based on microbial analysis of air and their products in the poultry of Korça, isolation of pathogens microorganisms with method selection/coincidence and identification of microorganisms with biochemical tests and preparations. The biochemical tests and experimental results showed that was isolated Pseudomonas spp. in outside sector and no Salmonella spp. was isolated. Measurement experimental show a large number of Escherichia coli in terrain DC.

Keywords: Food safety, pathogen microorganisms, isolation, poultry products, air microflora

TECHNICAL SCIENCES **P-TS-2**

Implementation of cryptographic algorithms via multithreading

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Abstract: Speed of the encryption and decryption processes is one of the main factors when it comes to implementation of cryptographic algorithms. The use of multithreading can significantly decrease the time required for these processes. The article describes a research on multithreaded execution of the RSA algorithm and proposes a conceptual model for implementation, outlining the main points of its software design. The choice of resources, methods and tools for the application deployment has been made as well as an assessment of the used operating system and programming language.

Keywords: Multithreading, Cryptographic Algorithms, Asymmetrical Encryption Algorithm RSA

TECHNICAL SCIENCES **P-TS-3**

Computer modeling and simulations of processes in serial resonance

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Abstract: The serial resonance is a long known and researched process in the theory of the electrical circuits. The use of modern computer technique and technologies enables quickly, accurately and easily to be designed and analyzed both simple and complex electrical circuits in which, under certain conditions, different resonance phenomena are observed. The article presents two methods to study the serial resonance in a linear electrical circuit with lumped parameters. The first method is with direct application the Kirchhoff's and Ohm's laws (the classic method) and the other – by using a specialized computer software CircuitMaker. The results that are calculated by both methods are compared and analyzed. The formulated conclusions are presented in the article.

Keywords: Serial Resonance, Quality Factor, Frequency Range.

TECHNICAL SCIENCES **P-TS-4**

Monitoring of the MHT network system

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Abstract: In the current study we present a monitoring of the MHT network system by DUDe. The administrators are constantly striving to maintain smooth operation of their networks. The system enables to monitor the status changes particularly outside the monitoring area. In the observed system, we use the Open Shortest Path First protocol, which is based on the link state routing protocol concept and uses Dijkstra’s shortest path first routing algorithm. An alert system is built to the MHT network. It can be used to supervise the network and can report the state of the network by using an alert system in the monitoring area.

Keywords: Network Monitoring, Computational models, the DUDe, Dijkstra’s algorithm, LAN

TECHNICAL SCIENCES **P-TS-5**

Application of CMS for bioinformatics websites

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Abstract: Nowadays, the open source community develops many tools for building and maintaining web applications for interdisciplinary fields of science such as bioinformatics. The content management systems (CMS) are software tools to manage webpages and websites. CMS provide many of the basic needs of an informatics group. In this paper we present a CMS system, named KCS (Kristian Cenov System). The designed system is flexible, fast, multifunctional and easy to use. Many of tools of KCS can be developed to support other research-specific activities - handling large biomedical datasets and deploying bioanalytical tools. KCS is designed to provide complete control of the Web site, ease of use, and easy adaptability to any type of Web site.

Keywords: software engineering, content management system, CMS, bioinformatics, internet, websites

TECHNICAL SCIENCES **P-TS-6**

Maximum-flow problem in networking

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Abstract: The communication network is made up of nodes and links. It carries traffic where traffic flows from a start node (source) to an end node (sink). In general, a communication network can be represented as: (1) a directed network - the flow is directional from one node to another and the links are considered as directional links; or (2) an undirected network - there is no differentiation between the direction of flow. The aim of the maximal flow problem is to find the maximum flow that can be sent from specified start node to specified end node through the edges of the network. The maximum flow problem asks for the largest amount of flow that can be transported from one vertex to another. Network flow modeling are used for traffic engineering of networks. It can help in determining routing decisions.

Keywords: maximum flow problem, routing, traffic engineering, communication network

Modern educational technologies in physics teaching

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Abstract: The use of modern educational technologies in the education of natural sciences is one of the current methodological problems. The article presents modern educational technologies, which are applicable in the physics teaching in Bulgaria. Innovative technologies based on the use of information and communication technologies in education are considered. Methodological possibilities and perspectives for their use in the educational process in physics are specified. Both advantages and disadvantages of the integration of modern educational technologies in the physics teaching are mentioned. The conducted pedagogical experiment by using computer edu-cational technologies in the secondary school physics teaching is at the base of the article. The modern educational technologies reveal new oppor-tunities for organizing physics teaching, for exchanging information in it and for increasing its effectiveness.

Keywords: Modern Educational Technologies, Information and Communication Technologies, Physics Teaching.

Computer modeling - the new challenge for primary teachers

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Abstract: Computer modeling is the newest educational subject entering the initial stage of basic education in the Republic of Bulgaria. From the school year 2018/2019, it became compulsory for third and fourth grade students. Despite all the benefits of this type of training, developing logical thinking and practical skills, its introduction proves to be a real challenge for today's Bulgarian primary school teacher. The aims of the current study are to explore the opinion and preparation for teaching of this subject on the part of the teacher. For this purpose, teachers need a number of additional qualification courses acquired for short periods, which are often quite new to them. This is a serious challenge for them.

Keywords: Computer Modeling, Scratch, Programming for children

Trends in computer modeling teaching (in primary school age)

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Abstract: The newly introduced subject Computer Modeling proves to be a serious challenge for the modern Bulgarian primary school teacher because of its specificity and the need for further qualification. Recently, this subject has been introduced as compulsory in the Bulgarian education system therefore has not yet been well studied. This provokes us to organize a focus group on "Methodological problems of computer modeling in primary school age" with the participation of expert teachers (trainers at national level). The main purpose of the study is to present the results, experiences and good practices shared during this focus group that represent the trends in teaching.

Keywords: Computer Modeling, Scratch, Programming for children

METHODOLOGY IN EDUCATION **P-ME-4**

Methodological provision of training in computer modeling in the third grade

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Abstract: Contemporary Bulgarian education is dynamic and continuous changing in order to improve quality, increase knowledge, skills and competencies of students. The tendency for the subjects to be more practical and to relate to the needs of real life and the labor market. One of these changes made in the last year is the introduction of the compulsory subject Computer Modeling in third and fourth grades. The focus of the study will be on checking the methodical assurance of the teaching. It includes an overview of both the available methodological literature and the software solutions available to primary teachers.

Keywords: Computer Modeling, Scratch, Programming for children

METHODOLOGY IN EDUCATION **P-ME-5**

Fire magic with alkaline metals and their compounds

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Abstract: The laboratory chemical experiment motivates the study of chemistry as a field of science. Our earlier report has revealed the relationship between the attractiveness and the scientific side of the chemical experiment. The purpose of the current communication is to demonstrate the connection between science and amusment, especially to the study of the first main group of the periodic system. The names of the selected experiments are mysterious, which excites the interest of learners: “Fire Snake”, “Fire without Matches”, “Fire in water”, “Floating flames”, “Fire under water”. The selected experiments are not just fun, but also reveal the basic properties of the alkaline metals and their compounds. These experiments are appropriate for a great variety of students from different ages.

Keywords: chemistry, chemical experiment, education, alkaline metals.

METHODOLOGY IN EDUCATION **P-ME-6**

An integrated approach to teaching the topic *Light and Colors* from the seventh grade Physics syllabus

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Abstract: The paper analyzes the possibilities of integrating the knowledge about the physical nature of colors and the knowledge about the color as one of the basic artistic means in painting. The employment of real and virtual experiment provides the opportunity to introduce and compare on the qualitative level two different models of gaining color perception: 1) obtaining light in random color by mixing in different proportions the light beams of three primary colors: red, green and blue and 2) obtaining new colors by the mechanical mixing of paints, as in this model the three primary colors are red, yellow and blue. Specific attention is paid to the practical application of the discussed models. The importance of the integrated lessons for the formation of an overall world picture in the students' minds is underscored.

Keywords: physics education, painting, light, color, integrated approach

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