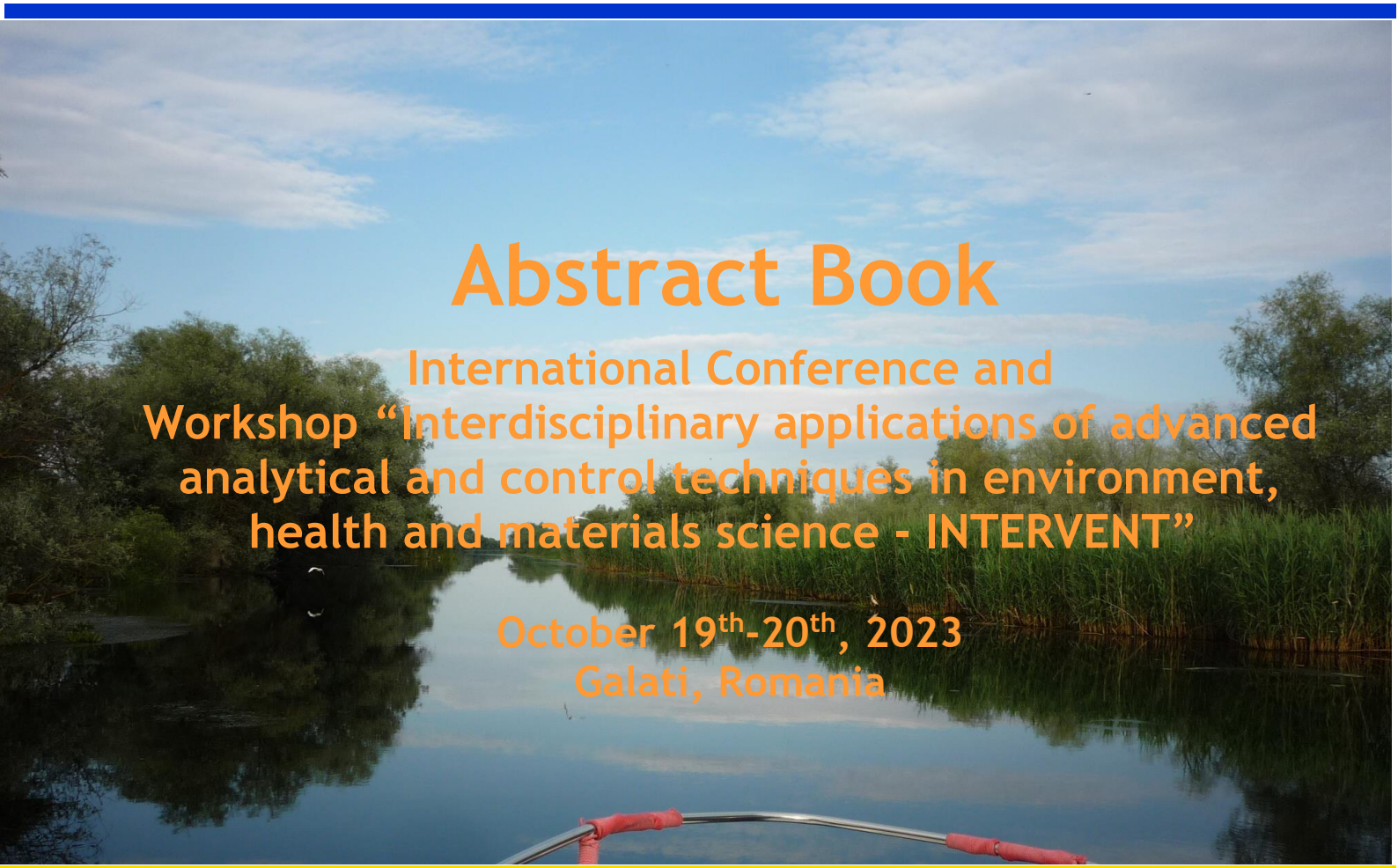

Abstract Book

International Conference and Workshop "Interdisciplinary applications of advanced analytical and control techniques in environment, health and materials science - INTERVENT"

October 19th-20th, 2023
Galati, Romania

Editors

Antoaneta Ene
Elena Zubcov

Editura USM
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Editors Preface

The **International Conference and Workshop "Interdisciplinary applications of advanced analytical and control techniques in environment, health and materials science - INTERVENT",** was organized in the period October 19th-20th 2023, in Galati, Romania by the INPOLDE research center, Faculty of Sciences and Environment, Dunarea de Jos University of Galati, in partnership with the Institute of Zoology, State University of Moldova, Chisinau, Republic of Moldova, and the Black Sea Basin MONITOX & HydroEcoNex scientific networks created in the frame of the projects funded by EU CBC Joint Operational Programme "Black Sea Basin 2014-2020". Selected papers were presented in plenary, oral, poster or virtual sessions, covering a wide range of topics grouped in three interrelated directions, with an emphasis on the results obtained in the international projects and national grants:

1. **Advanced analytical and modelling techniques applied in environment and health interdisciplinary research**
2. **Advanced characterization techniques applied in materials science**
3. **Physics and Biology integration in education**

The event is focused on: applications of nuclear, atomic and molecular techniques in interdisciplinary research; applications of radiometric, microscopy and imaging techniques in radiation protection, medicine, pharmacy, food safety, health studies and materials characterization; studies related to the assessment of levels and distribution of toxic and carcinogenic compounds and microorganisms in different environmental compartments; assessment of risk to human health and ecological state; environmental management and modelling techniques; remediation technologies; methods for detection and prioritization of endocrine disruptors and contaminants of environmental concern (CECs) – pharmaceuticals and personal care products (PPCPs); Physics and Biology concepts integration in education; health and environmental education methods.

Participation as authors or members of the scientific committee was very encouraging, from researchers and specialists members of the international projects MIS ETC 1676 INPOLDE, BSB27-MONITOX and BSB165-HydroEcoNex, to top scientists and young researchers representing other institutions from Romania, Moldova, Ukraine, United Arab Emirates, Egypt, Greece, Azerbaijan and Canada. 46 abstracts were selected for plenary, oral and poster presentations, covering a wide range of topics grouped in three connected sections.

The editors would like to thank: the authors of the papers and the international scientific committee for their assistance in reviewing and the funding of Dunarea de Jos University of Galati, Romania, through the grant „INTERVENT" no. 9187/2023.

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SUMMARY

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INVITED LECTURES

IL01. NUCLEAR RADIATIONS IN OUR LIVES: SOURCES, APPLICATIONS, PROTECTION MEASURES

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Radiation is the emission, propagation and transfer of energy in any medium in the form of electromagnetic waves or particles. Life on Earth evolved in the presence of cosmic radiations coming from outer space or those produced because of the presence of radioactive materials spread in the earth's crust with a high geographic variability. Three-quarters of the radioactivity in the environment comes from natural elements. Due to the destructive effects on humans and other living organisms, measurement of the ionizing radiation doses in the environmental compartments in various regions of the world is very important, besides the monitoring of various classes of toxicants. There are several types of ionizing radiations which interact differently with the substance they cross, depending on their nature and energy and the type of the crossed material.

The paper presents the main applications of nuclear radiations in medicine, industry, agriculture, teaching and research, the attenuation and build-up effects, biological (somatic, genetic) effects of ionizing radiation, the types of shielding materials used for human protection against radiations of different types (alpha, beta, gamma, X, neutrons) and health risk assessment.

The increase and diversification of the use of radioactive isotopes and nuclear energy also leads to an increase in the risk of radio-contamination of the environment and living organisms. Radionuclides that reach the air, water and soil affect the biosphere through trophic chains and are also transferred to the human body through ingestion, inhalation, diffusion, penetration or dermal contact. The investigation of the level of environmental radioactivity and the assessment of the health risk of radionuclides emitting different types of radiations are of great importance in the management of the environment and the assessment of radiological hazards to human health and ecosystems. Taking into consideration the strong penetration power of gamma radiations, the absorbed dose rate measurement in ambient air is considered as significant.

Acknowledgements: The research was carried out in the frame of the internal grant no. 9187/2023 (INTERVENT) of Dunarea de Jos University of Galati, Romania, and the international project BSB 27 MONITOX, funded by the Joint Operational Programme Bleck Sea Basin 2014-2020.

IL02. STUDY OF THE MIGRATION AND IMPACT OF METALS ON THE FUNCTIONING OF AQUATIC ECOSYSTEMS

Elena Zubcov

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Metals represent a rather large group of chemical elements, extremely necessary for life, but which can transform into environmental toxicants by accumulating in water, solid suspensions, silts, aquatic plants and animals to a toxic level for aquatic ecosystems and human health. Natural sources of metals in aquatic ecosystems are the parent rocks and soils of their hydrographic basins, as well as atmospheric precipitation which carries the products of volcanic eruptions. The sources of metal pollution are the metallurgical, military and chemical industry, thermal power plants, agriculture, urbanization, transport.

Migration capacity of metals in the very dynamic system "water-solid suspensions-silts-hydrobionts" is directly dependent on geographical factors, including hydrological ones, physico-chemical parameters of waters, silts, the state of hydrobiocenoses and, last but not least, on properties of metals and their ratio. Ratio of metal concentrations in water, solid suspensions and silts is an index of sorption-desorption properties and the processes of self-purification and secondary pollution.

Samples of water, suspensions, silts, biological material (plants, planktonic and benthic invertebrates, fish), atmospheric precipitation, waste water and samples from runoff from agricultural lands and urbanized territories were investigated. The used research scheme and methods correspond to ISO standards adapted to national ones (*Ecotoxicological methodological guide for environmental monitoring: problematics, laboratory techniques and health risk investigation, 2021*). Directly *in situ* or in the first 12 hours after sampling, the water samples were filtrated through membrane filters with a pore diameter of 45 microns to separate dissolved metals from those in solid suspensions. Several experimental works *in situ* and modelling in laboratory conditions were performed both to determine the influence and the level of accumulation of metals, as well as to evaluate the role of aquatic organisms in the biological migration.

The study of biogenic migration of metals is an important aspect of monitoring and assessment of the functioning of aquatic ecosystems, which provides scientific support for the sustainable management of aquatic resources and the development of directed aquaculture. Aquatic plants are able to accumulate quite high concentrations of metals, which allows their use as monitor organisms. The dynamics of metal accumulation has a seasonal character, as a reflection of the dynamics of metals in the aquatic environment. As plants have a high resistance to toxic concentrations of metals and have an intense growth, they serve as biofilters in water self-purification processes, but at the same time, aquatic plants can be a source of secondary pollution of aquatic ecosystems. The role of aquatic plants and animals in biogenic migration of trace metals is a function of physico-chemical parameters of the environment, taxonomical patterns of hydrobionts, their number and the chemical characteristics of chemical elements themselves. Such investigations are very important for to

estimate the quantitative role of the main groups of plants and animals in trace metals circulation, its bioaccumulation, biomagnification and to evaluation the functionality of water ecosystems.

By performing the polyfactorial analysis, the quantitative parameters of the weight of the main factors in the dynamics of the migration of metals in the investigated ecosystems are determined. The given laws are described by equations of the type: $y = a_0 + a_1x_1 + a_2x_2 + a_nx_n$..

Results of multiannual field and experimental research served as the basis for specifying the impact of metals on production-destruction processes, the growth and development of fish, for determining the buffer capacity of aquatic ecosystems and water quality. Based on these results, a new methodology for evaluating the ecological state of aquatic ecosystems was proposed.

Acknowledgements: The research was carried out in the framework of the National project 20.80009.7007.06 AQUABIO from the State Programme 2020 - 2023, and the international projects BSB 27 MONITOX and BSB 165 HydroEcoNex, Joint Operational Programme Bleck Sea Basin 2014-2020.

IL03. A FOCUSING STUDY ON ADVANCED RADIATION SHIELDING MATERIALS: *WHAT DO WE WANT? & HOW DO WE WORK?*

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Exposure to radiation has the potential to have detrimental effects on human health. Shielding materials are used in a variety of environments, including hospitals, nuclear power plants, and industrial sites, to protect employees, patients, and the general public from the detrimental impacts of ionizing radiation. While the utilization of Pb (Lead) and Pb-based materials in radiation facilities has been prevalent, it is anticipated that the field of radiation shielding materials will witness ongoing progressions propelled by technical innovations, research in materials science, and the development of new applications. The prevalence of the capacity to develop radiation shielding materials with tailored properties for diverse purposes is expected to increase. There is a growing likelihood that customized solutions for medical, industrial, and aerospace applications will see increased prevalence. This trend aims to enhance protective measures while simultaneously reducing the overall bulk and weight of materials involved. The current study aims to offer some advanced shielding materials concepts and methodological concepts used over the course of the research. Different types of shielding glasses, alloys, and other forms of shielding materials that have been designed and manufactured through our research group will be presented. Moreover, in-depth review of Monte Carlo simulations and theoretical computation techniques on shielding material studies will be presented.

IL04. MONITORING OF TOXIC POLLUTANTS AND CONTAMINANTS OF EMERGING CONCERN (CECS) IN THE DANUBE RIVER AND DELTA AND THE BLACK SEA BASIN: INPOLDE AND MONITOX INTERNATIONAL NETWORKS

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The migration of toxic chemicals (TOXs) with great impact on human health in the main aquatic ecosystems and protected areas from SE Romania, Republic of Moldova and Ukraine, affects a large number of population of the Lower Danube River (LDR) basin and Black Sea basin (BSB) and a very important issue for inhabitants of the large basins will be the identification of the sources of TOXs in their neighboring aquatic ecosystems and groundwater - agricultural terrains (fertilizers, pesticides), insufficient industrial and domestic wastewater treatment, erosion of polluted riparian soils, accumulations of municipal garbage and hazardous wastes, oil spills, vessel discharges, atmospheric depositions, release of toxics both from natural and anthropogenic sources (industry, traffic, animal farming, burning products, port and coastal activities, hospitals, nuclear activities).

The projects idea arose from the need for high-quality monitoring data for the LDR and BSB and the European Union as a whole, along with ecotoxicological data and a thorough study of risks of environmental effects of TOXs. At basin level it was identified the necessity for establishing a set of indicators to be used in various regions in monitoring of emerging toxic pollutants in water and related environmental matrices (sediment, biota), as well as the revising of the legislation regarding the thresholds of existing contaminant substances in these compartments, as a result of new scientific knowledge. There were several aspects which had to be elucidated, related to: the real influence of the geological background on migration of some trace elements, metals and other compounds from the bedrock to sediments and surface water or groundwater, the influence of river or sea on the quality of the groundwater, concentration of toxics preponderant in a matrix, the pollution of lands in the vicinity of rivers and seas with a large spectrum of TOXs which could spread on large distances in other compartments and could affect human health. The main threat in the LDR-BSB region was the immense deterioration perpetrated by human activities against the natural environment, which raises

imperative concern for our collective survival. Due to the fact that pollution events have no borders/do not stop at national borders, the in-depth study of processes occurring in large, interconnected river-seas basins and evaluation of people exposure to TOXs can be accomplished only in partnership, through cooperation based on knowledge, exchange of good practices and interdisciplinary research, conducted only in transnational networks.

The projects MIS ETC 1676 - INPOLDE and BSB27-MONITOX aimed at enhancing regional cross-border cooperation in the Danube and Black Sea basins to improve joint monitoring of environmental toxic pollution and better share and exchange of new analysis methodology, data and information on ecological state and human health impact of harmful substances. This implied:

1) to build strong interdisciplinary networks of analytical laboratories and experts (INPOLDE, MONITOX) to elaborate a common ecotoxicological monitoring system supporting regional programs for environmental protection and sustainable management;

2) to produce scientific platforms with harmonized information on toxics in soil, water, sediments and biota in shared riverine, deltaic and sea areas, and their potential impact on ecosystems and people.

Six classes of toxic substances were analysed in seven interconnected environmental compartments (surface water, groundwater, sediments, soils, bedrock and biota) in the Danube and Black Sea basins and border regions, eight types of connected investigations (geomorphological, geological/mineralogical, hydrogeological, physical, chemical, biological, microbiological, ecotoxicological) being performed, along with mapping of BSB pollution, modelling of environmental processes and health and ecological risk assessment. The creation of the interdisciplinary information resources and databases is an important approach for the study of toxic substances levels and migration in environment at regional and European level.

Acknowledgements: The researches were carried out in the frame of the EU Joint Operational Programme Romania-Ukraine-Republic of Moldova 2007-2013, project MIS ETC 1676- INPOLDE and the Joint Operational Programme Black Sea Basin 2014-2020, project BSB27-MONITOX.

IL05. OCCURRENCE AND FATE OF EMERGING CONTAMINANTS IN WATER – CURRENT ANALYTICAL CHALLENGES

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In the context of the great number of reports regarding the occurrence of the emerging contaminants of concern (CECs) in the environment and the continuous updating of the regulation in the field of water policy, there is a need for constant monitoring of these contaminants in the water environment. Four monitoring campaigns were carried out during 2012-2020 within various research projects including BSB27-MONITOX. A solid phase extraction (SPE) multi-method was optimised for compounds extraction and concentrations of 85 target compounds in surface water. The analyses

were carried out using high resolution mass spectrometry represented by Q-the Q-Exactive Orbitrap™. In agreement with other published data, the frequently identified pollutants were: pharmaceuticals (carbamazepine, diclofenac, ketoprofen, sulfamethoxazole, and trimethoprim), pesticides (imazalil, carbendazim, and thiabendazole) and bisphenol A as an endocrine disruptor.

The analysis of such contaminates is challenging in terms of very low concentration and matrix suppression, low recovery due to the non-specific extraction method used, or too low maximum acceptable method detection limits required by regulations (e.g. 0.035 ng/L for 17-α-ethynil estradiol EE2 proposed by the EU Decision 840/2018).

The present paper aims to emphases the issues encountered during our research. Optimisation of the SPE method for a high number of target compounds resulted in a number of 7 unidentified pharmaceuticals including nystatin, neomycin, spectinomycin, salicylic acid and ibuprofen. Recovery values lower than 50% were obtained for a number of 8 compounds including lincomycin, oxytetracycline, erythromycin, carprofen.

Ions suppression was observed for sulfamethoxazole, griseofulvin, fluconazole and carazolol. Erythromycin manifested ion enhancement (+140%) probable due to the binding to matrix components that may contribute with its ionization.

An untargeted approach was proposed based on high mass accuracy using HRMS-MS in data independent mode acquisition (vDIA) mode. Confirmation of the structure is based on fragmentation pattern comparison with online spectra libraries.

IL06. NAVIGATING DOSIMETRIC PATHWAYS: A COMPREHENSIVE BIOKINETIC AND DOSIMETRY ASSESSMENT OF ^{89}Zr-LABELLED MONOCLONAL ANTIBODIES IN HUMAN SUBJECTS

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Background: The realm of radiopharmaceuticals has perpetually burgeoned, yet the arena of ^{89}Zr-labelled monoclonal antibodies (MAbs) wades through relatively unexplored waters, particularly in the context of biodistribution, biokinetics, and resultant dosimetry within human physiology. Notably, despite the provision of data related to the dynamics of radionuclides such as ^{99m}Tc, ^{131}I, ^{111}In, and ^{123}I labelled with antibodies in ICRP Publication 128, there's a striking void concerning ^{89}Zr.

Objective: The imperative to navigate through this research lacuna spurred the development of a biokinetic model, coupled with comprehensive dosimetric analyses of ^{89}Zr-labelled MAbs. This study seeks to unveil the in-vivo dynamic behaviour and radiation exposure contours of these radiopharmaceuticals, providing a scaffold upon which therapeutic strategies and safety protocols can be meticulously crafted.

Methods: Leveraging both historical data from ICRP 128 and empirical data derived from clinical subjects administered with ^{89}Zr-labelled MAbs, a biokinetic model was formulated. Sequentially, dosimetry analyses were conducted, employing methodologies such as the WinAct

program and IDAC 2.1 software, aiming to delineate the absorbed doses and expose the organs most susceptible to radiation exposure.

Key Findings: Amongst the constellation of insights gleaned, the spleen, liver, kidneys, red marrow, and lungs emerged as the pinnacle of radiation exposure from 89*Zr*-labelled MAbs. A developed biokinetic model, sculpted from real patient data, demonstrated robust alignment with direct measurements, marking it as an instrumental preliminary tool for simulating ^{89}Zr isotope radiopharmaceutical dosimetry. When deploying radiopharmaceuticals with an activity of 75 MBq, absorbed doses of 115 mGy in the spleen, 100 mGy in the liver, and 100 mGy in the kidneys were discerned.

Conclusion: This study not only orchestrates a pioneering step towards unravelling the mysteries shrouding the in-vivo dynamics and dosimetric profiles of 89*Zr*-labelled MAbs but also propounds a preliminary model, rich with potential for further refinement and application in advancing our capabilities and understanding within ^{89}Zr radiopharmaceutical research and clinical applications.

Future Trajectory: This research beckons further exploration into the complex interplay of varied MAbs, their fragments, and different radiolabelling radionuclides, seeking to progressively enrich the available biokinetic and dosimetric data. While the developed models showcase promise, their continued validation and evolution, influenced by subsequent research, will inevitably augment their precision and applicability, sculpting them into pivotal instruments within the domain of radiopharmaceutical applications and research.

The presented abstract illuminates the endeavour to bridge a critical gap within radiopharmaceutical research, focusing on ^{89}Zr-labelled MAbs, offering a platform upon which future research and clinical applications can be progressively built and optimized.

IL07. APPLICATION OF GEOGRAPHIC INFORMATION SYSTEMS IN AGRICULTURE

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Our study covers Gobustan and Tartar experimental stations and the influence of natural conditions on the quality indicators of plants grown there. Here, the influence of natural conditions on the development of plants is studied based on the results of processing satellite images. During the research, data from Landsat 8 and 9 satellites were processed using Geographical Information Systems.

13 experimental points in Gobustan area and 8 experimental points in Tartar area were selected for research and various elements were analyzed.

In these stations, the growth indicator of the plant was determined and its dynamics were monitored. It was determined that its development was influenced by both natural conditions and plant care. Vegetation development index maps compiled by us on the basis of satellite images of

2022 and 2014 of Tarter RES area were superimposed and compared. A map of the comparison results of the respective months has been drawn up. To track the changes, they are evaluated in 4 categories. Thus, areas with a higher index compared to 2022 are backward, areas with a difference of 0-0.15 are weak, areas with a difference of 0.15-0.3 are moderately changed and areas with a difference above 0.3. and were evaluated as highly changed areas. It was determined that the areas where the decline was observed between the satellite image of January 2014 and the satellite image of January 2022 were mostly close to residential areas and scattered throughout the area. A weak change is observed in most areas in the study area. When comparing January with other months, the areas where decrease is observed in other months cover a wider area. In March, April and May, we can locally observe areas with medium and high development. Of course, there are many possible reasons for this decline and development. This can be influenced by both natural conditions and the level of plant care, fertilizing, watering conditions and others.

We determined plant growth index based on NDV index at 8 selected research points in Tarter RES. If we pay attention to the development index of 2014, the highest indicator in January is number 3, and the lowest indicator is at point 7, in March at 3 and 2 respectively, in April at 5 and 2, in June at 3 and 2 research points. It follows from this that the high indicator was mainly observed in areas with low absolute height. In addition, it was affected by slope inclination, exposure and solar radiation, as well as anthropogenic factors, especially fertilization, proper irrigation.

In the territory of Gobustan RES, practice points 1, 8, 11, 13 are southwest, practice points 2, 4, 7 are north, practice points 3, 9 are northwest, practice point 5 is west, 6, 12 The experiment points are located in the north-east, the 10th experiment point in the south, and the 12th experiment point in the south-east exposed slopes.

In January, the highest temperature was observed at 13 and the lowest temperature at experiment points 10, respectively, in February at 10 and 1, in March at 10 and 5.6, in April at 13 and 8, and at experiment points 4 and 8 in June. has been done.

If we pay attention to the dynamics of the Plant Development difference index at the experimental points, the highest indicator was 4.5, the lowest indicator was 9, in February 13 and 4, in March 10 and 2, in April 8 and 2, and in June 8 and 2, respectively. The different development of plant development at experimental points depends not only on natural conditions, but also on irrigation, fertilization and other factors.

ORAL PRESENTATIONS

OP01. EVALUATION THE CHEMICAL POTENTIAL OF SOME FLAVONES USING THE DFT THEORY AND MOLECULAR DOCKING

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The aim of this paper is to present a chemical activity characterization of two flavones: 6 – hidroxiluteolin and 3',4',5',5,6,7-hexahidroxiflavone using Density Functional Theory (DFT).

The analysis carried out aimed to evaluate the chemical potential and the electronic parameters (such as: E_{HOMO} – the energy of the highest occupied molecular orbital and E_{LUMO} - the energy of the lowest unoccupied molecular orbital) of the two flavones.

The molecular electrostatic (MEP) 3D diagrams were determined to indicate the sites of 6 – hidroxiluteolin and 3',4',5',5,6,7-hexahidroxiflavone prone to electrophilic or nucleophilic attacks. To determine if the complex formed is stable, the docking analysis was performed for 6 – hidroxiluteolin as ligand and PI3Kα kinase as receptor.

OP02. ANALYSIS OF THE PARTICULATE MATTER LONG TERM EMISSIONS IN ROMANIA BY SECTORS OF ACTIVITIES

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Particulate matter (PM) in the atmosphere is highly relevant due to its far-reaching implications. These tiny solid or liquid particles affect human health, causing respiratory and cardiovascular issues, and even premature death.

PM also plays a role in climate change, as some particles contribute to warming, while others have cooling effects, impacting Earth's energy balance. Additionally, PM influences visibility, transportation safety, and ecosystems by depositing on land and water surfaces, altering soil and water quality. Recognizing and monitoring the emissions and sources of PMs by 4 subclasses, from PM2.5 to PM10, but also as TSP (total suspended particles) and individually as BC – black carbon is vital for effective air quality management and mitigating its multifaceted impacts on our environment and well-being.

This paper presents an analysis of PMs emissions divided into the 4 classes presented above, for Romania, between 1990-2021, as given by the national report made according to the National Emission reduction Commitments Directive (NECD), which aims to reduce emissions of the main air

pollutants. The emission data are presented by national emission sectors, from different industries to different transport types, and also from agricultural activities, and waste management. Relevant averages and trends are quantified and analyzed as a reference for real-time data at city level, such that to assess the local pollution level and data accuracy as compared to the national reports.

OP03. COMPUTATIONAL ASSESSMENT OF THE TOXICITY OF NEW PSYCHOACTIVE CONTROLLED SUBSTANCES

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Over the past years, new synthetic substances produced to mimic the psychoactive activity of some traditional drugs have emerged in the black market. These previously unknown drugs are called new psychoactive substances (NPS) and pose serious threats to public health. This paper presents a computational toxicity evaluation of some representative controlled NPS. Also, in order to determine the subgrouping potential of the analyzed compounds, a mathematical approach was used by performing the Principal Component Analysis (PCA) algorithm.

OP04. DEEP CONVOLUTIONAL NEURAL NETWORKS SCREENING FOR ILLICIT SYNTHETIC DRUGS

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The primary objective of this research was to create advanced Convolutional Neural Network (CNN) models that excel in detecting and categorizing synthetic cannabinoids. To accomplish this, we conducted an in-depth analysis of the accuracy of various automated identification and classification systems for synthetic cannabinoids. These systems were built upon diverse pre-trained deep learning models. Our approach involved customizing, adjusting, and rigorously testing the CNN models to integrate automatic detection systems. We employed different optimization techniques and algorithms while experimenting with various learning rates to attain the highest possible level of accuracy.

Furthermore, we explored the benefits of utilizing transfer learning techniques in combination with ATR-FTIR spectroscopy for screening solutions.

POSTER PRESENTATIONS

PP01. ACUTE *IN VIVO* TOXICITY OF THE COPPER(II) COMPLEXES WITH NOVEL LIGAND: *N*-[4-({2-[1-(PYRIDIN-2-YL) ETHYLIDENE]HYDRAZINECARBOTHIOYL}AMINO)PHENYL]ACETAMIDE.

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The study of new materials in the field of coordination chemistry is increasing day by day, leading to the discovery of substances with beneficial biological properties. A class of organic compounds called thiosemicarbazones is expected to be the most promising due to a wide range of biological activities. The compounds along with their least toxic effect are of great interest [1].

Three new coordination compounds based on copper(II) salts: $[Cu(L)CH_3COO]$ (1), $[\{Cu(L)Cl\}_2]\cdot H_2O$ (2), $[Cu(L)H_2O\cdot DMF]NO_3$ (3), were obtained, where HL is *N*-[4-({2-[1-(pyridin-2-yl)ethylidene]hydrazinecarbothioyl}amino)phenyl]acetamide. The thiosemicarbazone HL was characterized by FT-IR, ^1H NMR, and ^{13}C NMR spectroscopy. All copper(II) coordination compounds were characterized by elemental analysis, FTIR, and molar electrical conductivity. All compounds were tested for toxicity to *Daphnia magna*.

To determine the toxicity of the tested compounds, the immobilization test on the crustacean *D. magna* was conducted following a European Standardized Methodology. International organizations for animal protection recommend conducting *in vivo* toxicity research on *D. magna*. In this context, as an alternative method used in this study, the complete replacement of animal toxicity testing with tests on invertebrate organisms was employed. *D. magna* is frequently used in laboratory experiments due to its structure, transparency, and ability to survive under a coverslip, making it easily observable under a microscope [2]. The test allowed for the evaluation of the acute toxicity of the tested compounds on *D. magna* at 24 hours, expressed as the median lethal concentration (LC_{50}), which was calculated using GraphPad software.

Microscopic analysis of the control *D. magna* organisms that were not exposed to chemical compounds did not reveal any pathological changes. The effect of the compounds at the median lethal concentration on *D. magna* was determined through microscopic examination, indicating slight movements in over 50% of these invertebrate organisms. Additionally, it was observed that a significant portion of the *D. magna* remained immobile, especially at high concentrations of the chemical compound, as they exhibited a total cytotoxic effect. Upon examination, it was noted that the limbs and bodies of *D. magna* were deformed, and their contents were mixed with the growth media.

The HL and the complex 2 with $LC_{50} \geq 100$ μM have practically no impact on *D. magna*, whereas complexes 1, 3 exhibit toxicity at concentrations of 10 and 100 μM. The LC_{50} values are 3.5 ± 2.8 μM for $[Cu(L)CH_3COO]$, and 8.9 ± 1.3 μM for $[Cu(L)H_2O \cdot DMF]NO_3$.

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PP02. SPECIFIC FEATURES OF THE RETINAL FUNDUS IMAGES USED FOR DIABETIC RETINOPATHY CHARACTERIZATION

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The commonest cause of blindness in people aged 30+ years is without any doubt diabetes. At the early stages of diabetic retinopathy, there are no typical effects/symptoms on the human vision. Diabetic retinopathy is one of the diabetes-related eyes and consists of blood vessels damaged in the retina. When retinopathy advances, new blood vessels grow in the retina. The new vessels on the optic disc often threaten vision by leading to vitreous hemorrhage.

The quality of retinal fundus images is usually analyzed based on first-order histogram, second-order textural, geometric, topological, and fractal dimension features. To improve the quality of the fundus images, the preprocessed stage is an essential step, and median and derivative filters are frequently used. The vessel edge's structure and edge detection are important to classify the retinopathy severity as normal, mild, moderate, proliferative, and severe. A low image quality can increase the false negatives.

The edge features were extracted from the retina images using the gradient direction algorithms and the spatial frequency response based on gradient direction images was determined. The Random Forest (RF) classifier algorithm is employed to investigate the edge's sharpness. The five stages of diabetic retinopathy, such as normal (No_DR), moderate, mild, proliferative, and severe were analyzed. For the proposed method, an accuracy of 89.7% during diabetic retinopathy classification was obtained, which follows the current state-of-the-art results.

PP03. STUDIES ON PHYSICAL PROPERTIES OF TIN OXIDE FILMS

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This work reports the preparation and structural and optical characterization of tin oxide (SnO_2) thin films. The films were prepared by thermal vacuum evaporation of polycrystalline powder of the compound in a residual air pressure of 5 10^{-5} Torr.

The substrate temperature was kept constant during the film deposition at 300 K. Transmission electron microscopy (TEM) and atomic force microscopy (AFM) were performed on the study of structural properties of tin oxide films with thickness of 0.6 μm.

The optical properties of thin films were investigated in the wavelength range of 300-1100 nm using a Perkin-Elmer double beam spectrophotometer. The correlations between optical parametres and the structure of tin oxide thin films are discussed.

PP04. THE AMBIENT NOISE LEVEL IN THE CITY OF GALATI AND SURROUNDINGS

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The intense and sustained noise to which we are subjected can cause disorders of the auditory system. It affects especially those who suffer from heart problems, but it also has dramatic consequences on the nervous system. It can cause stress, depression, sleep disturbances, cognitive problems and reduced ability to concentrate.

The city of Galati is located in the southeastern part of Romania, in the southeastern part of the county with the same name. Galati ranked fifth in terms of noise pollution and unfortunately the local authorities do not run any noise reduction or control program. Through this paper we want to join those who sound the alarm to the authorities to take concrete measures in order to manage and control noise pollution. During one day, more precisely, in three moments of the day, morning, lunch and evening, data were collected in different areas of the city of Galati and its surroundings. Equivalent noise level was determined with a professional digital acoustic sound level meter with two frequency filters: "A" and "C". The device can record sound values between 30dB-130dB in the 31.3 Hz and 8 KHz range. In general, the sound level exceeded the maximum admissible limit or came close to this value.

PP05. COMBINED ATOMIC AND NUCLEAR TECHNIQUES (AAS, PIXE, PIGE, ICP-MS) FOR ELEMENTAL AND ISOTOPIC ANALYSIS OF SOILS AND CROPS IMPACTED BY IRON AND STEEL INDUSTRY

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Industrial and agricultural activities release toxic elements into the environment, posing a severe risk to human and animal health. The aim of the study was to analyze soil and plant samples from Sendreni, Vadeni, and Tulucesti territories affected by the Galati steel industrial platform area. The study utilized advanced complementary atomic and nuclear methods such as High Resolution Continuum Source Atomic Absorption Spectrometry (HR-CS AAS), Inductively-coupled plasma mass spectrometry (ICP-MS), Proton-induced X-ray emission (PIXE), and Particle-induced gamma-ray emission (PIGE), to confirm soil and plant contamination.

The concentration of Cr, Ni, Cu, Pb, Cd, Co and Zn were quantified using the AAS technique. The levels of Cr, Ni, and Cu in the soil were found to exceed the normal values and even surpass the alert threshold for sensitive uses. This is a cause for concern and we must take action to address this issue. However, the levels of Pb, Zn, Cd, and Mn were found to be within the normal range. The study revealed that wheat and maize tissues, especially leaves, retain heavy metals. Sunflowers, on the other hand, were an exception to this rule. In the ecological conditions of the study area, sunflowers were found to retain higher amounts of heavy metals such as Cr, Cu, Pb, and Ni in the achenes, rather than in the leaves.

The isotopic analysis was performed by ICP-MS method. The isotope ratios such as $^{207}Pb/^{208}Pb$, $^{66}Zn/^{64}Zn$, $^{68}Zn/^{66}Zn$, $^{68}Zn/^{64}Zn$, $^{113}Cd/^{112}Cd$, and $^{65}Cu/^{63}Cu$ are higher than the natural abundance ratios. This suggests that there is an antropogenic accumulation of these elements in soil. High values of the ratios of the same isotopes in plants indicate the isotopic specificity of the studied area and the soil-plant interdependence relationship.

The PIXE and PIGE techniques were used to identify light elements such as F, Al, Na, Mg, Si, Cl, K, Fe, and Ti in both soil and plants. The analysis revealed that the fluorine concentration in

the soil exceeds the world average. This can be attributed to industrial emissions and the application of phosphate fertilizers and pesticides.

The issue of environmental pollution in Galati and Braila counties is a major concern, mostly due to industrial activities carried out by the Galati Iron and Steel Plant. However, this study has revealed that agricultural practices also contribute significantly to the presence of toxic or potentially harmful elements in the environment.

These findings are particularly relevant to professionals in the field of environmental science, as they highlight the complexity of metal/ element accumulation mechanisms in plants and emphasize the need for further research in this region.

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PP06. APPLICATION OF NON-DESTRUCTIVE ANALYTICAL TECHNIQUES FOR THE MANAGEMENT OF HAZARDOUS INDUSTRIAL WASTE

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The toxic elements contained in hazardous industrial waste can negatively affect the environment and the health of ecosystems if they are not managed correctly. These hazardous industrial wastes can be characterized using high-performance non-destructive analytical techniques. In this research, two Ion Beam Analysis (IBA) techniques, Particle Induced X-ray Emission (PIXE) and Particle Induced Gamma Ray Emission (PIGE), were used in complementarity with energy dispersive X-ray fluorescence analysis (ED-XRF) for the determination of the total concentrations of several major, minor and trace elements in various hazardous industrial wastes from industrial activities such as: galvanizing and pickling processes, respectively dismantling processes of some decommissioned industrial plants.

The atomic and nuclear analytical methods PIXE and PIGE were applied at the 3 MV Tandetron accelerator at the National Institute for Research and Development in Nuclear Physics and Engineering Horia Hulubei (IFIN-HH), Romania, using a 3 MeV proton beam as projectile particles. The elements determined by PIXE were: Na, Si, S, Cl, Ti, Mn, Fe, As, Br, Sr, Ag and Hg. In the case

of PIGE, the elements of interest F, Mg, Al, P and Ti were determined based on the (p,p´γ) nuclear reaction of the "p" protons on the target samples.

The ED-XRF analytical method was applied at the INPOLDE International Interdisciplinary Research Center of the "Dunarea de Jos" University in Galaţi (UDJG), Romania and in the Laboratory for physical-chemical determinations within the SetCar S.A. company, Braila, Romania, for the quantification of Cr, Ni, Cu, Zn, Mo, Sb and Pb.

Non-destructive multi-elemental techniques have proven to be very useful for hazardous industrial waste management by identifying a large series of trace elements, some of which are toxic to living organisms and humans. The obtained results will complement the compositional schemes obtained by using atomic absorption spectrometry for the materials investigated at the INPOLDE research center of UDJG, Romania.

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PP07. ANALYSIS OF THE CAST IRON MICROCOMPOSITION BY WAVELENGTH DISPERSIVE X-RAY FLUORESCENCE (WDXRF)

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Cast irons are iron-carbon alloys, in which the carbon content is between 2.11% C and 6.67% C and 3-4% other elements. The microstructure and their technological and operational characteristics are determined both by the chemical composition and the cooling rate applied during solidification.

X-ray fluorescence (XRF) is a widely used analytical method for quantitative environmental and the qualitative determination of the elementary chemical composition of samples with a variable number of elements. The great advantage of this method of analysis results from the fact that the samples, mainly metallic ones and powders, are not destroyed during the analysis and do not require a prior chemical treatment. The aim of this work was to analyze the microcomposition of several cast iron samples collected from different loads at the iron and steel works of Galati, by Wavelength Dispersive X-Ray Fluorescence (WDXRF). The factors that play an important role in the correctness of the analysis and depend on the preparation of the samples are: the state of the surface (surface geometry), the presence of non-uniformities (modifies the length of the radiation trajectory in the sample), the homogeneity of the sample and the mineralogical effect due to the crystalline structure of the material. To remove the mineralogical effect and to mitigate the matrix effect that appears in the spectral analysis, especially for ores, the melting method was used in the samples processing stage.

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PP08. STUDY OF THE HYDROCARBON-OXIDIZING ACTIVITY OF BACTERIOPLANKTON IN THE MOLDAVIAN SECTION OF THE PRUT RIVER

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Aquatic microorganisms (bacterioplankton, bacteriobenthos, heterotrophic epiphyte bacteria, etc.) plays a decisive role in the processes of biodegradation of autochthonous and allochthonous organic matter in surface water ecosystems, thus ensuring the cycle of elements in the habitat and participating in the processes of self-purification. Hydrocarbon-oxidizing bacteria are not a specific group of heterotrophic bacterioplankton. The presence of hydrocarbons in the habitat stimulates microorganisms (MOs) to utilize this organic substrate as well. Therefore, increase in the number of hydrocarbon-oxidizing MOs in relation to the total number of heterotrophic bacterioplankton can serve as an indicator of hydrocarbon pollution.

Water samples were collected in the winter, spring and summer seasons 2023 at the Costesti, Braniste, Sculeni, Leuseni, Cahul, Cislita-Prut and Giurgiulesti stations on the left bank of the Prut River. The following task was formulated: 1) to analyze the seasonal and spatial dynamics of the number of hydrocarbon-oxidizing MOs in the real Prut River water samples and 2) to test (laboratory experiment) the ability of the Prut River bacterioplankton to respond to the presence of hydrocarbons in the water habitat. The interdisciplinary technique was used to assess the hydrocarbon-oxidizing activity, namely: microbiological research was carried out in parallel with hydrochemical investigation of the natural water samples and samples enriched with diesel fuel.

The Costesti−Giurgiulesti transboundary Prut River section includes various ecological zones, such as the Costesti-Stinca Reservoir, the site downstream of the Costesti Hydro Power Plant, the mouth of the Jijia River, the floodplains of the Beleu Lake (where oil extraction is carried out despite the fact that it is a protected area of the scientific reserve "Prutul de Jos"), the area of the Prut River mouth with the Giurgiulesti International Free Port. The structure of microbial communities corresponds to the specific conditions of each these biotopes, being the most reproductive and adaptable component of the biota.

The results obtained demonstrate a high ability of the Prut River heterotrophic bacterioplankton to utilize petroleum hydrocarbons in their metabolic processes. The proportion of hydrocarbon-

oxidizing MOs in relation to total heterotrophic bacterioplankton ranged from 2 to 55 %. Seasonal dynamics is not expressed. Along the longitudinal profile of the river, the highest percentage were recorded at the Costesti, Braniste and Leuseni stations. The strong negative correlation between the number of hydrocarbon-oxidizing MOs and the BOD_5 value (R = -0.70) confirms the important role of this bacteria in the biodegradation of organic pollutants. On the other hand, the correlation with water temperature is very weak (R = 0.28), from which we can conclude that under conditions of anthropogenic load, the natural factor (water temperature) affects the quantitative characteristics of microbiota to a lesser extent than the ecological state of the water body.

Acknowledgements: The research was carried out in the framework of the AQUABIO project (2020 - 2023) from the State Program "Environment and Climate Change", implemented by the Laboratory of Hydrobiology and Ecotoxicology of the Institute of Zoology, and the international project BSB 27 MONITOX.

PP09. TEN YEARS OF MYCOTOXIN RESIDUES SCREENING IN PRODUCTS INTENDED FOR HUMAN AND ANIMAL CONSUMPTION

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This paper presents the multiannual dynamics of the concentrations for three toxins, analyzed between 2012 and 2023: Aflatoxin B1, Zearalenone and Ochratoxin from products intended for human consumption: wheat, maize and from products intended for animal consumption: combined forage and cereals and fodder products.

Aflatoxins are secondary metabolites of the fungi species *Aspergillus flavus*, *parasiticus* and *nominus*. Aflatoxins belong to the strongest natural occurring carcinogenetic substances. Aflatoxin B1 it is the analyte with the highest toxic significance. Zearalenone is formed by fungi of the genus *Fusarium.* It is a phytohormone which displays, apart from anabolic properties, mainly estrogenic effects, and may induce fertility disorders. Ochratoxin A is formed by fungi of the species *Aspergillus* and *Penicillium* and is hepatotoxic, teratogenic, carcinogenic and immunosuppressive properties. The basic principle of ELISA mycotoxins screening and analysis is the antigen-antibody reaction and photometrically measurement at 450 nm.

For the products intended for animal consumption, from the analyzed mycotoxins, cereals and fodder products had greater concentrations than combined forage. Aflatoxin A had concentrations between 1-16 µg/kg (combined forage) and 1-70 µg/kg (cereals and fodder products). Ochratoxin A had concentrations between 0.90 -98.30 µg/kg (combined forage) and 0.80 -136 µg/kg (cereals and

fodder products). Zearalenone had concentrations between 2.1-157 µg/kg (combined forage) and 2-391 µg/kg (cereals and fodder products).

For the products intended for human consumption, from the analyzed mycotoxins, maize had greater concentrations than wheat. Aflatoxin A had concentrations between 0.91-1.92 µg/kg (wheat) and 1.1-3.06 µg/kg (maize). Ochratoxin A had concentrations between 0.77 -4.36 µg/kg (wheat) and 0.91 - 4.69 µg/kg (maize). Zearalenone had concentrations between 1.34-56.94 µg/kg (wheat) and 2.11-249 µg/kg (maize).

The analyzed mycotoxin concentrations do not exceed the maximum values allowed by the legislation in force. Subsequent studies will be extended to different types of by-products intended for human and animal consumption.

PP10. MICROBIOLOGICAL CONTAMINATION LEVEL OF SURFACE WATER IN DANUBE AND NW BLACK SEA REGION: COLIFORM AND HETEROTROPHIC BACTERIA

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The microbiological contamination of the water with faecal bacteria due to anthropogenic activity is a very important issue for the population health and the assessment of the presence of pathogenic bacteria in water is a major concern for the protection of humans and aquatic animals. Coliform bacteria are indicators for the assessment of faecal pollution and a potential presence of pathogens, which is caused mainly of untreated wastewater.

In this paper we synthesized the results obtained for 32 sampling sites of MONITOX network in the Lower Danube basin and the Black Sea basin in two periods, before and after COVID-19 pandemic, e.g. April-June 2019 and June-July 2020. The target area for investigation of the level of the water microbiological contamination was the in Lower Danube (Calarasi/Silistra-Galati-Tulcea sectors, Danube Delta and Black Sea coast, from SE part of Romania. The determinations were carried out by counting of bacteria indicators of the organic pollution (heterotrophic bacteria and total coliforms).

The results demonstrated a decrease of microbiological contamination of surface water during the COVID-19 lockdown in all the samples collected form Black Sea coast, Danube River branches, Danube confluence with the Black Sea, and the Danube River downwards Galati town.

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PP11. HEAVY METALS DETERMINATION IN SOIL SAMPLES COLLECTED FROM A FUTURE RESIDENTIAL COMPLEX AREA FROM GALATI, ROMANIA

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This study was conducted to assess the extent of soil pollution in an area where a residential complex is planned for construction. The study aimed to investigate the potential impact of soil pollution on human health and the environment, and, least but not least, to propose remediation solutions. Soil samples were collected from Prutul S.A. and S.C. Intfor S.A.

Various indices were employed to evaluate pollution levels, including hazard index, total pollution index, ecological risk factor and ecological potential risk index. Regarding Prutul S.A., it was observed that the concentrations of As, Cr and Ni consistently exceeded acceptable values. The hazard index indicated that there is no immediate danger in this case. However, the total pollution index classified the area as having a moderate level of hazard.

The ecological risk factor indicated a moderate ecological potential for As and a very high ecological potential for Ni at several sampling points. The ecological potential risk index showed variations from moderate to very high ecological potential. In the case of INTFOR S.A., it was found that concentrations of Pb, Cr and Zn consistently exceeded permissible values. Both the total contamination index and the total pollution index revealed a hazardous situation in this area. For the remediation of the last area, it is recommended to apply a 40-70 cm layer of soil cover, which will be sealed with an asphalt layer to ensure a safe foundation for the construction of a residential complex.

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PP12. QUALITY STUDY CONDUCTED ON THE AGRICULTURAL EXPLOITED SOIL. CASE STUDY: ZĂVOAIA, BRĂILA COUNTY

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Agriculture is an important activity for society and a significant component of economic development. Healthy soils are of particular importance, and consequently, agricultural practices

must be developed while considering the maintenance of a healthy ecosystem where it already exists and the improvement of soil condition, where necessary. The samples were collected from the village of Dudescu, which is part of the Commune of Zăvoaia, city Insurăței, Brăila County. Samples were taken from the surface (0 cm), 5 cm and 30 cm deep. Representative soil samples were taken from areas with corn, soybean, wheat and sunflower crops. These locations were selected to investigate how agriculture impacts soil quality and, ultimately, the quality of the crops that grow in these areas. To evaluate the level of soil pollution, were determined the migration index, ecological potential risk and total ecological risk index. In this study, we can assume that the presence of elements Cr and Ni, with concentration above the normal values at all locations, is attributed to pollution in the Danube water used for irrigate. Cr and As concentrations decreased in cereal crops, as wheat has been proven to absorb Cr from the soil. Migration index values indicated that most heavy metals have very low, moderate, or high migration potential. In general, the values for the ecological potential risk and the ecological risk index, categorized pollution as low risk. Additionally, all other elements showed lower values, indicating good soil quality. However, high concentrations of Cr, Ni and As can have adverse effects on human health and the plants that grow in that soil. Therefore, for soil remediation, it is recommended to cultivate spinach (*Spinacia oleracea*).

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PP13. ASSESSMENT OF GROUNDWATER QUALITY FROM GALATI COUNTY WELLS USING PHYSICO-CHEMICAL METHODS AND HIGH-RESOLUTION CONTINUUM SOURCE ATOMIC ABSORPTION SPECTROMETRY

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Water is an essential resource for life. Approximately 97% of all quantity of the usable freshwater in the world is groundwater. In 2022, the European Environment Agency estimates that groundwater supplies 65% of drinking water and 25% of water for agricultural irrigation in the 27 EU Member States. In Romania, the percentage of the population that uses water from the free phreatic aquifer (water from wells) as a source of drinking water is significant (approx. 30%). Groundwater quality is a global problem that has a significant impact on human health and ecological systems. This is a valuable natural resource and as such should be protected from deterioration and chemical pollution.

The aim of this paper was to assess the physico-chemical quality of the water from wells in five villages surrounding by from the city of Galati (Satul Costi, Tulucești, Șendreni, Brânștea and Vameș), where live approx. 10 thousand inhabitants. were analysed the physico-chemical parameters (pH, temperature, salinity, conductivity, total dissolved solids, NO^{2-}, NO^{3-}, Cl^{-}, Ca^{2+}, Mg^{2+}), and concentration of heavy metals (Zn, Cd, Ni, Co, Fe, Mn, Cu, Cr, Li, Ca, Mg, Na, K, Al). The compliance of the evaluated quality parameters with Romanian legislation was monitored. High correlations were observed for Zn-Fe (0.999) and Zn-Al (0.686). Nitrate concentrations exceeded the legislated norms, which represents a major risk to population health.

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PP14. APPLICATIONS OF HIGH-RESOLUTION CONTINUUM SOURCE ATOMIC ABSORPTION SPECTROMETRY (HR-CS AAS)

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Atomic absorption spectrometry (AAS) is nowadays an analytical technique used to determine the concentration of metallic elements at trace level in the most diverse samples. It is widely used primarily because of its specificity and selectivity, easy handling and low operating costs.

An atomic absorption spectrometer (ContrAA@700 from Analytik Jena) equipped with a Xenon short arc lamp - high resolution continuous source (HR-CS-AAS) was used in this work. By applying flame (F-AAS), hydride (HG-AAS) and graphite tube (GF-AAS) techniques, it was possible to quantify the level of metals and metalloids in various complex solid or liquid samples. Prior to analysis, solid samples were digested using acid solutions according to standards and procedures recommended by qualified institutions using the Berghof'speedwave@ microwave digestion system.

All reagents used for the preparation of samples, working solutions and standards were of high purity. Also, the matrix modifiers, single- and multi-element standards and gases (C_2H_2, N_2O and Ar) used were of the quality recommended by the AAS technique.

HR-CS-AAS has been successfully applied to the analysis of surface and groundwater, supplements and food products (meat, bread), environmental samples (soil, moss, fish), biological samples (plant tissues), of industrial waste. With the help of the constructed calibration curves (the coefficient of determination $r^2 \cong 0.99$) it was possible to evaluate the elemental abundance (ppm and ppb) of Ag, Al, As, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Ni, Pb, Tl, Zn and Se from these samples.

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PP15. EXPLORING THE MICROSTRUCTURE OF COMPOSITE MATERIALS WITH SEM IMAGING TECHNIQUE: A REVIEW

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Generally, the microstructural characterization of materials is a key factor to understand their performance and technical properties. Particularly, exploring the composites' microstructure is essential from three points of view. Firstly, due to the multiple possibilities to arrange the reinforced phase among the matrix; the second, to identify, control and eliminate the structural defects; and finally, to point out the failure mechanisms. The microstructure evaluation of different types of composite materials was performed by means of scanning electron microscope (SEM). SEM imaging represent attempts towards the usual methods, which are non-adaptable and time-consuming. The obtained experimental results show the possibility to use SEM images, at higher resolution, to quickly analyzed the microstructure and texture, at reduced cost. SEM technique under secondary electron (SE) signal includes the possibility to combine imaging information with X-ray chemical microanalyses.

PP16. SEM INVESTIGATION OF FOOD PACKAGING BIOPOLYMERS. AN OVERVIEW

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The negative impact on the environment caused by the polymers in general, has facilitated the use of natural polymers. Investigation of biopolymers, with barrier properties, in food packaging means to identify the appropriate candidates, which could be obtained from fossil-based plastic sources. Biopolymers are recommended for their grease resistant, reduced water resistance, low brittleness and inhomogenous coating. Several biopolymers are introduced and they will expand in food and beverage packaging fields, as examples polylactic acid, bacterial cellulose, starch, waxes, alginate and zein protein. The Scanning Electron Microscopy (SEM) provides information about the morphology (homogeneous or heterogeneous), microstructure and quickly identification of chemical elements of a sample.

PP17. ASSESSMENT OF THE EFFICIENCY OF REDUCING HEAVY METALS FROM INDUSTRIAL WATER USING FILTER PAPERS WITH ADDED SEAWEED MASS

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This study aimed to valorize indigenous algae from the Romanian Black Sea, currently considered waste, by addressing metal pollution, especially in metallurgical wastewater. Simultaneously, the study sought to substitute virgin fiber pulp in the pulp and paper sector. The approach involved laboratory-level production of filter papers with algae, utilized in filtering metallurgical wastewater.

Materials included *Ulva rigida* seaweed, analyzed for metal removal capacity, and cellulose serving as the filter paper base. Seaweed powder was incorporated into cellulose to create these filter papers. Processing involved washing, drying, and grinding of algae and cellulose. After laboratory production using a Rapid Köthen machine, analyses aimed to determine filter paper efficiency for metal removal.

Results showed that all six filter paper samples effectively reduced total chromium concentrations in wastewater, ranging from 40% to 53.3%, complying with permissible limits. Notably, samples P4 and P5 excelled in reducing Cu^{2+} concentrations, achieving a remarkable 91.67% reduction.

For iron concentrations, all six samples, particularly those with seaweed additions (P1 to P5), demonstrated significant efficiency, reducing total Fe concentrations by over 98%. Seaweed-added filter papers also exhibited superior retention capacity for $Zn^{2+,}$ reducing concentrations by more than 91% across all samples.

In summary, this study successfully demonstrated the potential of filter papers with algae in efficiently reducing metal concentrations in wastewater, presenting a promising solution for environmental remediation.

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VIRTUAL POSTERS

VP01. THE ROLE OF ACQUIRING NEW KNOWLEDGE ON AQUATIC ECOSYSTEMS IN THEIR PRESERVATION AND RATIONAL USE IN A CHANGING WORLD

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In a continuously changing world, there is a need to identify the factors, which cause changes in the aquatic environment and to evaluate multilaterally the response of aquatic ecosystems in general and of some of their components – in particular.

Usage of aquatic ecosystems with the purpose of power generation became one of the biggest challenge in the last century. The construction of dams and the operation of hydropower plants damage the functioning of river ecosystems.

According to the water and silt physico-chemical parameters, the Dniester Hydropower Complex influences the functioning of the Dniester ecosystem. Laboratory modelling revealed very large changes in the river: if in the 1980s a high buffer capacity of the Dniester River was registered, nowadays this capacity has greatly decreased. This conclusion is also supported by multiannual data on the state of the Dniester River. In comparison, the characteristic correlations for running waters between hydrological, hydrochemical and biological parameters have been preserved in the Put River, which is placed in identical climatic conditions, and even has quite many sources of pollution in its hydrographic basin.

The investigations carried out grounded the obtaining of new knowledge on assessment of changes in the status of transboundary water ecosystems from Moldova, evaluation of the correlation between the processes of self-purification and secondary pollution.

Identification of regularities of the migration of chemical substances in the dynamic system "water-solid suspensions-silts-hydrobionts" is another research priority, as they serve as a scientific pillar for the proposal of preventive measures for control of the technogenic processes, minimisation of degrading effects of toxicants on the aquatic ecosystems, including protection of rare and endangered species of hydrobionts.

Laboratory modelling allowed determining the role of nutritive and toxic substances for different groups of hydrobionts, including fish species, and describing some aspects of their migration

and bioaccumulation. Some findings on the influence of cobalt (II) compounds on the state of common carp brooders were recently patented and implemented in pond fish farming.

The researches towards deciphering the circuit and the impact of some toxic substances, which can cause a risk for ecological and food security, are also important in the context of the European Community strategies, programs, and the association agreement of the Republic of Moldova with the European Union.

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VP02. MONITORING OF RADON CONCENTRATIONS IN EDUCATIONAL INSTITUTIONS IN THE MUNICIPALITIES OF CHISINAU AND CAHUL IN THE REPUBLIC OF MOLDOVA

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The paper presents the results of radon research in the Republic of Moldova in the context of the transposition of the Council of Europe Directive 2013/59/. Radon is a radioactive gas that comes from the decay of uranium and radium, present in the earth's crust. From the soil and water, it diffuses into the air in the atmosphere, being inhaled it settles in the lungs, causing the risk of serious pathology. Due to the insulation effect, radon can accumulate in rooms, and its level can become particularly high inside buildings. Exposure to radon can cause bronchopulmonary cancer. Starting from the harmful effects of this gas, we set out to study radon concentrations in indoor air. As part of the implementation of the national project MOL9007 supported by the IAEA, but also of other national scientific projects, research was carried out on the concentration of radon in the air in the homes of the Republic of Moldova, located in rural and urban areas of different geographical areas of the country, including the development of the methodology for measuring concentrations of radon in the air in homes by passive methods; procurement of equipment for measuring radon concentrations; establishing the reference level of radon in the air in the rooms; the development of the National Plan of Actions to control the exposure of the population and the occupationally exposed to radon; development of the Communication Strategy for the risk of exposure to radon; the national/international legislative framework in controlling the exposure of the population and the occupationally exposed to radon, which is stipulated in the Council of Europe Directive 2013/59/.

Between the years 2020-2023, measurements of radon concentrations were carried out in primary, secondary and high school educational institutions in the municipality of Chisinau and Cahul, Republic of Moldova.

Research methodology. The concentration of radioactive radon gas was measured using detectors (devices) of the RadonEye+2 type, safe for health, placed for 20 calendar days in the investigated room. The detectors were connected to a standard electrical network, being installed at a height of at least 1 meter above the floor surface, away from doors and windows, in the room where the residents spend most of their time. The detectors were programmed through the RadonEye+2 program, installed on the Smartphone, before starting the investigation. After 20 days, the detectors were disconnected from the electrical network and with the help of the RadonEye+2 program, the data from the device were transferred to the computer and the average value of radon in the investigated room was calculated.

Results. The results demonstrate that the average value of the radon concentration in the municipality of Chisinau was 121.75 Bq/m^3, and in the municipality of Cahul – 111.60 Bq/m^3. According to the geological map of the Republic of Moldova, there is a differentiation of the type of soils and rocks of the Central and Southern Zones of the country. This may have been the reason for the differences.

The results show that the average value of radon concentrations in primary, secondary and high school education institutions in both municipalities did not exceed the national reference level of radon in the air in the rooms - 300 Bq/m^3. Exceedings were detected in some kindergartens in the Buiucani and Ciocana sectors of the Chisinau municipality, and only in one of the investigated buildings in the Cahul municipality. Based on the regression analysis, the dependence of indoor radon concentrations on outdoor weather factors was established. A statistically significant relationship was established for the interaction of radon with indoor and outdoor air temperatures. The highest correlation (correlation coefficient = 0.41) was found for the interaction of radon with outdoor air temperature, and only 16.9% (R^2) of the variability in radon concentration in kindergartens can be attributed to the variation in outdoor air temperature.

Conclusions. The most effective way to solve the problem of radon exposure is to test workplace rooms, public buildings, including schools and kindergartens, and homes for radon gas and remediate buildings according to the recommendations of EURATOM directive 2013/59 and national norms.

VP03. PROGRAM OF MEASURES FOR IMPROVING HYDROMORPHOLOGICAL STATUS OF SURFACE WATERS IN THE LIMITS OF NORTH DEVELOPMENT REGION OF THE REPUBLIC OF MOLDOVA

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Water frame directive (Directive 2000/60/CE of EU Parliament and Council) approved in 2000, introduced a new way of water management in the European Union. Its main approach consists of development and implementation of river basin management plans, pilot areas being water bodies. These plans include: basin description, analysis of human impact and water use, environmental objectives. The core of the plan is the program of measures established as a result of water bodies and basin environment evaluation. Present study briefly describes the set of measures that should be implemented in order to improve hydrological and hydromorphological status of surface waters in the limits of the North Development Region of the Republic of Moldova. The study was developed within the project 20.80009.7007.11 "Evaluation of the stability of urban and rural ecosystems in order to ensure sustainable development" of Institute of Ecology and Geography.

Main set of measures is developed for improving rivers hydromorphology. As a reflection of identified human impact on water bodies, measures are oriented to liquidation of dykes, dams and reservoirs that are out of service, establishment and inventory of heavily modified bodies, piloting the rehabilitation works of this type of water bodies, elaboration and application of the code of good practices on river renaturation, control and prevention of human impact intensification. Also, among measures, important are renaturation of lower course of Camenca river, and of the region of Balatina – Prut channel. The large system of irrigation channels, constructed in this river lower part of, should be revised and partially demolished.

Another important set of measures includes those for improving waters hydrological status. In this regard, the main are afforestation actions, establishment of river protection zones and riparian strips, control on abstractions and wastewater discharges, improving and ensuring the application of the reservoirs' regulation, rehabilitation of springs, etc.

Among measures, an important place is maintained by improving of monitoring system: extension of hydrological, hydrochemical and hydrobiological monitoring network by installing new stations on surface and groundwater bodies, improvement of the forecasting system of hydrological and meteorological extreme events, development and implementation of hydromorphological monitoring.

Mitigation of climate change and protection against natural hazards is also important for water resources. In this regard, some of the measures are: including in agriculture cycle drought resistant species, increasing the lands rainwater retention capacity, improving rainwaters and irrigation systems management, ensuring minimum ecological flows of rivers and discharges from reservoirs, establishing water use limits, rehabilitation of hydrotechnical structures for protection of priority areas against floods, expansion of wetlands, promoting climate change resilience and adaptation

measures, rehabilitation and maintenance of priority reservoirs, development and implementation of the guide on the efficient use of natural waters / saving water.

Important measures are those which consider increasing the degree of population involvement in water resources protection, in the end, only in case of awareness of water resources importance, it is possible to improve their state.

VP04. ABOUT THE INTEGRATION OF PHYSICAL AND BIOLOGICAL COMPONENTS OF THE RIVER ECOSYSTEM

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The integration of physical and biological factors in river ecosystems is a basement of understanding how they function and support diverse forms of life. River ecosystems are dynamic and complex environments where physical and biological components interact in various ways. Natural disturbances such as floods, droughts, and sediment deposition can shape the physical characteristics of a river and influence the distribution and composition of biological communities. Biodiversity in river ecosystems contributes to ecosystem stability and resilience. Different species have unique adaptations to specific physical conditions and ecological niches. Human activities like dam construction, water extraction, pollution, and urbanization can disrupt the natural balance of physical and biological factors in river ecosystems, leading to habitat degradation and loss of biodiversity. The main physical factors that affect the Dniester ecosystem is the decrease in the total river volume. For almost 10 years, annual river runoff has not been able to reach the statistical "norm", which is estimated as a long-term average of 9.2-10.2 km^3. In 2010–2019, the average annual flow was 7.64 km3 versus 10.22 km^3 in 1951–1980. Study of flows along different sections of the river shows that this decrease is the result not only of climate change, but also of the hydropower plant influence. Relationship between runoff and nutrient concentrations suggests that land use practices and runoff management can play a significant role in nutrient dynamics. Over the past 20 years, there has been a stabilization of nutrient concentrations. The nutrient concentrations are noted

to be lower than the peak levels observed in the 1970s-1980s, which is a positive sign of improved water quality. However, they remain higher than in the 1950s, indicating that there is still room for further improvement to achieve more pristine conditions. The construction of reservoirs has led to a long-term decline in silica concentrations. Reservoirs alter the natural flow of silica through a river system, resulting in lower concentrations downstream. The concentrations of silicates in the Lower Dniester have a long-term tendency to decrease, falling in about 1.5 times, and their concentration has negative correlation with the runoff. Changes in physical factors may cause both immediate and delayed effects in biocenoses. Thus, we show that the water release from power plant reservoir first leads to a sharp increase in phytoplankton biomass downstream, and then to its significant decrease. Its inhibition is a delayed result of increased water turbidity, with almost unchanged nutrient concentrations. Understanding the integration of physical and biological factors in river ecosystems is essential for effective conservation and management. It helps scientists and policymakers make informed decisions to protect these valuable ecosystems, maintain water quality, and support the diverse life forms that depend on them.

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VP05. ON THE OXYGEN REGIME OF THE LOWER DNIESTER

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The content of dissolved oxygen in water is an integral indicator of the functioning of the ecosystem of a water body, which is determined by the balance of biological production-destruction and oxidative processes. During the work on the HydroEcoNex Project, measurements were taken of the almost continuous vertical distribution of water parameters in situ on the scale of horizontal homogeneity of water masses.

Quantitative estimates of the seasonal dynamics of O_2 concentration for the period 1985-2022 for this area indicate that on a climatic scale there was a decrease in oxygen saturation of the Dniester

waters by 5 - 20%, depending on the season. This phenomenon is caused by both a climatic increase in air temperature and anthropogenic thermal and other pollution, including the construction of hydroelectric power stations.

The features of the spatiotemporal structure of the field of dissolved oxygen in the waters of floodplain lakes and the Dniester estuary include, first of all, the presence of bottom hypoxic zones, which fall into the eutrophic type in terms of dissolved oxygen concentrations (less than 50%) and, on the other hand, significant water areas of eutrophic and hypertrophic waters both in terms of minimum transparency values (up to 0.2 m) and oxygen supersaturation - up to 170%.

Expeditions under the HydroEcoNex project showed that the three-dimensional oxygen concentration field of the Dniester estuary is formed under the influence of several natural factors and forms a rather specific structure. The emergence of a jump layer and, accordingly, a sharp decrease in vertical water exchange in the bottom layers is facilitated by: a climatic increase in the temperature of the air and water of the estuary; a noticeable change in prevailing directions and a decrease in wind speed; reduction in statistics of significant wind waves; increased penetration of dense salty sea waters into the estuary.

It has been experimentally shown that the distribution of O_2 is determined by the runoff of river waters, the circulation system, and bottom bathymetry; wind mixing provides "ventilation" of the water masses of the estuary, but the depth of its distribution is no more than 1.5-2 meters with the existing structure of density stratification. During expeditionary work, salty sea waters more than 10 ‰ were observed at the mouth of the Dniester. If in the upper layer (estuary water mass) oxygen saturation reaches 170%, then below the jump layer its content may decrease from 20% to 6%.

Consequently, it can be argued that climate change becomes for ecosystems that are already under anthropogenic pressure is a significant threat to their normal functioning.

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VP06. DIRECT OPTICAL PARTICLE TRACKING - A TECHNIQUE FOR SIZE DISTRIBUTION ASSESSMENT

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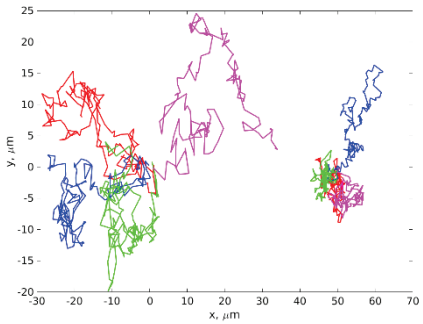
Nanotechnology, an emerging discipline within material science, has ushered in a new era of engineering by creating nanostructured materials with distinctive properties suitable for a wide range of bioengineering applications. The shape and size of these materials constitute critical variables, determined by the chosen synthesis method and chemical precursors. Silver nanoparticles, synthesized through chemical processes, exhibit antibacterial properties when their size falls within

a specific range. However, measuring the size of such nanoparticles, typically in the nanometer to tens of nanometers range, necessitates specialized techniques like Dynamic Light Scattering and Transmission Electron Microscopy. These methods are often limited by assumptions, high costs, and longer measurement times.

This paper introduces a novel approach utilizing Direct Particle Tracking for assessing particle size distribution in the early stages of nanoparticle synthesis. The study used realistic computer simulations of nanoparticle diffusion, employing the CHODIN code, and a specific code for Direct Particle Tracking written for this purpose. The Brownian motion of each particle is recorded (as in the Figure, for 20 nm and 90 nm particles), the mean square displacement is computed and the diffusion coefficient, as well.



The diameter of each particle is assessed and here from the particle distribution. The results on simulated particle diffusion demonstrate the feasibility of using Direct Particle Tracking as an effective method for size distribution assessment in the initial phases of nanoparticle synthesis. This innovation opens the door to real-time monitoring and control of nanoparticle size in bioengineering applications, promising significant advancements in the field of nanotechnology.

VP07. PB AND CD AIR POLLUTION SOURCES IDENTIFICATION BY MOSS BIOMONITORING IN ROMANIA

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Through the Romanian moss surveys, carried out in the frame of the International Cooperative Programme on Effects of Air Pollution on Natural Vegetation and Crops (ICP Vegetation), data on the levels of Cd and Pb in naturally growing mosses were provided.

The surveys have been repeated at five-years intervals, beginning in 2010 and continuing in 2015 and 2020. The analytical techniques used for the quantification of Cd and Pb in moss samples

were: atomic absorption spectrometry (2010) and inductively coupled plasma mass spectrometry (2015, 2020).

The maps of Cd and Pb atmospheric deposition were built, the pollution sources related to the hot spots in the maps were identified and a comparison of the mean and median values per survey year with other European countries was done.

VP08. OUTDOOR GAMMA DOSE RATE AND RISK TO POPULATION IN URBAN, NATURAL AND RECREATIONAL SITES FROM DANUBE AND PRUT RIVER BASINS, BLACK AND AEGEAN SEAS

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The study presents a synthesis of results obtained in the frame of cross-border projects such as Romania-Ukraine-Republic of Moldova and Black Sea Basin international grants, implemented in partnership by teams from Romania (RO), Moldova (MD) and Greece (GR), for gamma radiation dose rates measured in outdoor environments in various sites in Romania, Moldova and Greece, including urban, rural, touristic, protection areas and natural reserves. The targeted sites are found in the Lower Danube basin, Danube Delta, Lower Prut River Reserve (Galati and Tulcea County, Eastern Romania, and Cahul County, Moldova), as well as the Black Sea and Northern Aegean Sea basins (Navodari-Vama Veche, Constanta County, RO; Kavala prefecture, GR). 50 gamma dose rate measurements were carried out at each site with handheld survey meters (Digilert 100 and Inspector Alert), placed at 1 meter above ground level.

The results were compared with the official reports for external gamma dose and with the respective annual average values Romania and Moldova, our results being lower than the awareness limit of 250 nSv/h. Also, it can be noted that the dose rates were in most cases in the normal range of variation given by United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) 2008 Report, which is 52 – 163 nSv/h. The information will be used to complete the data for mapping the environmental radioactivity in SE Europe and to compare with

real-time monitoring data provided by the European Commission. Such studies are relevant for the radioecological monitoring, allowing us to determine the natural gamma background of the studied areas and to identify the areas where radioactive anomalies are present.

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VP09. THE TESTING OF THE ENVIRONMENTALLY FRIENDLY TECHNOLOGY FOR THE REMEDIATION OF POPS CONTAMINATED SITES

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The contamination by POPs substances is important for Republic of Moldova and worldwide. The implementation of different remediation technologies is a very important point for the management of contaminated sites. The several case studies for the testing of different environmentally friendly technologies were realized in Republic of Moldova last years. The aim of this work is a review of biotechnologies for the remediation of POPs contaminated soils made in Republic of Moldova. The analysis of the international practice showed their importance for the sustainable management of POPs contaminated sites. Every case study was realized with the site and risk assessment procedures. The site was studied in detail which included sampling, laboratory analysis, determination of hotspots and contamination area, evaluation of the contaminated soils volume, the conceptual model elaboration for the risk assessment, and the selection of the appropriate remediation technology. POPs concentration and spectrum were analysed using GC/MS method. The laboratory experiment was realized for the study of the effectiveness of biotechnology for high contaminated soil. The modification of DARAMEND technology was used for the bioremediation of high POPs contaminated soil. This experiment included the fertilizer supplement preparation from the local materials for the acceleration of the bioremediation process as follows: 40 % of iron powder (0.3 – 0.50 mm); 50 % of small wood shavings; 10 % of composted chicken manure. This fertilizer was used as an additive to the soil in the amount of 5 and 10% of the soil mass. The soil treatment after the fertilizer addition included cycles of anaerobic and aerobic conditions. The anaerobic condition phase included the soil hydration up to 70% of the maximum molecular moisture capacity, heating to 30^0 C and isolation from the air. This phase lasted for 14 days. The aerobic condition phase included the open-air condition for the temperature 20 – 25^0 C, soil loosening and drying up to 20% of the humidity. This phase lasted for 7 days. The remediation had 8 cycles. The obtained results showed that the initial POPs concentration from 500 – 650 mg/kg decreased to up 100 – 120 mg/kg (70 – 85 % of the initial concentrations). The blank experiment showed a reduction up to 60 %. The increase in the total number of microorganisms participating in the bioremediation process in all

experimental schemes from 40 to 120 % compared to the blank was indicated. The principal conclusion is that the bioremediation technologies are perspective, cost-effective and simple approach among all methods for the remediation of contaminated soils in the comparison with existing remediation approaches (https://frtr.gov/matrix2/section3/table3_2.pdf).

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VP10. CONSUMER AWARENESS REGARDING THE NECESSITY OF TRANSITION TO HEALTHY AND SUSTAINABLE DIETS

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The nutritional structure of the population, food production, agriculture and environmental protection are topics of global interest. The important role of diet and nutrition in promoting and maintaining the health and economy of a country has made dietary nutrition one of the strategic themes of government policies. The diseases associated with unbalanced nutrition: obesity, diabetes, cardiovascular diseases, cancer, osteoporosis and dental diseases are chronic diseases with the greatest burden on the economy and social system of a country. In the last years, worldwide, the burden of chronic diseases associated with inadequate nutrition has increased, reaching currently today in Eastern Europe to approximately 32% of all adult deaths are associated with dietary risk factors.

Sustainable healthy diets are food patterns that meet the needs of current generations, that is: promote the health and well-being of individuals; they are safe, accessible and equitable and have an impact on the environment, without threatening the ability of future generations to meet their needs. Although the need to adopt these diets is universally recognized, practical implementation is very difficult for several objective reasons (among them the low level of promotion of knowledge about nutrition, an insufficiently developed healthy lifestyle culture, and the food production, sales and advertising) and subjective (such as preferences, habits, individual psychophysiological reactions to the proposed food intake).

Improving the level of education in the alimentation field and building sustainable food systems from production to consumption and waste could increase the degree of awareness and significantly improve the transition of the population towards the adoption of healthy and sustainable diets.

VP11. PIXE-PIGE and SEM-EDX analysis of steels with special utilizations

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In this work the capabilities of atomic and nuclear methods PIGE (Particle-Induced Gamma-ray Emission), PIXE (Particle-Induced X-ray Emission) and SEM-EDX (Scanning Electron Microscopy Energy Dispersive X-ray Analysis) used for the determination of minor and trace constituents of special steels have been compared in terms of sensitivities, advantages and limitations.

Simultaneous PIXE–PIGE analyses have been carried out using a 3 MeV proton beam generated with the aid of the 3 MV Tandetron accelerator of the National Institute of Physics and Nuclear Engineering (IFIN-HH) Magurele. SEM-EDX investigations were carried out at Dunarea de Jos University of Galati, INPOLDE research center.

The minor and trace elements identified by us in the steel samples were the following: Al, Mn, Fe, V, Ti, Cr and Mg by PIGE; Ca, Ti, Cr, Mn, Fe, Cu, Ni, Zn by PIXE; C, N, O, Mg, Al, Si, P, S, Cl, Ag, Ca, Ti, V, Cr, Fe, Ni, Cu by SEM-EDX. By applying the three complementary techniques a very good overall picture of the complex elemental composition of a steel sample may be obtained.

VP12. XRF ANALYSIS OF HEAVY METALS IN SOILS COLLECTED FROM DIFFERENT PLAYGROUNDS FROM GALATI CITY, ROMANIA

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Soil in parks accumulates all emitted pollutants and will becomes a secondary source of heavy metals for the nearest receptors, primarily children. In this study, a total of five surface soils samples were collected from five different parks in Galati city, Romania, specifically from the playground area (PS). The soil samples were manually collected using a stainless steel shovel, that after every operation, was cleaned to prevent cross-contaminations between the samples. The sampling depth ranged from 0-0.05 m, with a sample weight varying between 1.5 and 2 kg.

The heavy metals concentration from the soil samples was determined using X-Ray Fluorescence Spectrometry (XRF) technique, with the aid of an Innovo-X Alpha Series XRF spectrometer. Innovo-X is a portable device, with a pistol shaped design, equipped with a X-Ray tube (Ag or W anode, 10-40 kV, 10-100 μA) and a Si PiN diode detector. Based on the mean concentrations, the presence of heavy metals led to the following pollution order:

Ba>Cr>Sr>Zn>Rb>Ni>Cu>Pb>As. Both the averages of geo-accumulation index and the enrichment coefficient indicated the same pollution order for the different locations as 1>5>2>3>4.

The presence of the heavy metals in parks and playgrounds is regulated as sensitive area under Romanian law, which is particularly important for children who often come into direct contact with the surface soil. Beside heavy traffic, other factors than can influence the accumulation of heavy metals in park soil may include the age of parks. Giving the cumulative nature of heavy metals pollution, older parks tend to be more polluted. Park no. 3, one of the oldest in our study, exhibited some of the highest values for As and Rb. Lastly, but not least, pollution originating from industrial activities is evident in our study, particularly in the first location, which presented maximum values for: Cr, Zn and Pb.

Acknowledgement: The work was performed in the frame of the internal grant INTERVENT, Contract no. 9187/2023, awarded by Dunarea de Jos University of Galati, Romania.

VP13. VEHICLE EMISSIONS EFFECTS ON SOIL QUALITY FROM A PUBLIC PARK AREA IN GALATI, ROMANIA

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The purpose of this work was to analyze representative soil samples collected from the Public Garden, taken from its four cardinal points and from a playground area. The location was selected to study how traffic affects the soil quality within the garden, subsequently influencing the quality of life for people who use the area for recreational purpose. The area is impacted both road and rail traffic. Approximately 0.6 kg of soil was sampled from the surface, 5 cm and from a depth of 30 cm. After preparation, the soil samples were analyzed, within the European Center of Excellence on Environmental Issues within the Faculty of Sciences and Environment, "Dunărea de Jos" University in Galati, using a portable XRF device, Thermo Scientific XLTj-793, Niton.

The highest degree of pollution was found in the samples collected near the main entrance. This is evident from the total concentrations of the pollutants detected within the upper 5 cm of soil, indicating anthropogenic pollution as a consequence of heavy traffic along Domnească Street. For the secondary entrances, the pollution levels were, on average, similar, and as expected, the playground area exhibited the lowest level of pollution.

The location closest to the source of rail traffic did not show significant excesses of heavy metals, with the exception of Cr, which presented the highest concentration at a depth of 30 cm. In other areas, high concentrations of Fe and Mn elements were observed, comparable to those found in scientific literature, resulting from anthropogenic pollution. The playground location contained the

lowest amount of heavy metals, attributed to its protection by vegetation and distance from the main road (over 20 meters).

Acknowledgement: The work was performed in the frame of the internal grant INTERVENT, Contract no. 9187/2023, awarded by Dunarea de Jos University of Galati, Romania.

VP14. INFLUENCE OF AGRICULTURAL PRACTICES ON SOIL QUALITY. STUDY CASE: FUNDENI, GALATI CITY

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The soil samples were taken in November 2021, from a vegetable garden, an alfalfa crop and two vineyard sites in the Fundeni commune, Galați County. The samples were allowed to dry (the remains of stones and vegetation being removed); the soil was then sieved through a 250 (µm) sieve and encapsulated, using special capsules for XRF analysis.

The samples collected from the vegetable garden indicated the presence of heavy metas that exceeded the legally acceptable values, including: Cr, Ni, Cu, As, Cd. Cd, in particular, exceeded the alert legal threshold for sensitive areas and even the intervention threshold. Elements such as: Cr (in the vegetable garden), Ni (in the alfalfa crop) and Cd (in both cases) showed high concentrations in the topsoil, suggesting potential pollution due to anthropogenic factors, combined with their affinity for organic matter. For the elements Cr (in the alfalfa crop), Cu (in both cases), Ag (in the alfalfa crop), an enrichment was observed due to the parental material, with low concentrations in the surface samples and higher at depth. In addition, certain elements exhibited nearly consistent concentrations across all three depths, such as Ni (in the vegetable garden), Cu (in the alfalfa crop), Ag (in the vegetable garden). In the case of vineyards locations, metals such as Cr, Ni, Cu, Zn, As, Cd exceeded the acceptable levels. Cd, once again, exceeded the alert threshold for sensitive areas and the intervention threshold. Elements like Cr (in both cases), Cu (in both cases), Zn (in both cases) and Cd (in both cases) showed high concentrations in the upper layer, indicating potential pollution from anthropogenic sources and their affinity for organic matter. Conversely, elements like Ni (in vineyard 2), As (in vineyard 1), Ag (in both cases) showed enrichment based on concentration trends, likely attributable to the parent material. Additionally, there were elements with nearly uniform concentrations across all three depths, including Ni (in vineyard 1), As (in vineyard 2) and Ag (in both cases).

Acknowledgement: The work was performed in the frame of the internal grant INTERVENT, Contract no. 9187/2023, awarded by Dunarea de Jos University of Galati, Romania.

VP15. THE EFFECT OF TRACE METALS ON GROWTH AND DEVELOPMENT OF FISH AND THE POSSIBILITIES OF USING TRACE ELEMENTS IN FISH FARMING

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Research was undertaken on the effect of trace elements on fish during early ontogenesis and a new method for increasing the fish fry resistivity of highly valued industrial species during artificial reproduction was elaborated. The first range of experiments studied the effect of different concentrations of trace elements on spawn development. The best results were obtained after spawn processing with *Cu+Zn+Mn* complex. Fish treatment with trace elements at other stages of ontogenesis did not show any positive results, moreover this had a negative effect. The method was tested not only in experimental conditions, but also at industrial scale and received the patent MD no. 1116.

Content of metals in fish eggs and larvae is an accurate reflection of that of metals in water (r=0.90-0.98), but it also depends on the metabolic peculiarities of the species. The experiments revealed that the use of such trace elements as *Zn, Mn* and *Co* and mixed complexes of *Cu+Zn+Mn* had a positive effect on fish larval growth rate, and not so relevant on larval viability. The research established also the concentrations which oppressed the growth and development of fish larvae.

The growth rate fry of fish is less dependent on trace element content in the water than that of fish larvae. A determining factor in fry of fish is the trace element content in the food. Therefore, the fish fry which were fed during 24-hour period with *Co* and *Zn* additives increased their body weight with 18-22% in comparison with control specimens, with 20-23% after Mn addition and with 25-32% after the addition of the complex *Cu+Zn+Mn*. On the contrary, *Cu* addition in the food, led to 14% decrease in their body weight. A positive result was obtained in fry of carp, grown under industrial conditions, during Mai-September. The fish fry from the experimental ponds received food enriched in *Co* and *Cu+Zn+Mn,* while that from control – without this. The fish fry from experimental ponds after one summer period had an average body weight of 22-41% higher and 18-29% higher, during 2-year period, than control one. The protein content in muscles of experimental specimens was also higher with 20-26% and 12-15% than controlling ones.

Mature fish possess a fairly developed homeostatic mechanism, which regulates the processes of accumulation and redistribution of metals between different organs depending on the prevalence of the period of growth or reproduction of the fish and their needs for one metal or another. Intense processes of accumulation of biologically important metals in the gonads dominate in the period preceding spawning, accompanied by a decrease in their concentrations in the skeletal muscles. In the growth period an opposite phenomenon is observed. However, the content of metals in fish organs and tissues is a function of the composition of the environment In all fish species the maximal values of the majority of trace elements were recorded on the skin surface and gills. Exceptions were made by copper, the maximum content of which was found in the liver and zinc, the concentration of which was the highest in gonads.

A positive result was obtained in the experiments with food enriched in Co for maturated fish at industrial scale. We obtained and implemented in fish farming the patent MD no. 1646. Thus, there is no doubt for the use of trace elements in modern industrial technologies of fish farming in order to increase the growth rate and the increase in biological resistivity of fish.

Acknowledgment: The research was carried out in the projects 20.80009.7007.06; BSB27,BSB165

LABORATORY TRAINING

LT01. LABORATORY APPLICATIONS OF GAMMA RAYS' ATTENUATION

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In this paper some laboratory applications of gamma rays' attenuation process are presented. The measurements have been carried out at Nuclear Experimental Physics and Dosimetry Laboratory at INPOLDE research center, Faculty of Sciences and Environment, Dunarea de Jos University of Galati, using a 3"x 3" NaI(Tl) detector coupled to a nuclear counter and 1"x 1" NaI(Tl) detector coupled to a PHYWE spectrometric chain.

The method was used for the investigation of the variation of linear attenuation coefficient with gamma energy and atomic number of attenuators, the determination of the composition of binary alloys of known constituents using only the photoelectric absorption of the gamma-rays by selecting the photopeak in the spectrum of the radioactive source and eliminating the scattered rays, and the determination of the density variation of non-homogeneous materials (bricks).

LT02. APPLICATIONS OF GAMMA RAY SPECTROMETRY USING SCINTILLATION AND SEMICONDUCTOR DETECTORS

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In this paper some applications of gamma ray spectrometry using both scintillation and semiconductor detectors are presented. The gamma spectrometric measurements have been carried out at Nuclear Experimental Physics and Dosimetry Laboratory at INPOLDE research center, Faculty of Sciences and Environment, Dunarea de Jos University of Galati, using a PHYWE 1"x 1" NaI(Tl) detector coupled to a spectrometric chain with multichannel analyzer and an ORTEC HPGe detector, based on the calibration made with the aid of five point radioactive sources emitting gamma rays of a large range of energies.

The method was used for the determination of the radionuclides in several soil and sediments samples and for the determination of the composition of binary alloys of known constituents using only the photoelectric absorption of the gamma-rays by selecting the photopeak in the spectrum of the radioactive source and eliminating the scattered rays.

LT03. MEASUREMENT OF RADON AND THORON IN INDOOR ENVIRONMENTS AND POPULATION DOSE EVALUATION

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The paper presents the results obtained during the measurement of gaseous radioactive isotopes of radon chemical element, radon (^{222}Rn) and thoron (^{220}Th), performed at Nuclear Experimental Physics and Dosimetry Laboratory at INPOLDE research center, Faculty of Sciences and Environment, Dunarea De Jos University of Galati and the interpretion of temporal variations in university spaces. For the **active** measurements calibrated instrument of SARAD type has been used and the data were processed with the aid of SARAD Radon Vision 6.3.4 software.

A discussion was made regarding the main factors which might have influence on the variability of radon/thoron levels in a public educational space, e.g. the type of construction material, location, ventilation degree of the space, floor level, measuring time, etc. The obtained values showed that the radon concentration variation in several physics laboratories greatly depend on the aeration of the respective room, increasing 2-4 times in the case of unventilated space even over a period of 3-4 days.

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