



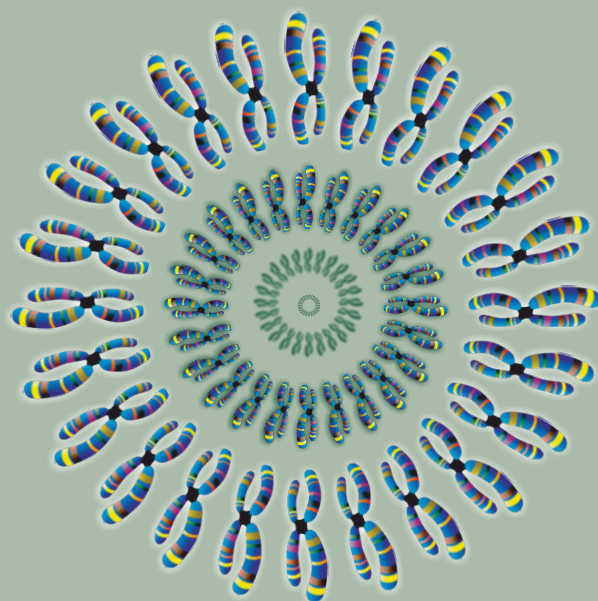
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ABSTRACT BOOK

Annual Scientific Session of Naturalist Students (SSASN),
7th edition, October 26, 2023

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New Trends in Biology: from Molecules to Complex Systems,
3rd edition, October 27-28, 2023

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FOREWORD

This volume brings together the abstracts of scientific work that have been communicated in two scientific manifestations – Annual Scientific Session of Naturalist Students (SSASN), 7th edition, October 26, 2023, and Scientific Session of the Faculty of Biology (SSFB), *New Trends in Biology: from Molecules to Complex Systems*, 3rd edition, October 27-28, 2023.

The SSAN 2023, organized by the Faculty of Biology of “Alexandru Ioan Cuza” University of Iași, together with the Association of Biological Students from Iași, aimed at developing the skills of scientific communication and familiarizing students with the rigor of scientific research. Bachelor's and master's students, mostly from the Faculty of Biology of Alexandru Ioan Cuza University of Iasi, presented 17 works carried out under the scientific coordination of the teaching staff and researchers from the university; of these, only 10 were selected for their abstracts to be included in this volume. The topics of communications were varied – taxonomy and ecology, entomology, neurophysiology, animal nutrition, biochemistry, human genetics, and molecular biology.

The SSFB 2023 was organized by the Faculty of Biology of the “Alexandru Ioan Cuza” University of Iași, in partnership with “Anastasiu Fătu” Botanical Garden, Museum of Natural History, Romanian Academy – Iași Branch, and Central University Library “Mihai Eminescu”. A diversity of scientific events (i.e., plenary lectures, poster session, oral communications, workshops, roundtable, and exhibition) summed 81 contributions of 149 authors from Romania and abroad (i.e., Algeria, France, Germany, Iraq, Poland, Republic of Moldova, South Africa, USA). As in the previous edition of SSFB, the scientific contributions have been grouped in three major themes named *Taxonomy and Ecology*, *Experimental and Molecular Biology*, and *Educational Resources in Biology*. This volume includes the abstracts of 44 works presented within the SSFB 2023, disseminating new research results on a variety of topics, such as plant anatomy and ecology, animal behavior, new species, bioarchaeology and social anthropology, biotechnology, neurobiology, transcriptomics, proteomics, genomics, cytotoxicity, museology, teaching methods.

The scientific events occasioned by SSFB 2023 strengthened again the collegial and professional links between the participants, debating relevant issues, challenges, opportunities, and new discoveries in Biology. The success of the SSFB 3rd edition resulted from the common effort and enthusiasm of the organizing committee members, moderators, as well as all the authors, to whom we thank once again!

On behalf of the organizers,
Luminița Bejenaru, Mihaela Danu, Ciprian Mânzu, and Marius Mihășan

**Annual Scientific Session of Naturalist Students (SSAN), 7th edition,
October 26, 2023****ISABELLINE WHEATEAR (*OENANTHE ISABELLINA*), A NEW SPECIES FOR
THE REPUBLIC OF MOLDOVA: EXPANSION OR OVERLOOKING**

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The Isabelline Wheatear (*Oenanthe isabellina*) is a small passerine bird belonging to the Old World flycatcher family, Muscicapidae. It has a Central Asian distribution, with its western limit reaching Eastern Europe, encompassing Bulgaria, Romania, and Ukraine. Prior to recent observations, there were no documented records of the Isabelline Wheatear in the territory between the Dniester and Prut rivers in the Republic of Moldova, and no official or unofficial reports of this species could be found.

The first unofficial record of the Isabelline Wheatear's presence in Moldova dates back to May 30, 2021, in Coșcalia, Căușeni district. A few days later the first breeding evidence was obtained close to Beșalma, Găgăuzia. One year later, the initial unofficial record from Coșcalia was officially substantiated with evidence, confirming the breeding status. Since then, a total of nine separate locations, each with more than 1 km between them, have been documented as habitats for the Isabelline Wheatear during the breeding season. These locations comprise four areas in the Căușeni district, two in the Ștefan Vodă district, two in Găgăuzia, and one in the Taraclia district. All these areas are characterised by steppe habitats with short vegetation, with crevices in which to breed, conditions necessary for the Isabelline Wheatear's presence.

Using Maxent species distribution models (SDMs), we found that this new territory provides a suitable environment for the expansion of the Isabelline Wheatear. The primary question now is which population colonised this area: the South Black Sea population through Romania or the North Black Sea population through Crimea.

ORDER HYMENOPTERA. STUDY CASE: *TRITELEIA PEYERIMHOFFI*

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Triteleia peyerimhoffi (Kieffer) is a species of parasitoid wasps, with Palearctic distribution, described in the family Scelionidae (Platygastridae), the host being the orthopteran *Uromenus brevicolis* (Fisher). *Triteleia peyerimhoffi* presents high intraspecific variability, potentially influenced by a Circum Mediterranean distribution area.

The superfamily Platygastridae is among taxonomic groups called “dark taxa”, that present difficulty in identifying and differentiating in between the species, lack fundamental information such as biology and distribution and were largely excluded from conservation efforts and red lists. The German Barcode of Life III: Dark Taxa project aims to complete the

DNA databases for dark taxa insects, allowing further research in integrated taxonomy, as well as including these groups in ecology and biodiversity conservation studies.

The study material was captured using various techniques, (such as Malaise traps, yellow pan traps, sweep net and entomological aspirator). COI DNA barcodes were obtained through PCR by Sanger sequencing or using the Oxford Nanopore MinION portable sequencing device.

The aim of this study is to update the distribution of *Triteleia peyerimhoffi* species, which was found in Germany for the first time, this being the northernmost point of this species distribution. Furthermore, the studied specimens were morphologically analyzed, to assess the intraspecific variability and compare it with barcode data.

A NEW SPECIES OF JUMPING SPIDER FOR THE ROMANIAN FAUNA

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In the work to be published, we attest the presence of a new salticid species for the Romanian arachnofauna. Three specimens of the *Saitis tauricus* (Kulczyński 1905) species were collected and photographed by wildlife enthusiasts in Constanța County. Since 1905, when the holotype was described, several works have been attested the presence of this species in the Balkan and Mediterranean areas. Based on the current distribution map, this species was recorded in the countries around Romania and the Republic of Moldova. We assume that this species would also be present in the Republic of Moldova. With these results, we would like to make a call for the study of salticides in Romania or make an invitation for passionate involvement in the study of nature.

EXPLORING COLOR ABERRATIONS: TWO CASES OF ABNORMAL PIGMENTATION IN FREE-RANGING REPTILES FROM ROMANIA

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The Grass snake (*Natrix natrix*) and the Eastern Green Lizard (*Lacerta viridis*) are two very well-studied species of reptiles in Europe, with a wide range, the Grass Snake presenting various color morphs. Sometimes, color aberrations, such as melanism, albinism, leucism or erythrism can occur in reptiles. Melanism refers to great amounts of melanin being produced, while albinism refers, generally to the partial or complete lack of it. My work presents an observation of an albino juvenile Grass snake (*Natrix natrix*) photographed in a park in Bucharest, Romania and an observation of a melanistic Eastern Green Lizard (*Lacerta viridis*), found at Valea lui David, Iași, Romania. The albino individual had no pigment visible, in contrast with already published records which presented xanthophores or other pigments. This represents the first observation of a completely albino *Natrix natrix*, and it was recorded with the aid of citizen science.

THE INFLUENCE OF ADMINISTERING *EQUISETUM TELMATEIA* EHRH. ESSENTIAL OIL ON COGNITIVE IMPAIRMENT IN ZEBRAFISH

ANĂSTĂSOAIEI ALEXANDRA IONELA¹, DUMITRU GABRIELA¹, TODIRĂȘCU-CIORNEA ELENA¹, HRIȚCU LUCIAN¹, BOIANGIU RĂZVAN ȘTEFAN¹

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Literature data indicate for species of the genus *Equisetum* a high capacity for biosynthesis of an impressive number of phytochemicals, which may have properties to improve the general health of humans. Traditional medicine in ancient Greece used these plants to treat wounds and skin inflammations, but also to heal fractures (due to the action of silicic acid and the numerous minerals identified). Nowadays, many species of the genus *Equisetum* are still used in traditional medicine all over the world for various purposes, such as antiseptic (*Equisetum telmateia*), diuretic (*Equisetum giganteum*), against jaundice and hepatitis, but also for the treatment of urinary tract problems (*Equisetum debile*). *Equisetum telmateia* Ehrh. (big horsetail) has anti-inflammatory and antioxidant properties and is used to treat rheumatism, broken bones, genito-urinary diseases, prostatitis, gastrointestinal disorders, inflammation, and hypertension, as well as for diuretic and expectorant purposes.

The present paper aimed to evaluate the effects of *Equisetum telmateia* Ehrh. essential oil administration on an experimental model of Alzheimer's disease - a neurological disorder that causes progressive brain atrophy and cell death, as it is known that the earliest sign of the disease is a subtle decline in memory functions in a clearly conscious state. Thus, the experimental results obtained showed improvements in cognitive parameters in the fish batches that were treated with *Equisetum telmateia* Ehrh. essential oil, in close correlation with the dose of administered extract, improving locomotor activity and the desire to explore the new arm in the case of the Y test, and the new object in the case of the recognition test, respectively.

THE EFFECT OF THE ESSENTIAL OIL OF *CORIANDRUM SATIVUM* VAR. *MICROCARPUM* IN IMPROVING MEMORY DEFICIT AND OXIDATIVE STRESS IN THE ZEBRAFISH MODEL

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Anxiety and behavioral disorders have a relatively high prevalence in modern society and affect one eighth of the world's total population. The most well-known tranquilizers or anxiolytics are those of the benzodiazepine family, which act by modulating GABAergic receptors, natural remedies having the same efficacy as conventional drugs, but with fewer side effects, being considered a valuable addition to the treatment options for anxiety-related disorders. However, the acceptance of alternative remedies has so far been hampered by the scarcity of pharmacological studies elucidating their indications, limitations and mechanisms of action.

Coriandrum sativum var. *microcarpum* L. (coriander), a member of the Apiaceae family, is a popular plant with versatile applications, originating from the Mediterranean region and widely cultivated in Central and Eastern Europe and many Asian countries. The main components of coriander essential oil are linoleic and linolenic acids, data from the literature associating nutritional supplementation with coriander seeds with a decrease in the concentration of

saturated fatty acids, but also an increase in unsaturated ones. The health benefits of this plant include antibacterial, anti-inflammatory, digestive, diuretic, carminative, hypoglycemic, hypotensive, muscle relaxant and antioxidant properties, inclusive a preventive effect on changes in brain histology such as lymphocytic infiltration and cellular edema.

The aim of this research was to determine the effect of coriander oil on anxious behavior and some biochemical parameters in *Danio rerio*, by inducing an animal model of dementia. Thus, the obtained results showed that the administration of *Coriandrum sativum* oil contributes to the prevention of the anxiogenic effect of scopolamine, but in a dose-dependent manner. Regarding the biochemical parameters, the obtained results indicate the ameliorative effect of coriander oil on the oxidative stress induced by the administration of scopolamine in the brain of zebrafish by increasing the total content of glutathione and reducing lipid and protein oxidation.

THE INFLUENCE OF *EQUISETUM ARVENSE* L. OIL ON OXIDATIVE STRESS IN *DANIO RERIO*

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Equisetum arvense L. (horsetail) is a valuable source of secondary metabolites, alkaloids, flavonoids (such as quercetin) with hepatoprotective and antioxidant properties, carbohydrates, proteins and amino acids, phytosterols, saponins, provitamins and vitamins (C, E, K, B₁, B₂, B₆ nicotinic acid, folic acid and pantothenic acid), and other biologically active triterpenoids, substances that have anti-inflammatory, analgesic, anticonvulsant, antihyperglycemic, anticancer, antibacterial, antifungal, cytotoxic, antidiabetic, antilithiasis, dermatological, wound healing, diuretic, anxiolytic, sedative and stimulating cognitive performance. In addition, the literature data note the multitude of trace elements present such as Na, K, Ca, Mg, P, Fe, Zn, Cu, Mn, Si, Sr, etc., copper and zinc being essential elements required for superoxide dismutase - an enzyme involved in the first line of defense against free radicals.

Thus, knowing that plant antioxidants are of major interest for medicine by protecting the body against oxidative stress, generated in the context of diseases such as atherosclerosis, Alzheimer's, Parkinson's, etc., our study aimed to evaluate the influence of the administration of *Equisetum arvense* L. oil on oxidative stress in *Danio rerio*, the oxidative stress enzymes representing a neuroprotective compensatory factor in degenerative manifestations.

The results obtained show that the essential oil of *Equisetum arvense* L. counteracted, to a large extent, the experimentally induced oxidative stress in zebrafish, the activity of superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPX) decreasing significantly, compared with the control group, in close correlation with the dose of extract administered.

STUDIES ON THE INFLUENCE OF *CENTAUREA BALSAMITA* LAM. OIL ON THE NEURODEGENERATE PROCESSES IN THE ZEBRAFISH EXPERIMENTAL MODEL

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Zebrafish, a species of great importance in the field of comparative biology as well as in biomedical fields, exhibits rapid reproduction with a relatively short growth time and many eggs laid every few weeks. In addition, low maintenance cost compared to rodent care has led to the use of this species as an outstanding model for the study of pharmacology, genetics, environmental toxicology, cancer and neurodegenerative diseases, with many studies indicating the use of zebrafish to evaluate a series of pollutants.

Danio rerio has shown particular importance in the study of cancer toxicology because it can develop neoplasms histologically like human cancers. Due to the ongoing study of fish genomics, several useful tools for interpreting basic biological processes have been discovered, including transgenic models, gene-specific disruptions, genetic screening, and carcinogenesis assays. Thus, the zebrafish is emerging as an effective model for the discovery of new cancer genes and for the discovery of drugs that combat this disease. Zebrafish also provide new insights into stem cell differentiation and contribute to new diagnostic and therapeutic opportunities for human heart disease.

Thus, taking into account all the benefits of using the zebrafish as an animal model, the present paper presents the results obtained as a result of the administration of the essential oil of *Centaurea balsamita* Lam. in *Danio rerio* specimens with scopolamine-induced memory deficits - a non-selective muscarinic antagonist that interferes with short-term memory and learning processes in animals and humans.

THE IMPORTANCE OF GENETIC FACTORS IN THE DETERMINISM OF MALIGNANT LYMPHOMAS

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Hodgkin and non-Hodgkin lymphomas are lymphoproliferative diseases well known for their complexity and genetic heterogeneity; their onset is insidious and are frequently diagnosed in advanced, even terminal, stages.

Trying to assess the importance of genetic factors in the determinism of malignant lymphomas we studied a group of patients investigated in the Clinics of Haematology in Iași (from 2010 to 2019). In accordance with literature data, our study shows the fact that malignant lymphomas occupy an important place in the large group of lymphoproliferative diseases. For the majority of the studied cases we observed the lack of familial antecedents and we concluded that genetic factors had a minor part in their determinism and the recurrence risk is reduced (2-4%). Predisposing diseases (Rheumatoid Polyarthrititis, LES, HIV, EBV), environmental carcinogens and the region of residence are playing important parts in their determinism. Aged persons from urban agglomerations, especially males are more frequently diagnosed early because of the better access to medical services. In the case of the less frequent patients with genetic

predisposition we recommended family inquiry and the calculation of recurrence risk in the view of family genetic counselling. The highest recurrence risks were recorded for patients with both parents affected and then for patients with one first degree and one second degree relative affected.

Eventually, we emphasize the importance of the implementation for the entire Romanian population of better preventive actions for the early diagnose of lymphomas.

FIRST REPORT OF *SALVIA REVELATA* MÁTIS & A.Z. SZABÓ IN THE REPUBLIC OF MOLDOVA

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Identified in 2015 in Dobrogea (Romania), but officially recognized through the valid publication in 2023, the species *Salvia revelata* Mátis & A.Z. Szabó has a still insufficiently known distribution, most likely due to the frequent confusion with the close species, *S. austriaca* Jacq. s.str. This communication represents the first confirmation of its presence on the territory of the Republic of Moldova.

Scientific Session of the Faculty of Biology (SSFB), *New Trends in Biology: from Molecules to Complex Systems*, 3rd edition, October 27-28, 2023

PLENARY LECTURE

**MODELING AND DESIGN OF OLIGOMERIC AMYLOID AGGREGATES,
NANOFIBRILS AND NANOPARTICLE PROTEIN CORONAS**

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Computational molecular modeling methods are growing in popularity due to their increasing applicability to study a broad range of molecular biophysics systems, spanning multiple system sizes (e.g., from atomistic to residue-based representations, and even to multiple protein-protein interactions). This talk will present several recent examples on how modern computational modeling methods, from atomistic molecular dynamics to protein docking can be used in conjunction with physics-based enhanced sampling methods to unveil structural details and molecular mechanisms of biomolecular systems of high biomedical relevance, from Alzheimer's disease to type 2 diabetes and cancer.

TAXONOMY AND ECOLOGY

**DIPTERA (INSECTA) FROM THE CARPATHIANS, ROMANIA: BARCODING
DARK TAXA IN A BIODIVERSITY HOTSPOT FROM EUROPE**

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„Dark taxa” represent the overlooked part of biodiversity in international genetic databases, due to their problematic taxonomy, being part of little researched groups of organisms, although it most commonly includes endemics or regional taxa, with major roles in assessment of the native aquatic biodiversity. In Romania, six biodiversity hot spots have been identified in the Carpathian Mountains. They provide an evolutionary well defined geographic template for the survival and formation of new species and also harbour unknown or overlooked species. Diptera are a very important, yet poorly explored component of aquatic ecosystems due to their difficult species level taxonomy and cryptic larvae forms.

Our initiative proposes the species-level identification of aquatic and semi-aquatic Diptera from important areas regarding the aquatic biodiversity of the Carpathian Mountains, using morphological and molecular methods.

In total, 1211 specimens were collected between 2012 and 2022, analyzed and DNA barcodes were obtained, using the standard barcode region (*mtCOI*). 859 sequences belonging to 170 morphologically identified species and 26 undetermined taxonomic units, mostly represented by larvae. A total of 111 concordant BINs, 113 singleton BINs, with 68 new BINs not previously reported in the Barcode of Life Data System (BOLD) were identified.

Our results estimate a more realistic dimension of aquatic biodiversity and encourage the application of molecular methods in conservation and management of water resources in the Carpathian area.

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REDESCRIPTION OF LARVA OF *LAMPRODILA MIRIFICA* (COLEOPTERA: BUPRESTIDAE) BASED ON SEM PHOTOGRAPHY

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In this communication the larva of *Lamprodila* (*Lamprodila*) *mirifica* is described using optical macrophotography and SEM techniques. A previous description has been published, but under the name of another species of the genus, in which the structure of the gut mucosae was primarily used.

ANALYSIS OF THE FAUNA OF THE MEDIEVAL SETTLEMENT OF THE OTTOMAN ERA (16TH – 17TH CENTURIES) FROM PAZVANT – CHEIA (CONSTANȚA COUNTY)

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The archaeological research carried out in the Casimcei Valley, within the framework of the Romanian-Polish project Central Dobrudja - Landscape Changes and Human-Environment Interactions from Neolithic to Middle Ages (2014-2016), allowed the identification of new sites, among them the points Cheia-Pazvant II (Ottoman-era rural settlement) and Cheia Pazvant I (its necropolis).

The fauna from the Cheia-Pazvant II point (Constanța county) comes from a rural settlement, dated in the 16th-17th centuries, and is among the few Ottoman settlements in Dobrogea studied from an archaeozoological point of view. Faunal remains have all the characteristics of household waste. Several taxa were identified: one species of fish - carp, two species of birds - chicken and goose and ten species of mammals - cattle, sheep, goat, horse, donkey, dog, cat, wolf, fox and hare. The most numerous are the fragments of mammals which represent 93.19%, followed by those of birds (6.33%) and fish (0.48%). Livestock breeding is dominant, the main species found in the sample being cattle, followed by sheep and goats. These were exploited in a mixed manner, both for their by-products and meat. Indices related to horse meat consumption are present in a reduced manner. The pig is absent in the faunal sample, which confirms the existence of religious customs imposed in food, characteristic, in the present case, of the Muslim community.

EVALUATION OF ANIMAL RESOURCES USED IN COMMUNITIES OF BABADAG CULTURE (HALLSTATT, IRON AGE), IN THE AREA OF NORTHERN DOBROGEA: ARCHAEOZOOLOGICAL DATA

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Iron Age consists of two periods: Hallstatt and La Tène. The most representative culture of the Hallstatt period is Babadag (11th/8th-7th BCE), specific to the beginning of Iron Age in southeastern Romania.

This study aims to assess the animal resources used in the food economy of the communities of Babadag culture on the territory of Northern Dobrogea: Enisala-Palanca, Telița-Celic-Dere, Babadag, Niculițel-Cornet and Beidaud.

Faunal remains attributed to the classes Mammalia, Reptilia, Pisces, Aves and Mollusca were identified in all of the studied samples. Analyzing comparatively the proportion of mammals, it stands out that the domestic ones significantly exceed the proportion of wild mammals, from which it follows that the basic occupation of the Babadag culture communities was represented by animal husbandry. In the sample from Niculițel-Cornet domestic mammals were assigned the lowest percentage, more precisely 88%, while in the sample from Beidaud, 95%. However, in order to cover their protein needs, the populations in all the settlements under this study were practicing hunting (especially of large species, such as red deer), molluscs harvesting and fishing. The last activity has an important role because in the sample from Enisala-Palanca, approximately 40% of the remains were attributed to the Pisces class, followed by the sample from Niculițel-Cornet, in a percentage of approximately 30%. Among the domestic mammals, the cattle were preferred, followed by the sheep/goat group, domestic pig, horse, and among the wild species, the most significant are red deer, wild boar, and roe deer.

THE ANALYSIS OF THE FAUNAL REMAINS DISCOVERED IN THE LATE IRON AGE SETTLEMENT (4TH-3RD CENTURY BCE) FROM DOBROVĂȚ – LA LIVADĂ

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The Dobrovăț-La Livadă site is located in the northern area of the Central Moldavian Plateau, in the area of the Dobrovăț commune (Iași county). It dates back to the 5th-3rd centuries BCE, at the beginning of the second Iron Age. The site was investigated by A. Berzovan in 2020.

The archaeozoological analysis was carried out at the Institute of Archeology from Iași, the methods applied being: anatomical and taxonomic identification, quantification of faunal remains, taphonomic and paleopathological identification, age estimation, estimation of the amount of meat, evaluation of the paleoenvironment and statistical analysis. The study material is represented by faunal remains of household origin.

With a percentage of approx. 93% domestic mammals, animal husbandry was the main meat-procuring activity of this prehistoric community. Domestic cattle were the most important taxon, accounting for 30% NISP, 25% MNI and providing 90% of the total estimated meat. The horse was mainly used for riding and traction force, but taking into account the traces of butchering, it is possible that this species was consumed in some isolated cases.

Hunting was not an important occupation for this community, the wild boar and red deer being the only wild species identified.

Correlating the wild mammals preferred habitat with the high proportion of domestic ruminants and the domestic pig, we can imagine a palaeoenvironment very similar to that of present day: the settlement surrounded by some open fields so the cattle, sheep and goats can graze but the deciduous forest was not too far from the settlement suggested by the presence of wild boar and red deer and, also, by the high proportion of the domestic pig which at that time were set loose in the forest so they can feed.

ANATOMO-COMPARATIVE STUDY OF SKELETAL REMAINS DISCOVERED IN THE ARCHEOLOGICAL SITE OF ROȘIORI (NEAMȚ COUNTY)

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Through the archaeological excavations carried out in the Roșiori site (Dulcești commune, Neamț county), located on the upper terrace of the Moldova river, four levels of habitation were identified: Geto-Dacian (5th-4th centuries BCE), Bastarnic (2nd-1st centuries BCE), of the Free Dacians (2nd-3rd centuries CE) and Romanesque (6th-7th centuries CE). A rich faunal material was collected in the nine archeological campaigns carried out in the Roșiori site, and in this paper 1339 skeletal remains from the levels of the 5th-4th BCE, 2nd-3rd CE and 6th-7th CE centuries are preliminarily analyzed.

In all levels, the remains of domestic mammals predominate, and among them the most numerous are those of domestic cattle (*Bos taurus*), sheep/goat (*Ovis aries/Capra hircus*) and pig (*Sus domesticus*). Domestic cattle record maximum frequencies in the more recent levels (2nd-3rd and 6th-7th centuries), and sheep/goat in the Geto-Dacian level. The horse (*Equus*

caballus) is better represented in the 2nd-3rd and 6th-7th century levels. The remains of wild mammals are fewer, being identified as deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*) and beaver (*Castor fiber*). The presence of skeletal remains of birds and molluscs has also been reported, but with reduced frequencies.

PRELIMINARY ARCHAEOZOOLOGICAL DATA CONCERNING THE PREHISTORIC SITE OF CUCUTENI A3 CULTURE FROM COSTEȘTI-CIER (IAȘI COUNTY, ROMANIA)

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The analyzed faunal remains come from the archaeological site of Costești-Cier (Iași County), being discovered and collected during the excavation campaigns of 2015, 2016, 2017 and 2018. The archaeozoological analysis was carried out on 2155 faunal remains belonging to the Chalcolithic period, Cucuteni culture, phase A3 (4350-4200 cal. BC). The faunal groups identified are represented by mammals (92.11% NISP = number of identified specimens), birds (0.51%), and molluscs (7.38%), the latter one being represented by: *Unio*, *Cepaea* and *Helix*. Among the identified mammals, the predominant species are the domestic ones (85.35%): *Ovis aries*/*Capra hircus*, *Bos taurus*, *Sus domesticus* and *Canis familiaris*, and the wild ones (14.65%) are represented by: *Cervus elaphus*, *Sus scrofa*, *Equus ferus*, *Lepus europaeus*, *Bos primigenius*, *Capreolus capreolus*, *Meles meles*, *Vulpes vulpes*, *Canis lupus*, and *Rodentia*. The archaeozoological analysis highlights the main animal resources associated with economic practices by the prehistoric community of Cucuteni culture from Costești-Cier (Iași County, Romania): mollusc harvesting, hunting and animal husbandry, the latter one being the most represented.

PALEOHISTOLOGICAL STUDY OF INFLAMMATORY REACTIONS IN A HUMAN SKELETON WITH A POSSIBLE METASTATIC CARCINOMA DISCOVERED IN IASI CITY (17TH-19TH CENTURIES)

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The histological study on archaeological human remains represents a valuable research area in paleoanthropology. The examination of archaeological human bone tissue can provide valuable information of cellular activity associated with past diseases or can contribute to strengthens in the differential diagnosis. This study refers to a paleohistological approach of several pathological lesions of a possible metastatic carcinoma identified in a human skeleton (M190) discovered in an archaeological site of 17th-19th centuries from Iasi City. The

paleoanthropological analysis reveals that the M190 skeleton belonged to an adult male of 30-35 years old. A previous paleopathological analysis carried out through imagistic methods (i.e., X-rays, CT scans) highlighted several perforations/lesions on both skull and postcranial skeleton. Also, on the long bones new bone formation areas were observed, which are subjected to the analysis in this study.

Small bone samples were collected and embedded in epoxy resin EpoThin 2® (Buehler), ground and polished manually, using wet/dry carbide papers of decreasing grit sizes. The bone sections were examined under a transmitted light microscope. The histotaphonomy assessment was based on the semi-quantitative system Oxford Histological Index (OHI) system. The osteological material collected from the M190 skeleton showed an extensive taphonomic degradation with several areas of infiltrations, taphonomic inclusions and mainly bacterial degradation morphological types. The postmortem changes observed at microscopic level had considerably limited the analysis and description of the tissue. In all analysis samples, new bone tissue formed by apposition was identified, on the external surface of the bone. The new bone tissue formed as the result of an inflammatory process of the periosteum showed two morphological patterns (i.e., homogeneous and villous) with different development in various anatomical segments.

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SEXUAL DIMORPHISM IN MEDIEVAL HUMAN DENTAL SAMPLES FROM IASI CITY (ROMANIA): MORPHOMETRIC AND NON-METRIC EVIDENCE

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This study starts from the hypothesis that sexual dimorphism is found not only at the dimensional level but also in the covariation of the tooth structural components. Also, the degree of sexual dimorphism expression is definitely a peculiarity of every human population spatially and chronologically defined. This study aims to present and identify the changes in the tooth shape and non-metric traits using standardized reference points to establish parameters of sexual dimorphism in several medieval human dental samples from the city of Iași (16th-19th centuries).

The bidimensional data for geometric morphometrics were collected using a set of landmarks located on the occlusal surface of the lower second molar and its periphery. Also, non-metric traits for the same molar teeth (i.e., cusp numbers, and groove patterns) were scored according to the ASUDAS system.

The results of the study highlight dental sexual dimorphism patterns marked by the plasticity of the two buccal cusps (i.e., protoconid, and hypoconid), and the intercuspid grooves. The covariation of the shape variables with the nonmetric traits between the two sexes shows significant differences between the studied human dental samples (Procrustes ANOVA: $F = 3.13$; $p = 0.006$), and the trend and the way of covariation these variables highlight specific characteristics in each analyzed human group; features of these interpopulation covariations are also presented in the paper.

Acknowledgements. This work was supported by a grant of the Ministry of Research, Innovation and Digitization, CNCS - UEFISCDI, project number PN-III-P4-PCE-2021-1180, within PNCDI III.

DIVERSITY OF ANIMAL RESOURCES IN THE ECONOMY OF MEDIEVAL MOLDOVA: NEW ARCHAEOZOOLOGICAL DATA

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Faunal remains discovered in archaeological sites can substantially contribute to the reconstruction of lifestyles and subsistence practices for past communities. Archaeozoological studies have already provided valuable information on various aspects of human-animal interactions, subsistence strategies, economic activities, and cultural practices, contributing to understanding of European medieval societies and their relationship with the animal world. In the case of Medieval Moldova, the archaeozoological research is essential, since written documents are generally lacunary and ambiguous.

This study is focus on the diversity of animal resources used in the economy of Medieval Moldova as they are reflected by archaeozoological analyses made for the sites of Eastern Romania and Republic of Moldova. The archaeozoological data are statistically analysed and compared in terms of frequencies, and the Correspondence Analysis of the identified animal species and medieval settlements reveals associations between these two variables.

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TRADITIONAL ROMANIAN VALUES IN THE CONTEXT OF GLOBALIZATION. CASE STUDY

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The work we are presenting is part of a series dedicated to the Roman Catholic confessional communities in Moldova and shows the results of a social anthropology research carried out in Gherăești, Neamț county. It proposes an evaluation of the local specificity. In this sense, the aim is to reveal the following aspects: the image of the locality and the community in the local collective mind; traditions and holidays; perception regarding the future of the community.

The theoretical premise from which we start consists in the fact that, in general, by community we understand the members of a group that asserts a distinct identity given by the consciousness of a common history or origin.

The research is qualitative. The results show us that the members of the Gherăești community want to preserve the traditional values given by the family, the religious faith and the history of the community, these being constitutive elements of their identity and specificity.

The conclusions emphasize the idea that identity and collective memory must be passed on.

APPLICATIONS OF PLANT ANATOMY IN FORENSIC RESEARCH

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Pharmaceutical products of plant nature sold under the generic name of *teas* are represented by mixtures of plant fragments, chopped at various sizes and which studies of the last decade show to be increasingly more often to be compromised. In this sense, we believe that a correct examination of these products must include a scanning electron microscopy (S.E.M.) analysis to complete the chemical determinations (which sometimes happen to be the only methods of determination used).

Creating a database with photomicrographs of the contents of batches of vegetable products would make the providers and the competent institutions that issue compliance notices responsible for their actions, and consumer protection would take a step forward in terms of respecting quality standards.

PRELIMINARY DATA REGARDING CENOSES WITH CRASSULACEAE SPECIES IN THE PIETRELE ROȘII BOTANICAL RESERVE

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The Crassulaceae is a systematically complex botanical family with an impressive morphological diversity, encompassing 35 genera and 1500 species, making it the largest botanical family belonging to the order Saxifragales. The vast majority of species in the Crassulaceae family are succulent plants. Regarding plant ecology, the species inhabit semi-arid areas with adaptations to xeric environmental conditions and have an almost cosmopolitan distribution, with centres of diversity in Mexico, South America and the Himalayas.

The Crassulaceae family is well represented in Romania in terms of the diversity of succulent plant species, including the genera *Sedum*, *Sempervivum*, *Jovibarba* and *Rhodiola*. They are annual or perennial plants, mostly found in mountainous areas, on cliffs, sands, and old walls. The phenotypic variety and the richness of the species means that the systematics of the botanical family is in a constant state of flux, as both the genetic boundaries and the relationships between genera are ambiguously understood and require further study (both phytocenological and genetic).

Our study contributes to the understanding of the cenotic context of Crassulaceae species within the Botanical and Geological Reserve Pietrele Roșii located in Tulgheș village, Harghita county, emphasizing the need to identify the ecological preferences of the target species in order to understand their biological complexity. The protected area is located at an altitude of 1215m, on the mountain Piatra Comarnicului, north-east of Tulgheș, which represents the southwestern extremity of the Bistrița Mountains. Within the Reserve with forest vegetation and glades there is a cliff composed of hippuritic limestones, and the important floristic elements (*Astragalus roemerii*, *Hieracium pillosum*, *Silene acaulis*, *Delphinium simonkaianum* etc.) make the area phytogeographically important, including the following phytogeographic stages: the mountain stage of pure spruce forests, the mountain stage of mixed forests and the hilly stage of oak forests and hillside mixed forests.

Sedum hispanicum, *Sedum acre*, *Jovibarba globifera*, *Hylotelephium maximum* have been identified on the territory of the Botanical Reserve, the best represented being the genus *Sedum*, which occupies extensive areas, having a pioneering role on the cliffs observed in our study.

PRELIMINARY DATA ON *AMBROSIA ARTEMISIIFOLIA* POPULATIONS IN ROMANIA

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Ambrosia artemisiifolia L. (Fam. Asteraceae) is an annual herbaceous species native to North America. It was first introduced 1863 in Western Europe as an exotic plant, adapting to the conditions very well and in the year 1910 it appeared in Romania.

Due to the small dimensions and form of the fruit the distribution of the species was facilitated with the help of wind, train, and car traffic and also by humans. The present state of this species is invasive because it produces a larger quantity of seeds than native species.

Besides the large seed production, it produces a large quantity pollen grains which are a danger to human health because it irritates the skin and the mucus lining of the nose. This species represents danger her so many combat operations were conducted on eradicating it applying her besides plucking the plants and cutting it, but they didn't succeed in accomplishing this purpose.

The aim of this report is to contribute to the chorology of this species by analysing the distribution and also morpho-anatomical aspects from specimens collected from Iași (Bârnova, Ciurea and The Botanical Garden), Botoșani (Vlădeni) and Buzau (Cotu-Ciorii).

THE MELANISTIC COLOR MORPH IN TERRESTRIAL POLYMORPHIC SNAKES: A SYSTEMATIC REVIEW AND GLOBAL META-ANALYSIS

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Animal coloration is generally adapted to abiotic and biotic factors and is involved in fundamental aspects of animals' lives such as predator-prey interactions, therefore being subjected to intense selective pressures. The dorsal coloration of reptiles protects the animals from predation, either through background matching or aposematism, influences its ability to thermoregulate, absorbs damaging radiation from reaching important structures and plays an important role in intra- and interspecific signaling, including reproduction. The thermal melanism hypothesis predicts that individuals with lower skin reflectance (such as melanistics) will heat up faster and reach higher body temperatures compared to normal colored conspecifics, leading to a plethora of adaptive advantages such as access to a wider range of habitats, longer activity periods, higher growth rates, better body condition and increased reproductive output. There have been a few qualitative reviews on the evolutionary significance of melanism in reptiles, but so far, no quantitative analysis exists. Such a synthesis is essential to advancing our understanding of the importance of melanism in snake populations. Consequently, our systematic review and meta-analysis aims to (1) summarize the current

research regarding the role of melanism in polymorphic terrestrial snake species, (2) address some of the important questions that still exist regarding the phenomenon, such as: (2.1) how prevalent is melanism in terrestrial snakes which have a melanistic morph, (2.2) what environmental correlates can explain the observed proportion of melanistic individuals, (2.3) is the proportion of melanistic individuals different between the two sexes, (2.4) does the melanistic morph possess an adaptive advantage compared to normal-colored individuals in terms of body size (i.e. are melanistics larger than their normal counterparts), and (3) identify remaining gaps in our knowledge where further studies are still needed.

EXPLORING NOCTURNAL BEHAVIOR IN THE COMMON GRASS SNAKE (*Natrix natrix*) WITH THE HELP OF CITIZEN SCIENCE

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Nocturnal activity plays a crucial role in the biology of various animal species. While many amphibians are nocturnal due to their tolerance of lower temperatures and reliance on humidity and precipitation, reptiles, including snakes, often exhibit a mix of diurnal and nocturnal activity patterns influenced by temperature fluctuations. In Europe, most snake species are diurnal, while some are nocturnal and a few show a mix of these activity patterns. The common grass snake (*Natrix natrix*) is a primary diurnal species that has a wide distribution, ranging from the Rhine region in Germany eastward to Lake Baikal, including also Fennoscandia (northern Europe), the Balkan Peninsula and some parts of the Middle East. Our study explores the nocturnal behavior of the common grass snake (*Natrix natrix*) across its distribution range, using data gathered from citizen science platforms like iNaturalist. We collected a total of 127 nocturnal observations, with 33 being crepuscular (25.98%) and 94 nocturnal (74.02%) records. Observations of nocturnal activity spanned from March to November, peaking between May and August. Striped individuals were found to be active at higher temperatures than unstriped ones, which is attributed to regional variations in body patterns. Moon presence had no significant impact on nocturnal behavior. Overall, this study contributes valuable insights into the nocturnal behavior of a primarily diurnal species, highlighting the need for further research to comprehensively understand the factors driving this behavior and its ecological implications.

THE LEAF SURFACE, AS A BIOINDICATOR OF URBAN POLLUTION (CASE STUDY: IAȘI)

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The European Environment Agency (EEA), based on air quality monitoring in major European cities (we refer to PM 2.5 and PM 10), placed the city of Iași in position 340 (in a ranking of 375, from the cleanest to the more polluted). It seems unbelievable in the conditions where in the Integrated Air Quality Plan of the city of Iași (2021-2025) measures to expand green spaces (especially tree planting) are provided as strategic actions to improve air quality. And to make things seem even more complicated, in 2023, the city of Iași won the grand prize in the Parks and urban forests category in the Green Cities Awards 2023 competition. In other words, although they are doing well in terms of green spaces, the people of Iași are breathing polluted air.

But where does this idea come from that the solution for clean air in the urban environment is to use the ecosystem service provided by the numerous planted trees? The idea took shape with the signing of the Kyoto Protocol (1997) which operationalized the United Nations Framework Convention on Climate Change by committing industrialized countries and economies in transition "to the limitation and reduction of greenhouse gas (GHG) emissions in accordance with the individual objectives agreed upon by each." But time has shown that although the signatory countries have set up their objectives, urban pollution has increased significantly, because instead of reducing emissions, the easy way of planting trees to absorb the pollutants has been chosen. In other words, living organisms, which give us humans our daily oxygen, be used to cover up our lack of real concern for the environment.

Correlated with these objectives, worldwide scientific research on urban pollution and the solutions generated by this scientific research have resulted in the generation of lists of plant species resistant or weakly resistant to pollution, useful or useless as services in the urban ecosystem, capable or incapable to clean the urban air; moreover, by the discovery that some of these in turn produce volatile organic compounds (BVOC) similar to volatile organic compounds (VOC/VOC) generated by anthropogenic pollution, the international circuit of scientific works has come to express and perpetuate a real contempt for of plants that do not deserve to be part of the urban ecosystem because they themselves pollute us and that a rigorous selection of tree species is needed that prove to have a really active role in improving air quality. In other words, "air quality benefits if you select the right type of trees." And the most recommended, in these studies, are conifers.

The work is complemented by a series of SEM photographs of gymnosperm species cultivated as ornamentals in the city of Iași (pine and fir species, spruce, larch) from 25 locations and which show the presence on the leaf surfaces of numerous deposits formed by solid particles (PM 2.5 and PM 10) and mycelial hyphae that cover them in varying proportions, preventing them from carrying out photosynthesis, blocking their stomata, causing total or partial defoliation and showing that these species, cultivated for aesthetic purposes, are like us, humans, at as vulnerable to pollution and that they have the right, like us, to a clean environment in order to live. In other words, what we don't inhale is deposited on the plants around us.

The message of the lecture is: In the Green City, plants are healthy only if people understand that they too are living organisms that have the right to a clean environment!

RESEARCH ON THE MORPHOLOGY AND MICRO-MORPHOLOGY OF THE SEEDS OF THREE SPECIES OF *SCUTELLARIA* L.

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This research aims to describe the seeds micromorphology and morphology of three *Scutellaria* species. The seeds of analyzed species were obtained from the following institutions: the Botanical Garden „Alexandru Borza” in Cluj (seeds of *S. altissima* L.), the Botanical Garden of the University of Medicine, Pharmacy, Science and Technology „George Emil Palade” in Târgu Mureș (seeds of *S. altissima* L., and *S. hastifolia* L.), and from the Institute of Genetics, Physiology, and Plant Protection in Chisinau, Republic of Moldova (seeds of *S. baicalensis* Georgi).

The morphology of seeds was observed using the Olympus stereo zoom microscope SZX7, binocular, with a magnification range of 0.8x to 5.6x. In order to be observed under the Vega Tescan II SBH Scanning Electron Microscope (SEM), the seeds were subjected to metallization ($\pm 95\%$ pure gold coating) using the EMS 550x metalizer. After three consecutive metallization, the seeds were coated with three gold foils, with a thickness of 10 - 15 nm, and then scanned using a 30 kV electron beam. Micrographs were taken at a magnification power between 500 μm - 20 μm and used to measure the width and length of seeds in μm using ImageJ software. The obtained results were compared with the available literature data.

We observed that seed size is not uniform, even within the same species. Across all analyzed species, seed length exceeded seed width. Additionally, in the case of *Scutellaria altissima* L. and *Scutellaria hastifolia* L. seeds, there were no significant differences in external morphology. According to the observations of other researchers, the morphology and micromorphology of *Scutellaria* L. seeds play a significant role in the identification and classification of species within the genus *Scutellaria* L.

RESEARCH REGARDING THE NUTLETS MICROMORPHOLOGY OF SPECIES BELONGING TO THE GENUS *ECHIMUM* L. (BORAGINACEAE FAMILY)

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The study presents the results of the micromorphological analysis results of the nutlets of four species of the genus *Echium* L., respectively: *Echium vulgare* L., *Echium amoenum* Fisch. and Mey., *Echium russicum* J. F. Gmel. and *Echium italicum* L. using the scanning electron microscope (SEM). The plant material used for SEM analysis comes from batches of seeds purchased from "Jelitto perennial seeds", Germany (for *Echium vulgare* L. – EA020, *Echium amoenum* Fisch. and Mey. – EA015 and *Echium russicum* J. F. Gmel. – EA017), as well as from samples collected from the vicinity of the Biological Station Navy "Prof. Dr. Ioan Borcea", Agigea, Constanța (for *Echium italicum* L.).

The investigations were made with the Tescan Vega II scanning microscope, which is owned by the Faculty of Biology of the "Alexandru Ioan Cuza" University of Iași. The nutlets were analyzed from a micromorphological point of view, both on the ventral and dorsal sides,

highlighting the types of ornamentation (simple and in the form of protuberances) and their density.

The results illustrate that there are micromorphological differences, at the level of the analyzed surfaces, between the nutlets of the studied *Echium* L. species. The differences are represented by the abundance of simple and prominent ornaments, in the form of protuberances, in relation to the shape and dimensions of the nutlets.

STUDY OF SOIL MESOFAUNA IN SOME PROTECTED GRASSLAND AREAS IN THE NORTH-EASTERN PART OF ROMANIA

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The investigations were carried out in two Natura 2000 protected areas. A qualitative and quantitative analysis of the edaphic mesofauna in representative ecological plots from these two protected meadows was conducted. We considered both the grasslands within the strictly protected areas and their buffer zones for sampling. The aim was to estimate the overall density of mesofauna, as well as of each group and the relevant numerical relationships among microarthropods for a functional perspective. Our results indicate the highest density of soil microarthropods in the Mârzești grassland. However, we observed that in the buffer zone of both sites, the density is lower than in the strictly protected area. Among mites *Trombidiformes* and *Oribatida* are predominant both at Mârzești and Bârca reserves. The identified stressors are grazing activities and the preceding drought period before sample collection. The latter had a negative impact on whole groups of mesofauna, but especially on drought-sensitive groups of mesofauna, such as *Astigmatina* and *Entognatha*, which are nearly absent in the samples provided from both sites. Another feature of the communities studied is the horizontal distribution of the populations, as determined by the standard deviation and Pearson's coefficient of variation (s%). The results indicate an aggregate distribution of the main microarthropod groups, suggesting less favorable conditions for these organisms. In conclusion, our findings demonstrate that human activity and climatic variability can significantly influence the composition and density of edaphic mesofauna in Natura 2000 sites. Identifying the stress factors is essential for the protection of biodiversity and ecosystem resilience in these areas.

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REDESCRIPTION OF *SCOLELEPIS TRIDENTATA* (SOUTHERN, 1914) (ANNELIDA: SPIONIDAE), WITH DESCRIPTION OF A NEW SPECIES OF *SCOLELEPIS* FROM THE BLACK SEA

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Scoelepis Blainville, 1828 is one of the most speciose and taxonomically difficult genera of spionid polychaetes. The genus is commonly divided into two subgenera. The subgenus

Scolecopsis Blainville, 1828 includes species with blunt or conical, uni-, bi- or tridentate hooded hooks with falcate or straight shafts and having smooth palpal sheaths, while the subgenus *Parascolecopsis* Maciolek, 1987 includes species having sharp, multidentate hooks with curved shafts and with papillated palpal sheaths.

In the Black Sea two species have been formerly reported as belonging to the subgenus *Parascolecopsis* – *Scolecopsis* (*Parascolecopsis*) *tridentata* (Southern, 1914) and *S. (P.) cantabra* (Rioja, 1918) (both as either *Nerinides* or *Pseudomalacoceros*). Both species are quite rare in the Black Sea and when found are usually fragmentary.

The examination of material in the collection of the “Grigore Antipa” National Museum of Natural History in Bucharest (Romania) labelled ‘*Nerinides cantabra*’, revealed specimens belonging to two different species preserved in the same vial. One of them was identified as *Scolecopsis cantabra*, while the second resembled more *S. (P.) tridentata*. To clarify the taxonomic identity of *Parascolecopsis* from the Black Sea, the type series of *S. (P.) tridentata* and non-type specimens of *Scolecopsis cantabra* were examined. The type material of *Scolecopsis cantabra* is not known to exist. Nonetheless, based on literature data and personal observations, the latter taxon clearly belongs to the subgenus *Scolecopsis* s. str. The examination of additional specimens received from the Ukrainian and Russian coasts of the Black Sea, identified as *Pseudomalacoceros tridentata* or as *Nerinides tridentata*, revealed that they differ from the nominal species in several characters and warrants designation as a new species.

EXPERIMENTAL AND MOLECULAR BIOLOGY

SKIN TISSUE ENGINEERING: THE POTENTIAL USE OF SEA BUCKTHORN OIL AND LAVENDER ESSENTIAL OIL

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The aim of the study was to evaluate the phytochemical profile of three vegetal oils which will be used as mixtures integrated in a hybrid gel bio-structure based on a natural/synthetic polymer matrix enriched with active ingredients.

Two fixed oils (FOSBx) of sea buckthorn fruits (*Hippophae rhamnoides* L.) from different manufacturers and one essential oil (EOL) of lavender inflorescences (*Lavanda angustifolia* Mill.) were evaluated.

Sea buckthorn oil contains carotenoids (e.g. zeaxanthin, β -carotene, lycopene, lutein), fat soluble vitamins (tocopherols), polyphenols, phytosterols, unsaturated fatty acids etc. Linolic, linolenic, oleic and linoleic acids have beneficial effects on skin disorders; carotenoids have antioxidant action, stimulate collagen synthesis and epithelization, and polyphenols antioxidant and cytoprotective properties. Lavender essential oil has anti-inflammatory, antibacterial, antioxidant, antiseptic effects and is used in skin disorders treatment, mainly due to its content in linalool and linalyl acetate.

EOL was analyzed by GC-MS. Derivatization of fatty acids from FOSBx was performed by FAME method, the analysis being made by GC-MS. Free fatty acids were determined using standard CA 5a-40 as method. Spectrophotometry was used to quantify total carotenoids. Total polyphenols were evaluated by Folin-Ciocalteu method, after a previous SPE extraction.

EOL extracted by hidrodistillation contains as major components: linalool 17.71%, α -terpineol 7.31%, linalyl acetate 6.77%, 1,8-cineole 5.75%, 4-terpineol 4.89%, lavandulyl acetate 4.74%. GC-MS analysis of FOSBx highlighted 2 saturated fatty acids (palmitic and stearic) and 6 unsaturated fatty acids (myristic, palmitoleic, oleic, vaccenic, linoleic and linolenic) with a specific chemical profile for each sample: ethanol-based extraction sample has a higher content of palmitic and palmitoleic acids while sunflower oil-based extraction sample has higher amounts of oleic and linoleic acids. These differences are caused by the origin of the raw material (wild flora or conventional cultures) and/or by pedo-climatic features, as well as type of extraction technology.

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TRANSCRIPTOMIC STUDY OF NICOTINE CATABOLISM IN *PAENARTHROBACTER NICOTINOVORANS* ATCC 49919 USING DIRECT RNA SEQUENCING

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Introduction: *Paenarthrobacter nicotinovorans* ATCC 49919 is an actinobacterium that can degrade toxic nicotine by using a cluster of 40 genes encoded by the pAO1 megaplasmid. The nicotine catabolic genes are sequenced and there is extensive knowledge on the function of most of them. However, the mechanisms which regulate nicotine catabolism and the interplay between the degradation pathway encoded by pAO1 and the general metabolism of the cell are unexplored.

Materials and methods: The bacterium was grown on citrate medium with and without nicotine. Cells were harvested at three timepoints correlated with nicotine catabolism. Native RNA was extracted and polyadenylated for sequencing adapter ligation. Library preparation was performed with the Oxford Nanopore Technologies (ONT) Direct RNA sequencing kit (SQK-RNA002). Libraries were sequenced with the ONT MinION Mk1B device coupled to a Flongle adapter. Raw data was basecalled with Guppy_6.3.2 and its high accuracy algorithm. The basecalled data was processed and assessed for differential gene expression between control and nicotine-treatment using the nf-core/nanoseq v3.1.0 pipeline.

Results: The sequencing runs yielded 1 million reads totalling over 1 Gb, 80% of which had quality scores above 7. The basecalled data and files used for differential expression analysis are available in the NCBI GEO database (accession no. GSE240220). Of the 40 identified genes with nicotine-related expression ($\text{padj} < 0.1$; $\text{abs}(\log_2\text{FoldChange}) > 1$), less than half were previously known to be involved in nicotine catabolism, most being reported here first.

Conclusions: This work is among the first bacterial transcriptomic studies using the MinION Flongle. Differential expression analyses identified over 20 novel genes suggested here as having nicotine-related expression. This first transcriptomic analysis of nicotine catabolism in *P. nicotinovorans* ATCC 49919 should facilitate the development of a metabolic model of nicotine degradation based on multi-omics and aid the environmental and biotechnological applications of this useful strain.

ANTIBIOFILM ACTIVITY OF A SYNTHETIC FLAVONOID AGAINST *CANDIDA GLABRATA*

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Currently, infections caused by *Candida* biofilm forming species are becoming increasingly challenging to treat due to their recurrence, chronicity, and growing drug resistance. The discovery of new molecules is a high medical priority in addressing this issue. Synthetic flavonoids could be a reliable solution due to their important antimicrobial activity. Therefore, we report here the potent in vitro antifungal and anti-biofilm activity of ClCl-flav - a synthetic tricyclic flavonoid. Minimum inhibitory/fungicidal concentration, inhibition of biofilm formation and disruption of mature biofilms were assessed to evaluate the antifungal and anti-biofilm potential of Cl-Cl-flav. Our results showed that flavonoid Cl-Cl exhibited significant antifungal activity against a clinical isolate of *Candida glabrata*, with a minimum inhibitory concentration (MIC) of 31.25 µg/mL and a minimum fungicidal concentration of 62.5 µg/mL. Furthermore, Cl-Cl-flav displayed the capacity to inhibit biofilm formation at subinhibitory concentrations, impeding biofilm formation up to 80% at concentrations equivalent to $\frac{1}{2} \times \text{MIC}$, $\frac{1}{4} \times \text{MIC}$, and $\frac{1}{8} \times \text{MIC}$. A 70% disruption of mature biofilms compared to control was recorded at concentrations as low as 3.9 µg/mL. It's important to note that Cl-Cl-flav showed a more important anti-biofilm activity in comparison to fluconazole, a commonly used antifungal agent. Thus, this synthetic flavonoid emerges as a potential novel antifungal agent to combat biofilm related infections caused by *C. glabrata*.

GLYCEROL INCREASES TRANSGLUTAMINASE PRODUCTION BY A *STREPTOMYCES MOBARAENSIS* STRAIN

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Microbial transglutaminase is an enzyme of biotechnological importance, used in various fields such as bakery, meat, dairy, pharmaceutical or cosmetic industry. The practical applications of the enzyme are varied, from improving the texture of cheeses to prevent the separation of whey from milk to increasing the adhesion of cosmetics to ensure uniform application. In this context, we tested different carbon sources with the aim of optimizing transglutaminase production, using a *Streptomyces mobaraensis* strain. Glycerol, dextrin, maltodextrin, sorbitol and molasses were used as a carbon source for preparation of the culture medium. Enzyme activity was evaluated by a spectrophotometric method, using N-carbobenzoxy-L-glutamyl-glycine as a substrate. Also, parameters such as the pH of the culture medium, the biomass and the morphological aspect of the culture were assessed. Among all the carbon sources used, glycerol allowed the recording of the highest enzyme activity (0.84 IU/mL). Compared to the other sources tested, the use of glycerol led to a significant improvement in enzyme activity of up to 33.97%. The use of dextrin in the composition of the culture medium increased the biomass, values being higher compared to glycerol. The lowest pH value (5.6) was recorded in the case of glycerol. The micro-morphological analysis did not reveal any significant differences

between the cultures grown in the presence of different carbon sources. pH influences biomass and enzyme activity. The results obtained indicate that glycerol had a significant positive impact on transglutaminase biosynthesis compared to the other carbon sources tested.

A MASS SPECTROMETRY-BASED INVESTIGATION OF HUMAN SERUM FROM DONORS WITH BREAST CANCER TO IDENTIFY PROTEIN BIOMARKERS FOR EARLY BREAST CANCER DETECTION

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Breast cancer (BC) is a leading cause of death for women globally. An invasive ductal carcinoma (IDC) is one of the most common subtypes, accounting for 85% of all BCs. General screening methods rely on detection of masses by physical examination and/or lesions identified by X-ray mammography. Current biologic markers (DNA, RNA, proteins) assess risk of disease progression or monitor response to treatment, rather than detect BC early. Thus, early diagnosis and treatment of BC is crucial. One way to detect BC in its early phase is through identification of proteins that are dysregulated due to the onset of BC (i.e. protein biomarkers). Mass spectrometry (MS)-based proteomic methods can be used for the investigation of protein biomarkers. Here, utilizing MS-based proteomic methods, we can quantify protein differences from women with BC and without, and if significant proteins are consistently dysregulated, this could lead to a protein biomarker for BC, therefore aiding in earlier diagnosis and treatment. Using serum from women with BC and the matched controls, we are able to perform both in-gel and in-solution based proteomic methods followed by nano-liquid chromatography tandem mass spectrometry (nanoLC-MS/MS) to identify proteins which are dysregulated between the matched pair, and also quantify them. Therefore, proteins found to be differentially expressed between the BC and control samples could be further quantified using targeted proteomics to determine a protein biomarker for BC which could aid in the diagnosis, prognosis and treatment.

IN VITRO EVALUATION OF THE CYTOTOXIC EFFECT OF SODIUM METABISULPHITE (E223) ON NORMAL MAMMALIAN CELLS

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The aim of the present study was to describe the sodium metabisulphite (E223) interaction with two normal epithelial cell lines, i.e. MCF-12A (ATCC® CRL-10782) and Vero (ATCC® CCL-81) cells, exposed for 24 and 48 hours to 12.5, 25, 50 and 100 µg/mL of this food additive. Cell sensitivity was assessed using MTT (3-[4,5-dimethylthiazol-2-yl]-2,5 diphenyl tetrazolium

bromide), method based on MTT conversion to formazan crystals by living cells, thereby determining mitochondrial activity which is correlated with the number of viable cells. Sodium metabisulphite (SMB), also known as sodium pyrosulphite ($\text{Na}_2\text{S}_2\text{O}_5$), is a synthetic food additive widely used as a preservative with antioxidant and antibacterial action in a variety of food products (fruits, greens, seafood, and alcoholic beverages), but it is also used in the pharmaceutical industry as an excipient to improve the stability of the active components in some drugs.

In the case of Vero cells, the 24-hour treatment caused a decrease in cell viability from 91.15% (12.5 $\mu\text{g/mL}$) to 76.56% (100 $\mu\text{g/mL}$), the decrease which became more noticeable after 48 hours of treatment, the cell viability reaching values of 77.64% (12.5 $\mu\text{g/mL}$) and 52.63% (100 $\mu\text{g/mL}$).

The response of MCF-12A cells to the application of SMB for 24 hours was insignificant, cell viability varying between 95.01 (12.5 $\mu\text{g/mL}$) and 85.57% (100 $\mu\text{g/mL}$). However, the 48-hour treatment with SMB at the same doses resulted in more pronounced decrease in cell viability. Thus, at the minimum dose of 12.5 $\mu\text{g/mL}$ the cell viability value was 69.48%, and at the maximum tested dose (100 $\mu\text{g/mL}$) the value was 52.97%, corresponding to notable cytotoxic effects.

For both cell lines, the clonogenic growth capacity, expressed by the ability of cells to reproduce themselves, decreased with the increase of SMB dose, the process being associated with the decrease of the cells adhesion to the substrate.

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BIOFILM FORMATION UNDER ABIOTIC STRESS BY *BACILLUS VELEZENSIS* P3.3S – A PLANT GROWTH PROMOTING BACTERIA

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The ability of plant growth promoting bacteria used as biofertilizers to form biofilms appears to be of great importance in agriculture, as bacterial colonization of the plant root surface is an important step in many plant-beneficial activities. In addition, biofilms provide a protected growth pattern and advantages in harsh environments. Therefore, the aim of this study was to evaluate the influence of abiotic stress on biofilm formation by *Bacillus velezensis* P3.3S. First, genes involved in biofilm formation were identified in the draft genome of strain P3.3S, annotated with NCBI PGAP, using the BLAST algorithm. Biofilm formation ability under abiotic stress (pH, salinity, drought) was assessed by crystal violet method and biofilm architecture was visualized by scanning electron microscopy (SEM). BLAST analysis identified 47 genes involved in biofilm formation and production of extracellular polymeric substances, the most important being: *spo0A*, *tapA*, *sipW*, *tasA*, *sinR*, *sinI*, *ylbF*, *ymcA*, *yua*, *epsC-O*. The potential of the strain to form biofilm decreased with increasing pH and NaCl concentration, with the highest amount of biofilm recorded at pH 6 and 10 g/l NaCl. On the other hand, the amount of biofilm increased with PEG 8000 concentration up to 15%, after which the amount of biofilm remained approximately constant at 17.7% and 20% PEG 8000. SEM images show that the morphology of the biofilm formed varies according to the stress

condition studied. In conclusion, the strain *Bacillus velezensis* P3.3S remains strongly adherent, suggesting that it could be used as a biofertilizer in stressed soils.

COMPETITIVENESS EVALUATION IN THE INVASIVE SPECIES *AMORPHA FRUTICOSA* FROM THE FOREST PLANTATIONS OF THE JIJIA PLAIN THROUGH ECOPHYSIOLOGICAL AND MORPHOLOGICAL PARAMETERS

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Amorpha fruticosa L. (indigo bush) is an invasive shrub native to North America with great ecological plasticity now widespread in most of the northern hemisphere, being sometimes spontaneous, distributed in a wide range of habitats (riparian and alluvial habitats, coastal dunes, also in disturbed and anthropogenic areas) (Grabic et al., 2022; Doroftei et al., 2005; Dumitrașcu et al., 2013).

The purpose of this study is to analyse photosynthetic capacity (rate of the instantaneous photosynthesis, the respiration, the transpiration and the stomatal conductance) and photo-assimilatory compounds (chlorophylls and carotenoids) as ecophysiological parameters and, morphological parameters in leaves and fruits, in order to establish the competitiveness of *Amorpha fruticosa* as a strategy of invasive behaviour. The investigation was carried in wetlands plantation, in floodplain of the Jijia river (Golăești), northeastern part of Romania. Photosynthesis rate registered higher values in *Amorpha fruticosa* ($18.03 \mu\text{mol m}^{-2}\text{s}^{-1}$) in comparison with *Quercus petraea* ($6.14 \mu\text{mol m}^{-2}\text{s}^{-1}$), and with *Prunus spinosa* ($10.22 \mu\text{mol m}^{-2}\text{s}^{-1}$) both situated nearby and a value of $3.41 \mu\text{mol m}^{-2}\text{s}^{-1}$ in distanced individuals from the competitor species. *Amorpha fruticosa* registered a higher rate of respiration ($9.41 \mu\text{mol m}^{-2}\text{s}^{-1}$) than *Quercus petraea* and *Prunus spinosa* which almost registered $6 \mu\text{mol m}^{-2}\text{s}^{-1}$, but excepting the isolated individuals ($1.07 \mu\text{mol m}^{-2}\text{s}^{-1}$). Transpiration was direct proportional with photosynthesis rate and with stomatal conductance. The A/E ratio (photosynthesis in rapport with transpiration) was higher in *Amorpha fruticosa* ($10.22 \mu\text{mol CO}_2 \text{ mmol H}_2\text{O}^{-1}$) than in *Quercus petraea* and *Prunus spinosa* leaf, revealing that a superior water management in case of invasive plants than native species. Morphological traits such as inflorescence length, number of fruits per raceme, length of the leaf rachis, the number of leaflets per leaf presented slightly differences between the analyzed individuals. Competition strategy of *Amorpha fruticosa* was different depending on various characteristic of competitor species.

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CHEMICAL COMPOSITION OF ESSENTIAL OILS IN *LAVANDULA ANGUSTIFOLIA* MILL. CV. 'CODREANCA'

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Species belonging to the *Lavandula* genus have many pharmacological and industrial properties, with great economic importance in terms of the presence of essential oils.

The purpose of this study is to analyze the chemical composition of essential oil of *Lavandula angustifolia* Mill. cv. 'Codreanca'. The experiment was carried out in a protected (unheated greenhouse) and unprotected (field) space. To achieve the objectives proposed in this experiment, plants of the species *Lavandula angustifolia* Mill. cv. 'Codreanca' were used, with three experimental variants, respectively: watered with H₂O (v1); watered with standard Hoagland nutrient solution (v2); watered with Hoagland nutrient solution containing a double amount of K (v3). The plant material was collected, in the flowering period, in June 2019. The essential oil was extracted by hydrodistillation according to European Pharmacopoeia standards. The separation and the identification of the components have been carried out using GC-MS (gas chromatography coupled with mass spectrometry).

Following the analysis of the chemical composition of the essential oil, more than 60 compounds were identified in the 'Codreanca' variety, including, in high concentrations, linalool, linalyl acetate, eucalyptol, borneol, terpinen-4-ol, camphor, lavandulyl acetate and caryophyllene oxide. Linalool and linalyl acetate being the most abundant monoterpenes identified.

SCREENING OF THE SODIUM BENZOATE (E211) ACTION ON THE CYTOPHYSIOLOGY OF SOME NORMAL CELL SYSTEMS

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This research is focused on cellular response to sodium benzoate (E211) application in two normal mammalian cells, namely MCF-12A (ATCC® CRL-10782) and Vero (ATCC® CCL-81), purchased from American Type Culture Collection (ATCC). The monitored parameters were cell viability (MTT assay), cell morphology (optical microscopy) and cell survival (clonogenic assay).

Cell viability was investigated after 24- and 48-hour treatment with the compounds added to the culture medium (300 µL/ well), in doses of 12.5; 25; 50 and 100 µg/mL.

Variable cellular responses were obtained depending on the concentration, the duration of the treatment, as well as the tested cell line. Therefore, the 24-hour treatment with E211 of Vero monkey kidney cells revealed, at the dose of 12.5 µg/mL, a negligible effect on cell viability (94.23%), and at the dose of 100 µg/mL the negative impact on cell viability was higher

(77.65%). The 48-hour treatment was followed by a decrease in cell viability, with values of 81.58% (12.5 µg/mL) and 67.62% (100 µg/mL), respectively. In MCF-12A cells, 24-hour treatment with the additive resulted in negligible interference with cell viability, of 95.71% (12.5 µg/mL) and 90.98% (100 µg/mL). In contrast, the 48-hour treatment determined a strong negative effect on cell viability starting with the dose of 12.5 µg/mL (65.37%), which was accentuated at the dose of 100 µg/mL (51.24%). The more pronounced cytotoxic effect of sodium benzoate on human MCF-12A cells compared to monkey Vero is evident.

The morphological damage of Vero cells when treated with E211 is more intense than that of MCF-12A cells, the decrease in the adherence ability to the substrate being observed at the high tested concentrations.

Clonogenesis capacity decreases significantly with increasing dose for lung fibroblasts Vero cells, and for MCF-12A cells it initially increases.

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COMPARATIVE ANALYSIS OF *PAENARTHROBACTER NICOTINOVORANS* GROWTH CURVES ON RELATED MEDIA

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Paenarthrobacter nicotinovorans (initially named *Arthrobacter oxidans*, the *A. nicotinovorans*) has been extensively studied due to its unusual metabolic characteristic – the ability to metabolize nicotine. If nicotine replaces glucose in the growth medium, an intense blue colored pigment is formed during the growth of the microorganism and nicotine is depleted usually within 48 hours. The current study aims to establish a culturing system that would allow sampling of all growth phases of the microorganisms within 24 hours. This is required for future studies such as transcriptomics or proteomics analysis. Cells were grown on 3 different media (citrate with yeast extract, citrate with biotin, minimal media with biotin) at 28°C and 190 rpm. Samples were taken every hour and centrifuged. Supernatant was collected, blue pigment levels measured at 580 nm and nicotine concentration measured by HPLC. Cells were washed and the turbidity was measured at 600 nm. All data was recorded in triplicate, analyzed with the Data Analysis tool pack and plotted using Microsoft Excel.

The main finding is that a 10 ml pOA1+ preculture grown for 24 hours used to inoculate a 100 ml medium gives the best results. In the case of the citrate with yeast extract medium, the bacterial density is higher for both strains and the biomass accumulates the fastest. The accumulation of blue pigment in the minimal with biotin medium on the other hand occurs in a longer time and the blue-pigment is most stable.

In conclusion, a protocol that allows the sampling of all the major growth phases of a *Paenarthrobacter nicotinovorans* culture within 24 hours have been established. The key aspect is using 10X more inoculum compared with the standard growth system described in the literature for this strain.

USING THE CRISPR CPF1 AND DCASI9 SYSTEMS TO MODIFY THE METABOLISM IN *PAENARTHROBACTER NICOTINOVORANS* ATCC 49919

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Paenarthrobacter nicotinovorans ATCC 49919 is a nicotine degrading microorganism (NDM) with biotechnological potential for the production of compounds of industrial and pharmaceutical importance like 6-hydroxy-L-nicotine. In the present study we aim to develop a genetic engineering tool based on the CRISPR system that would allow fast and easy editing of the *P. nicotinovorans* genome to increase its biotechnological potential. Our aim is to inactivate or drastically reduce the expression of 6-hydroxy-L-nicotine oxidase (6hlnO), the key enzyme that catabolizes the conversion of 6-hydroxy-L-nicotine (6-HLN) to 6-hydroxy-methylmyosmine (6-HMM).

Two distinct approaches have been used to inactivate the gene of interest. One is based on the CRISPR-Cpf1 system and aims to completely knock-out the 6hlnO gene by deleting it. Genes containing the CRISPR-Cpf1 system from plasmid pJYS3-DcrtYF have been transferred into the pART2 plasmid using Gibson assembly, resulting the pART2-Cpf1 plasmid. We are in the process of targeting the CRISPR-Cpf1 system for 6hlnO by cloning a crRNA sequence and corresponding protospacers into the pART2-Cpf1.

The second approach is based on the CRISPR/dCasi9 system and allows partial and controlled inactivation of the 6hlnO gene transcription. Thus, the CRISPR/dCasi9 system has been targeted to the gene of interest by cloning a 20 bp spacer with the sequence complementary to the 6hlnO gene into the pCasiART plasmid using the Golden-Gate assembly method and the pCasiART-D6hlnO have been obtained. The resulting plasmids have been introduced into *P. nicotinovorans* by electroporation.

Experiments are underway for evaluating the efficiency of 6hlnO gene inactivation of the two constructs: pART2-Cpf1-D6hlnO and pCasiART-D6hlnO. For this, cultures in liquid-broth will be performed and samples at regular intervals will be analyzed by HPLC for quantification of nicotine and 6HLN levels.

COMPARATIVE ANALYSIS OF 61 PLASMIDS RELATED TO PAO1

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pAO1 megaplasmid of *Paenarthrobacter nicotinovorans* is a large conjugative catabolic plasmid best known for its nic-genes cluster, a set of genes encoding a catabolic pathway for nicotine degradation. The nic-genes have a lower G + C content than the megaplasmid's average suggesting that have been acquired by horizontal gene transfer. pAO1 provide a model for studying the molecular evolution of catabolic pathways and their spread by horizontal gene transfer via soil bacterial plasmids. The current work attempts to perform a comparative analysis of all the available plasmids belonging to *Arthrobacter*, *Paenarthrobacter*, *Rhodococcus* and *Nocardioides* strains. Plasmid sequences have been downloaded from Genbank. Only complete and circular sequences were taken into account. Digital DNA-DNA hybridization (dDDH) values were calculated with formula d4 using Genome-to-Genome Distance calculator (GGDC) 3.0 and average nucleotide identity (ANI) values with OrthoANI.

Data was visualized with Heatmapper (<http://www.heatmapper.ca/>). Hierarchical clustering was performed by average linkage and Euclidean distances were calculated. dDDH values from the pairwise comparison of the 61 plasmids allowed us to identify one major cluster containing 9 plasmids with highly similar sequences. All these plasmids belong to *Arthrobacter* and *Paenarthrobacter* strains and are highly similar with the pAO1 plasmid of *Paenarthrobacter nicotinovorans* ATCC49919. A second smaller cluster containing plasmids pA, pB, pC from *P. urefaciens* strain AT, pADNL1 from *P. urefaciens* strain DnL1-1, and pTC1 from *P. aurescens* strain TC1 can also be described. ANI data on the other hand shows the existence of only two major plasmid clusters – one that contains plasmids belonging to *Arthrobacter*/*Paenarthrobacter*, and one belonging to *Rhodococcus* strains. Tacking into account that dDDH was calculated using the full DNA sequences of the plasmids, while ANI was calculated tacking into account only orthologues genes, this difference in clustering is expected and shows the existence of a core set of genes common for *Arthrobacters* and a different core set for *Rhodococcus*.

COMPARATIVE ANALYSIS OF 14 PAENARTHROBACTER GENOMES

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Members of the genus *Paenarthrobacter* have been reported in the literature as possessing interesting metabolic capabilities such as degrading xenobiotics. Thus, *Paenarthrobacters* are appealing for biotechnology development, especially in bioconversion and bioremediation. The complete sequencing and assembly of bacterial genomes in general and of this genus in particular is leading to a deeper understanding of the biology and evolution of these microorganisms. Among genetically variable bacterial species, a single strain rarely characterizes an entire species. Instead, researchers are sequencing multiple strains of a species to compile the 'pan-genome' – the global genetic repertoire of a bacterial species. Pan-genome analysis identifies the conserved core genes, accessory genes and unique (strain-specific) genes of a species. However, assembling incompletely sequenced bacterial genomes is a major challenge in bioinformatics, as the sequences obtained can be fragmented and have gaps.

There are currently many *Paenarthrobacter* genomes available as drafts, i.e incompletely assembled genomes. The *Paenarthrobacter nicotinovorans* strain ATCC 49919 genome is one of the fully sequenced and assembled strains and was therefore selected as a reference for comparative analysis of the genomes studied in this work.

16 genomes (14 *Paenarthrobacter* and 2 *Rhodococcus* used as outgroup) were downloaded from GenBank and imported in Geneious and BPGA. Multiple alignment of the whole genomes was performed using the progressiveMauve algorithm. The algorithm identifies and aligns regions of local collinearity, based on which a phylogenetic tree was generated. BPGA (Bacterial Pan-Genome Analysis) was used for generating pan-genomic and core-genomic trees. Our results showed that *P. nicotinovorans* SSBW5, 26Cvi.1E and 231Sha2.1M6 strains are mislabeled in the database and do not belong to the same species. Also, we have shown that *Paenarthrobacter* sp. YJN-D is an ancestor of *P. nicotinovorans* ATCC 49919 and *P. nicotinovorans* Hce-1. The data is useful to clarify phylogenetic relationships and taxonomic reclassification of the strains studied.

ANTIBIOFILM ACTIVITY OF BRCL-FLAV AGAINST *CANDIDA KRUSEI*

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Due to increasing resistance to antifungal agents, fungal infection caused by *Candida* species is a major concern for the medical community worldwide. The resistance of *Candida* cells to some drugs such as fluconazole and amphotericin B is due to their ability to form biofilms, with the sessile cells being up to 2000 times more resistant than the planktonic cells. Therefore, the aim of the present study was to evaluate the activity of the synthetic flavonoid BrCl on the formation of biofilm by *Candida krusei*. In this context, the antibiofilm potential of BrCl-flav was estimated using the minimum biofilm inhibitory concentration (MBIC₉₀). Crystal violet staining was used to assess in vitro biofilm formation at different stages (adhesion, preformation, formation, and maturation) in the presence of BrCl-flav. In addition, the effect of BrCl-flav on the architecture of the mature biofilm was also assessed using optical and confocal microscopy. Our data have shown that BrCl-flav has an important anti-*Candida* activity, with an MBIC₉₀ value of 15.62 µg/ml. In the presence of BrCl-flav at subinhibitory concentrations, adhesion, preformation and biofilm formation were inhibited. The mature biofilm produced by *C. krusei* was also eradicated by BrCl-flav. Our results suggest that BrCl-flav has significant potential as a novel antibiofilm agent against *Candida* biofilm.

COMPARATIVE ANALYSIS OF PROTEINS FRACTIONS DURING THE GROWTH OF *PAENARTHROBACTER NICOTINOVORANS*

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Paenarthrobacter nicotinovorans is an interesting soil bacteria due to its ability to metabolize nicotine. Extensive work has been performed to characterize the strain, including the recent sequencing of its genome, transcriptomics, and proteomics analysis. The proteomics approach failed to identify any transcriptional factors and transmembrane proteins known to be expressed when nicotine is present. Most probably, sample harvesting and processing was not the best. The current work reports some preliminary data in an effort to re-think the whole proteomics approach and correlate it with the already existing data. *Paenarthrobacter nicotinovorans* ATCC 49919 was grown on various media (citrate with yeast extract, citrate with biotin, minimal medium with biotin) for 24 hours and 3 samples were taken at specific OD's: 0.25 - start of the log phase, 0.6 - middle of the log phase, >0.6 aiming for the end of log phase and at least 24 hours of growth for late stationary phase. Sample were lysed in the presence of SDS and β-mercapto-ethanol and loaded on a Maxi gradient gel. After separation, gels were stained with Coomassie Brilliant Blue R-250. Gels were photographed and analyzed with BioRad Image Lab. Protein molecular weights and concentrations were extrapolated from calibration curves generated using ROTI Mark Standard Markers. A total of 30 samples containing cell lysates were separated by SDS-PAGE. Various differences in terms of presence of extra fractions were

observed when nicotine was present in the medium, indicating that this approach could be integrated into a gel-based proteomics study.

CYTOPHYSIOLOGICAL INDICATORS FOR DETERMINATION OF THE SODIUM NITRITE (E250) EFFECT ON SOME CELL LINES WITH HUMAN AND ANIMAL ORIGIN

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The effect of sodium nitrite (E250) on cell viability (MTT assay), cell morphology (light microscopy), survival and cell proliferation (Clonogenic assay) was investigated using MCF-12A (ATCC® CRL-10782) human mammary gland epithelial cells and Vero (ATCC® CCL-81) kidney cells from the African monkey *Cercopithecus aethiops*.

To determine cell viability, the concentrations of 12.5; 25; 50 and 100 µg/mL sodium nitrite were used, during 24 and 48 hours, to capture the optimal moment of the additive's action.

The cells response varied both with the time of exposure to the additive, the concentration used and with the tested cell line. Thus, after 24 hours of treatment, the sensitivity of Vero cells was more accentuated, recording viability values of 85.58% at 12.5 µg/mL, respectively a viability of 76.36% in the case of the application of 100 µg/mL sodium nitrite. The viability of MCF-12A cells at the same treatment interval was between 95.05% (12.5 µg/mL) and 85.45% (100 µg/mL). Instead, prolonging the treatment for 48 hours resulted in a more intense reduction of MCF-12A cells viability, ranging from 79.98% (12.5 µg/mL) to 57.78% (100 µg/mL), and Vero cells showed a viability of 88.00% (12.5 µg/mL), respectively 66.46% (100 µg/mL). These results denote the delayed onset of the cytotoxic phenomenon in the human cells, compared to monkey, which may be correlated with the different rate of cell division (18 hours for Vero and 35.42 hours for MCF-12A cells).

Regarding the cell morphology, the changes induced by sodium nitrite treatment were generally represented by loss of substrate adhesion and difficulties in the monolayer formation leading to the accumulation of death floating cells in the culture medium.

Colony formation capacity decreased proportionally with the increase of the additive concentration, the response pattern being similar for both cell lines.

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EDUCATIONAL RESOURCES IN BIOLOGY

MUSEUM OF NATURAL HISTORY: PRESENT AND PERSPECTIVES

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Stepping toward the 190 jubilee since its foundation in 1834, The Natural History Museum presents itself as an institution that need to retrace his own value as part of the "Alexandru Ioan Cuza" University. It needs to re-evaluate its objectives and contribution it has as part of the University and renew of its image and role toward the local a regional community.

The paper presents a short history of the Natural History Museum in Iasi, its evolution, the present status of the institution. We made a SWAT analysis, propose some changes of the museum status, and bring in front some ideas to be debated for the design of the future permanent exhibition.

If at its beginnings the main objective was „presentation of the land and underground treasures of Moldavia, and curiosities from abroad” nowadays it need to be focused both on preserving its scientific, cultural and historical heritage in his depositories and educating the public toward the natural assets conservation.

ASPECTS OF PERFORMANCE LEARNING IN BIOLOGY: RESULTS OF THE OLYMPIADS AND SCHOOL COMPETITIONS IN IAȘI COUNTY, IN 2023

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Biology as a subject in pre-university education is approached with interest by students, not only for the significance of theoretical knowledge but especially for its practical applications. Simultaneously, biology holds a central position among the sciences when it comes to students' interest in admission to higher education in medical, pharmaceutical, biochemical, ecological, agricultural, or healthcare-related fields. Consequently, numerous successful student participations in local, county, and national-level biology competitions and Olympiads are observed. While local and county phases of these competitions may have a mass character, their national stages serve as a platform showcasing high achievement in the study of biology, opening pathways to higher education.

As a result, this work presents the achievements in biological education in Iași County in the year 2023, in national-level biology Olympiads and school competitions such as the National Biology Olympiad, National Science Olympiad for Juniors, National Earth Sciences Olympiad, National Creativity Olympiad, the "George Emil Palade" National Contest, National Environmental Projects Contest, National Scientific Communications Contest for high school students, and the Skilled Sanitarians Contest. Some of the factors contributing to these achievements include: first and foremost, the positive perception students have of biology as a

subject; then, the level of determination and involvement of biology teachers, and finally, the level of education and involvement of parents. Another significant factor for success in learning biology is the availability of well-equipped biology laboratories, supplemented by field exploration facilities specific to biology. The authors of this work aim to present their 'recipe for success' in achieving these performances, through the types of learning situations generated and the predominantly used methods in preparing students for Olympiads and school competitions.

INQUIRY- BASED LEARNING IN TEACHING BIOLOGY AT SECONDARY SCHOOL

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Inquiry-based learning is an innovative and engaging concept for the contemporary educational process, opening perspectives towards a new learning paradigm. In the modern era, characterized by complexity and rapid change, inquiry-based learning becomes a way to prepare students for the challenges of the future. In contrast to traditional methods, where learning is more passive, inquiry places at the center of the educational process active exploration, discovery, and knowledge construction. Inquiry is not just a teaching method, but a holistic approach through which critical thinking, problem-solving, and collaboration skills are developed. It invites students to become researchers of their own learning, to ask questions, to discover and to construct a certain level of understanding of the subject investigated. In this context, teachers become guides and facilitators, providing guidance and support, allowing students space for curiosity and creative exploration.

In this context, the present work aims to explore, from a theoretical point of view, the concept of inquiry-based learning, as well as how it can be applied at the middle school level for the subject of biology. Thus, the paper offers a critical look at how inquiry-based learning can improve the educational process at the middle school level and can prepare students for a deeper understanding of the biological sciences. From a practical perspective, criteria are proposed for analyzing five of the most used biology textbooks for the sixth grade, to evaluate how this method is present and implemented in the Romanian education system. Following the analysis of the textbooks, recommendations are formulated for teachers and textbook editors, with the aim of developing captivating and interactive educational content from the perspective of inquiry-based learning.

CHALLENGES IN ACHIEVING SCIENTIFIC LITERACY IN BIOLOGY: A CASE STUDY OF SEVERAL SCHOOLS FROM ROMANIA

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Disciplinary literacy (Shanahan & Shanahan, 2008), including biological literacy, which can be defined as the ability to read and write in a specific discipline, contributes to the development of scientific literacy in general, the ability that the learner (a future adult) needs in order to integrate into the knowledge-based modern society.

The analysis of the Romanian students' results at national and international tests (for example: *PISA*) as well as the conclusions of numerous studies and research in the field of scientific literacy, are meant to draw attention to the need of improvement measures in this type of literacy in Romania.

Starting from these premises, in this paper we aim to understand the difficulties of reading, comprehension and writing biology texts by students (Fang, 2005; Lemke, 1990; Wellington & Osborne, 2001), as well as the difficulties teachers face in achieving scientific literacy in biology (Ariely & Yarden, 2018; Osborne, 2014).

Based on selected information from the specialized literature, a questionnaire is designed to identify the difficulties encountered by biology teachers in several pre-university education institutions in Romania in their current teaching practices related to disciplinary literacy.

Among the ways of improving this type of teaching in secondary schools, the paper proposes the use of Adapted Primary Literature (APL), providing examples and case studies in this regard, as well as a set of suggestions for teachers who intend to use adapted scientific articles in teaching biology.

THE RELATIONSHIP BETWEEN THE MENTOR'S COMPETENCES AND THE TRAINING GOALS OF STUDENT INTERNS DURING THE PEDAGOGICAL PRACTICE IN BIOLOGY

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The organization of the pedagogical practice of the students, in accordance with the needs of the initial preparation for the teaching career, is carried out in accordance with the educational plans of the new curriculum and the institutional reorganization, ensuring their quality at the level of educational standards, in the spirit of the modernization of the educational process.

In this study, we review some professional competencies specific to the mentor teacher, such as methodological, communication and relational, evaluation, psychosocial, technological, or career management competencies. These skills were put into practice in the activity with the students who have the goals of their various training objectives like the explanation of the contextualization of the teaching-learning methods, the forms of organization of the didactic activities, the use of teaching aids in the teaching-learning of Biology, the algorithm didactic design in Biology aimed at macro-design, micro-design, lesson structuring model, and

evaluation of the learning process, activity properties, textbooks, didactic activity projects, teaching aids and the effects of student knowledge.

At the same time, this paper proposes several standards regarding integration into the school unit program, didactic activities in which the student is a co-participant, relations with students and the teaching staff, the adoption of responsible attitudes towards the teaching profession or regarding the learning products produced, which lead to the development of skills and the fulfillment of training objectives.

Through this work, we also emphasize the fact that a mentor is a real support for student practitioners, inducing a climate of will, in which all participants "are going" in a constructive and formative direction, and thus the "mechanism" mentor-student-class student works efficiently.