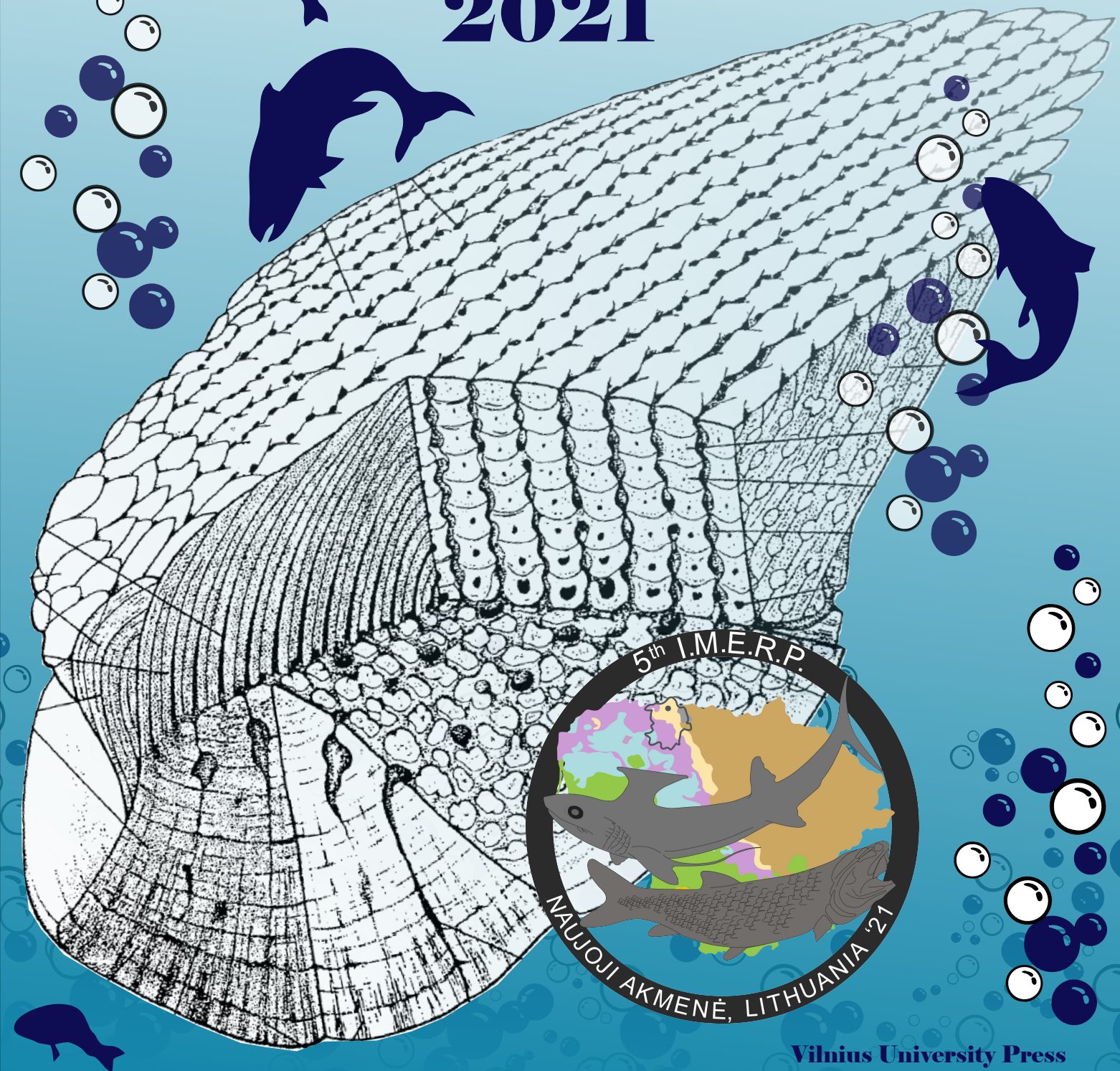
# 5th International Meeting of Early-stage Researchers in Palaeontology Lithuania 2021

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# 5th International Meeting of Early-stage Researchers in Palaeontology
## Online event, May 18-21

# BOOK OF ABSTRACTS


**2021**


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# WELCOME

This is the abstract book of the **5th International Meeting of Early-stage Researchers in Palaeontology (IMERP).** More information about the IMERP can be found here.

Originally 5th IMERP should have taken place in 2020, yet due to the pandemic covid-19 situation it was postponed to 2021 and for the first time in its early history IMERP will be an online event. This presents new challenges for IMERP attendees and organizers. Nevertheless, we hope that these challenges will teach us all something new and that despite obstacles IMERP will serve its main purposes.

**The two main objectives of IMERP are:**
To provide a **friendly environment** for early-stage researchers to present their research through oral or poster presentations and follow each other's progress. To **share new methods and ideas** useful in palaeontology, and develop the skills of the attendees with the help of leading experts, invited to give lectures about their fields.

It is also the first time IMERP is organized in Lithuania. Usually, field trips and excursions help to tell the story about the unique geological history and palaeontology of the region where the non-online event takes place. As this event is online, we will try to communicate the same story by all other means possible. For instance, on the title page of this book there is an image of underwater world. It represents the fact that most of its geological history Lithuania was below a sea-level. Also, the central title page object is a 3-dimensional diagram illustrating the internal structure of a scale of *Mongolepis rozmanae*. This diagram was created and genus was erected by one of the most acknowledged Lithuanian paleoichthyologist – Valentina Karatajūtė-Talimaa.

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# SCIENTIFIC COMMITTEE

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# CONFERENCE PROGRAM

## (Tuesday) 18th May 2021

| Time | Presenter | Title of the Lecture |
|---|---|---|
| 10.00-10.30 | **Welcome Speech** | |
| 10.30-10.45 | L. Daumantas, P. Šinkūnas, E. Rudnickaitė and A. Spiridonov | Report of ichnofossils found in the aeolian dunes and sand sheets of Lithuania. |
| 10.45-11.00 | A. C. H. O'Connell, N. Torres-Tamayo and A. R. Cuff | Assessing pelvic indicators of locomotion and sexual dimorphism in humans (Homo sapiens) and chimpanzees (Pan troglodytes) |
| 11.00-11.15 | R. Martino, L. Pandolfi and C. Dal Sasso | New data on the dwarf insular Hippopotamus pentlandi von Meyer 1832 from Sicily |
| 11.15-11.30 | C. Tura-Poch, M. Prat-Vericat, L. Sorbelli, I. Rufí, A. Boscaini and D. A. Iurino, J. Madurell-Malapeira | Late Pleistocene Lynx pardinus remains from Avenc del Marge del Moro (Garraf Massif; NE Iberian Peninsula) |
| 11.30-12.00 | COFFEE BREAK | |
| 12.00-12.15 | M. Prat-Vericat, I. Rufí, S. Jovells-Vaqué, L. Sorbelli, X. Terradas and J. Madurell-Malapeira | The Middle to Late Pleistocene vertebrate assemblage from Cova 120 (Alta Garrotxa, Eastern Pyrenees) |
| 12.15-13.00 | **1st Keynote Speaker – Andrej Spiridonov** | |
| 13.00-13.15 | **Discussion** | |
| 13.15-13.30 | K. Chitoglou, L. Pandolfi, G.E. Konidaris and D.S. Kostopoulos | The rhino remains from the Lower Pleistocene site of Tsiotra Vryssi (Mygdonia Basin, Greece) |
| 13.30-14.30 | **LUNCH** | |
| 14.30-14.45 | A. Faggi and L. Pandolfi | Early Pleistocene fossil rhinos, the contribution of metapodials to their identification |
| 14.45-15.30 | **2nd Keynote Speaker – Alycia L. Stigall** | |
| 15.30-15.45 | **Discussion** | |
| 15.45-16.00 | A. Cuccu, A. Valenciano, B. Azanza and D. DeMiguel | New carnivore material from the Early Pleistocene of La Puebla de Valverde (Spain): a multivariate taxonomical approach based on the dentition updates the systematics of the genus Lynx. |
| 16.00-16.15 | COFFEE BREAK | |
| 16.15-16.30 | S. Khan, A. Farooqui, U.K Shukla, K. Grosfield, S. Ali and V. Prasad | High resolution MAT – MAP estimates for Late Pliocene vegetation between 3.4 to 2.6 Ma, from Yermak Plateau, marginal Arctic Ocean |
| 16.30-16.45 | P. Skandalos, F. Cailleux, M. Bilgin and L. W. van den Hoek Ostende | Analysing the virtual dental pattern of Spalacinae preliminary results based on Pliocene species |
| 16.45-17.00 | D. Rojas and J. Esteve | Morphological assessment of ptychopariid trilobites Agraulos longicephalus Hicks, 1872 and |



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| | | Agraulos ceticephalus Barrande, 1846 from the Drumian of Spain and the Czech Republic |
| 17.00-17.15 | B. Becker-Kerber, A. E. Albani, K. Konhauser, A. A. Elmola, C. Fontaine, P. S. G. Paim, A. Mazurier, G. Prado, D. Galante, P. B. Kerber, A. L. Z. da Rosa, T. R. Fairchild, A. Meunier and M. L. A. F. Pacheco | The role of volcanic-derived clays in the preservation of Ediacaran biota |
| 17.15-17.30 | COFFEE BREAK | |
| 17.30-18.30 | BRAINSTORM | |

## (Wednesday) 19th May 2021

| Time | Presenter | Title of the Lecture |
|---|---|---|
| 10.00-10.15 | K. Bose and S. S. Das | Taxonomic and ecological diversity of Miocene gastropods of the Dwarka Basin, Western India |
| 10.15-10.30 | D. D. Badea, B. G. Rățoi and M. Brânzilă | The first record of Muridae (Mammalia, Rodentia) from the Late Miocene of the Moldavian Platform (Eastern Romania) |
| 10.30-10.45 | L. Boudia and B. Mansour | Preliminary biodiversity and palaeoenvironmental characterization results of diatoms in the Messinian diatomite formation (Upper Miocene, Eastern Dahra, Lower Chelif basin, Algeria) |
| 10.45-11.00 | S. Chakraborty, S. Chakravorti, D. P. Sengnbupta and S. S. Das | Marine community of crustaceans in the Oligocene of Kutch Basin, India |
| 11.00-11.15 | B. Bojarski, L. Rolbiecki, K. Cierocka and J.N. Izdebska | Nematoda as the source of information of so-called "amber forest" – what story do they tell us? |
| 11.15-11.35 | J. Rabińska | Cretaceous sea urchins from the Brzozówka site near Kraków – systematics and living environment |
| 11.35-12.00 | COFFEE BREAK | |
| 12.00-12.15 | O. Kohout and M. Košťák | New Acanthoceratid ammonites from Czech Republic and their ornamentation |
| 12.15-13.00 | 3rd Keynote Speaker – Nikita Zelenkov | |
| 13.00-13.15 | Discussion | |
| 13.15-13.30 | D. Mazurek, K. Waindzoch and P.Janecki | Upper Cretaceous fossils from Opole Region (Poland) informs early evolution of Fagales. |
| 13.30-14.30 | LUNCH | |
| 14.30-14.45 | J. Słowiński | Symbiotic relations between tube-dwelling polychaetes and hydroids: case study from the Jurassic of the Polish Basin |
| 14.45-15.30 | 4th Keynote Speaker – Emily G. Mitchell | |
| 15.30-15.45 | Discussion | |

| | | |
|---|---|---|
| 15.45-16.00 | A. Rytel | Environmental, spatial and temporal distribution of Tanystropheus (Reptilia: Archosauromorpha) |
| 16.00-16.15 | COFFEE BREAK | |
| 16.15-16.30 | W. Pawlak, M. Tałanda, T. Sulej and G. Niedźwiedzki | Lungfish from the Upper Triassic of Greenland and remarks about palaeobiogeography |
| 16.30-16.45 | S. Kalita, E. M. Teschner and D. Konietzko-Meier | Role of dermal bones in the Buoyancy of the Late Triassic temnospondyl amphibian Metoposaurus krasiejowensis |
| 16.45-17.00 | E.M. Teschner, P. Janecki and D. Konietzko-Meier | Postcranial anatomy and palaeohistology of Cyclotosaurus intermedius from the Late Triassic of Krasiejów (SW Poland) |
| 17.00-17.15 | Y.N. Jha and H.N. Sinha | Palynological investigation and its palaeoenvironmental significance in the early Permian Talchir Formation of West Bokaro Coalfield, Jharkhand, India |
| 17.15-17.30 | V. Cígler and T. Kumpan | A Lower Tournaisian conodonts stratigraphy of the Moravian Karst (Czechia) and Montagne Noire (France) |
| 17.30-17.45 | O. Vanhaesebroucke and R. Cloutier | Morphological disparity and evolutionary radiation of early jawed vertebrates |
| 17.45-18.00 | T. Y. Chen | Computer Vision in Paleontology: A Burgeoning Field |

# (Thursday) 20th May 2021

| Time | Presenter | Title of the Lecture |
|---|---|---|
| 10.00-10.15 | T. Laville, M-B. Fore1, T.A. Hegna and S. Charbonnier | Insight into thylacocephalan anatomy: new look at Concavicaris woodfordi (Euarthropoda: Pancrustacea?) using micro-tomography |
| 10.15-10.30 | K. Pawełczyk | Biotaxonomy and palaeoenvironmental significance of microproblematics from Devonian reef complexes (Poland, Holy Cross Mountains) |
| 10.30-10.45 | A. Majchrzyk, M. Zapalski and M. Jakubowicz | Mesophotic community from the foot of the Devonian Aferdou el Mrakib Reef (anti-Atlas, Morocco) |
| 10.45-11.00 | P. Świś | Devonian roots of the enigmatic Carboniferous conodont Dollymae |
| 11.00-11.15 | M. Gajewska, Z. Dubicka and W. Kozłowski | The mysterious Middle Devonian foraminifera and microproblematica from Miłoszów (Holy Cross Mountains, Poland) |
| 11.15-11.30 | A. Kowalewska | Arthropods and associated fauna from the erratics at the Orłowo Cliff |
| 11.30-12.15 | COFFEE BREAK | |
| 12.15-12.30 | N. Hohmann and E. Jarochowska | Modeling the effects of sedimentary condensation and dilution on palaeontological data |
| 12.30-12.45 | J. De Entrambasaguas and O. R. Regalado-Fernandez | Looking into the past to build a better future. Conservation palaeobiology and the key role of palaeontologists in conservation science |

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| 12.45-13.00 | G. Mathes, W. Kiessling and M. J. Steinbauer | Cascading palaeoclimate interactions affect origination rates of marine genera |
| 13.00-13.15 | M. Rifl and K. Holcová | Image analysis of microborings: delineating assemblages in thin section to regional sedimentological assessments |
| 13.15-13.30 | E. Piqueras Ricote | Eolarva kuanchuanpuensis is not the earliest metazoan larva |
| 13.30-14.30 | **LUNCH** | |
| **POSTER SESSION** | | |
| 14.30-14.35 | A. Savković | Cave bear (*Ursus spelaeus* (Rosenmuller)) from Canetova and Samar caves, SE Serbia |
| 14.35-14.40 | M. Guerrero-Campos, V. G. Tagua, P. Cruzado-Caballero and C. Castillo Ruiz | Extinct giant tortoises and their megaherbivore role in the Macaronesian Islands |
| 14.40-14.45 | D. Sanz-Pérez, M. Hernández Fernández, M. B. Muñoz-García, P. Pérez-Dios, J. Morales and L. Domingo | Palaeoenvironmental, palaeoclimatic and palaeoecological shifts throughout the MN12-MN13 transition in central-eastern Iberian Peninsula |
| 14.45-14.50 | G. Svorligkou, I. Giaourtsakis and S. Roussiakis | New craniodental material of Rhinocerotids (Perissodactyla, Rhinocerotidae) from the Late Miocene of Samos Island, Greece |
| 14.50-14.55 | P.M. Carro-Rodríguez, P. López-Guerrero, P. Peláez-Campomanes and M.Á. Álvarez-Sierra | Microcomputed tomography in extinct rodents from Cerro de los Batallones (Upper Miocene, Madrid, Spain) |
| 14.55-15.00 | B. Bojarski, J.N. Izdebska, K. Cierocka and L. Rolbiecki | Peacock caught again in amber - the second record of the Tuckerellidae family (Acariformes, Prostigmata) in Baltic amber |
| 15.00-15.05 | E.M. Teschner | Geochemical signal distributed in the dermal bones of Metoposaurus krasiejowensis from the Late Triassic of Krasiejów |
| 15.05-15.10 | B. Coutret, D. Néraudeau, D. Gendry, R. Gougeon and M. Poujol | Insight into an undescribed ichnofossil assemblage from the Early Cambrian Le Rozel Formation (NW France) |
| 15.10-15.15 | M.C. Velasco-Flores, J. González-Dionis, L.M. Sender Palomar, P. Cruzado-Caballero and C. Castillo | Virtual palaeontology in outreach and education: 3D modelling of the fossil plant Heritage of the Canary Islands |
| 15.15-15.30 | COFFEE BREAK | |
| 15.30-15.45 | Short Overview of the 5th IMERP | |
| 15.45-16.15 | 6th IMERP Proposal | |
| 16.15-16.20 | L. A. Norton, F. Abdala, J. Benoit and S. C. Jasinoski | Digital reconstruction of tooth replacement from serial tomograms of a destroyed holotype |
| 16.20-16.25 | B. Becker-Kerber, A. A. Elmola, A. Zhuravlev, C. Gaucher, M. G. Simões, J. A. Gámez | Clay templates in Ediacaran algae – implication for burgess-shale type preservation |

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| | Vintaned, C. Fontaine,G. M. E. M. Prado, L. M. Lino, D. Ferreira Sanchez, D. Galante, P. S. G. Paim, F. Callefo, G. Kerber, A. Meunier, A. E. Albani | |
| 16.25-16.40 | M.G. Suárez, J. Esteve and J.J. Álvaro | Influence of ecomorphological trends in the Paleozoic trilobite biodiversity patterns |
| 16.40-16.50 | **ART CONTEST WINNERS** | |
| 16.50-17.00 | **5TH IMERP CLOSING CEREMONY** | |

# ABSTRACTS

# KEYNOTE SPEAKERS

**USING ECOLOGY TO UNLOCK THE SECRETS OF EARLY ANIMAL EVOLUTION.**

Emily G. Mitchell


Ediacaran fossils occupy a crucial position in the history of life on Earth, marking the transition between 3 billion years of microbial life and the Cambrian explosion of modern animals. The oldest Ediacaran fossils exhibit unique anatomies, making it difficult to resolve the key processes underlying their evolutionary biology. However, the sessile nature of Ediacaran organisms, coupled with their in-situ preservation, means detailed ecological analyses can be used to “reverse engineer” these evolutionary dynamics. In this talk I will discuss how ecological analyses have enabled us to resolve the life-cycles of key species, determine competition dynamics, and investigate the role that stochastic and deterministic processes played within these communities and on early animal evolution.

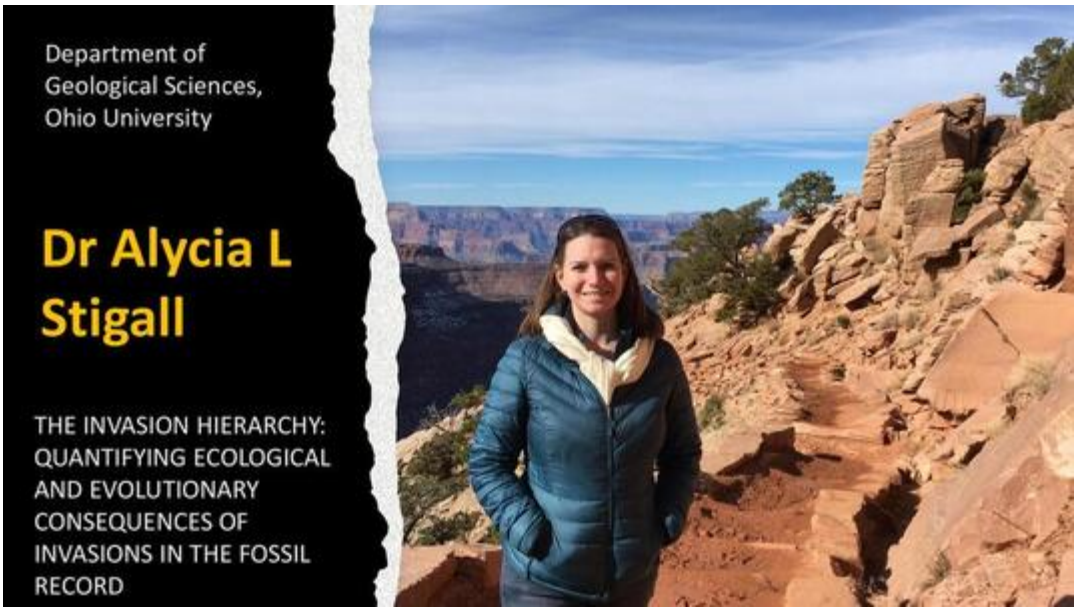
**RECURRENCE QUANTIFICATION ANALYSES IN PALEONTOLOGY. DYNAMICAL SYSTEMS WINDOW INTO THE PAST.**

Andrej Spiridonov


Paleontological record holds the only direct evidence on the long-term evolution and ecological change. Theoretical and experimental studies of modern ecological-evolutionary systems show the prevalence of nonlinear processes in the biotal change. Since paleontological record spans many orders of magnitude on the time scale it reflects convolution of complex internal biotic dynamics with external climate systems, which exhibit range of scale free and scale specific dynamic regimes. This overwhelming complexity of paleoecological and evolutionary dynamics requires application of rigorous techniques which can handle non-linearity, stochasticity and non-stationarity of stratigraphic time series. The recurrence plots and recurrence quantification analysis which are based on the dynamical systems theory represent one such a tool. Recurrence is a return of a system to the similar condition, and it is a fundamental property of any system experiencing change. Therefore it can yield insights on some of the long-standing issues in paleontology, for example stability vs. continuity of change, and contingency vs. determinism in biotal evolution. In this talk we will explore some of the applications and modern developments of recurrence plots in characterizations of paleocommunity dynamics in the context of extinction events, their use as an additional tool for stratigraphic correlation, and the detection of time-specific anomalies in dynamics of marine biota and geochemical records.

## THE INVASION HIERARCHY: QUANTIFYING ECOLOGICAL AND EVOLUTIONARY CONSEQUENCES OF INVASIONS IN THE FOSSIL RECORD

Alycia L Stigall




Species invasions are pervasive in Earth's history, yet the ecological and evolutionary consequences of species invasions vary greatly. Invasion events can be organized in a hierarchy of increasing invasion intensity from ephemeral invasions to globally pervasive invasive regimes. Each level exhibits emergent properties exceeding the sum of interactions at lower levels. The ecological impacts of lower-level impacts can be negligible or result in temporary community accommodation. Invasion events at moderate to high levels of the hierarchy permanently alter quantitative aspects of ecological communities, regional faunas, and global ecosystems. The prevalence of invasive species results in quantifiable evolutionary changes by fostering niche evolution, differential survival of ecologically generalized taxa, faunal homogenization, and suppressing speciation. These impacts can contribute to mass extinctions and biodiversity crises that alter the trajectory of ecological and evolutionary patterns of life. In this talk, we'll explore the impacts of invasions at various levels of the hierarchy incorporating examples of ephemeral invasions in local strata, the regional Richmondian Invasion, the Great Ordovician Biodiversification Event, the Great American Biotic Interchange, and the Late Devonian Biodiversity Crisis. The fossil record provides a long-term record of how invasion impacts may scale up through time, which can augment ecological studies of modern species invasions.

**THE ORIGIN AND EARLY EVOLUTION OF AND THE MODERN BIRDS (AVES: ORNITHUROMORPHA)**

Nikita Zelenkov


Irresectable of their exact date of origin, birds are well diversified already in the early Cretaceous, i.e. when undoubted avians first occur in the fossil record. As expected, a variety of morphologically primitive taxa (often resembling non-avian dinosaurs in their body-plan and osteology) are known from this epoch, but these ones co-occur with morphologically derived forms, appearing to be very close to the modern radiation of birds. The origin and early evolutionary history of modern-birds (the clade Ornithuromorpha) is not clear, as no clearly transitional forms are known. It is generally believed that the origin of Ornithuromorpha is linked with the basal divergence of the clade Ornithothoraces, which also includes the so-called opposite birds, Enantiornithes. In my presentation I will discuss a possible alternative hypothesis of the origin of morphologically modern birds, which I proposed recently – this links Ornithuromorpha with one particular group of opposite birds. I will further discuss the ecological prerequisites for the evolutionary formation of Ornithuromorpha, and trace their early adaptations.

# ORAL PRESENTATIONS

# THE FIRST RECORD OF MURIDAE (MAMMALIA,RODENTIA) FROM THE LATE MIOCENE OF THE MOLDAVIAN PLATFORM (EASTERN ROMANIA)

D. D. Badea[1],*, B. G. Rățoi[1], M. Brânzilă[1]

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Keywords: micromammals, *Muridae*, *Progonomys*, paleoenviroment, biostratigraphy, Late Miocene, Moldavian Platform.

The last sedimentary megasequence on the Moldavian Platform (Săndulescu 1984) is referred as the Upper Badenian (Middle Miocene) - Maeotian (Ionesi 1994). The murid fossils were found in several outcrops in the Bârnova area (12 km south of Iași City). Here, the Upper Bessarabian (early Late Miocene) deposits belonging to the Bârnova Formation suggest a littoral environment (Grasu et. al., 2002). The Bârnova Formation is widespread in the south part of the Moldavian Platform (100 meters in thickness) and consists of white sands with brown mudstone interbeddings, likely deposited in a fresh (as supported by the presence of mollusk -genera *Unio, Hydrobia, Melanopsis,* and *Planorbis*) or brackish water context (supported by the several species of the bivalvia, such as *Congeria sp* ; Jeanrenaud, 1971, Brânzilă, 1999). The dental remains from the *Muridae* represent a particularly important finding because of their potential biostratigraphical significance. Morphological analyses of the dental material, were carried out by using bivariate plots. Using this method, it can be recognized the presence of the species *Progonomys hispanicus* from the Late Miocene of Bârnova. It is the first murid species ever recorded in the Late Miocene of Romania.

**References:**

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# THE ROLE OF VOLCANIC-DERIVED CLAYS IN THE PRESERVATION OF EDIACARAN BIOTA

B. Becker-Kerber[1,2], A.E. Albani[2], K. Konhauser[3], A.A. Elmola[2], C. Fontaine[2], P.S.G. Paim[4], A. Mazurier[2], G. Prado[5], D. Galante[6], P.B. Kerber[7], A.L.Z. da Rosa[8], T.R. Fairchild[5], A. Meunier[2], M.L. A.F. Pacheco[9]

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Studies on the appearance and evolution of the first macroscopic complex life and animals has largely relied on exceptionally preserved fossils in siliciclastic rocks from the Ediacaran Period (635–539 Ma). Yet, many questions remain open regarding the possible formation mechanisms of the so-called 'Ediacaran-style' preservation. Here we show that the classic moldic preservation observed in the Itajaí Basin (ca. 563 Ma) is related to clay mineral authigenesis resulting from the alteration of volcanogenic material. The fossil impressions (e.g., *Palaeopascichnus*) occur in close association with abundant volcanogenic sediments, including ash-fall pyroclasts. The clay authigenesis was also likely enhanced by microbial activity, as evidenced by the presence of microbial mats and higher illitization at the fossiliferous surfaces and clays replicating the microbial constructions. The precipitation of clay minerals allowed the preservation of fossils at micrometric scales. This high-fidelity preservation resulted from the rapid burial during volcanic events allied to the microbially-mediated mineralization. Therefore, the Itajaí Basin *Lagerstätte* highlights that diverse minerals can play a role in fossil preservation, and that perhaps 'Ediacaran-style' preservation result from different processes leading to the same broad style of preservation.

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# NEMATODA AS THE SOURCE OF INFORMATION OF SO-CALLED "AMBER FOREST" – WHAT STORY DO THEY TELL US?

B. Bojarski*, L. Rolbiecki , K. Cierocka , J.N. Izdebska

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The fossil record of nematodes contains mostly parasitic forms preserved either in form of fossiliferous remains, including inclusions in various types of fossil resins, or ichnofossils (traces of their interactions with hosts or eggs). Knowledge of non-parasitic forms is fragmentary and primarily based on molecular studies. The poorly recognized fossil record of free-living groups could be related to the form of their preservation. Parasitic forms are usually easier to find as inclusions in fossil resin thanks to an association with their hosts. They usually occur caught fleeing from their dying host straight into a resin matrix.

This study reveals different morphotypes of nematodes not associated with any animal host, found in Baltic amber nuggets as groups of numerous specimens of different ontogenetic stages, which could suggest other than animal parasitism type of feeding. Analysis of their taxonomic assignment and type of preservation provides information about the taphonomical aspects of the resin they were found in.

Each trophic groups of Nematoda preserved in amber, especially free-living carnivores, phytophagous and plant parasites could provide a better understanding of the paleoecology of "amber forest" and the conditions of forming inclusions and amber itself.

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# TAXONOMIC AND ECOLOGICAL DIVERSITY OF MIOCENE GASTROPODS OF THE DWARKA BASIN, WESTERN INDIA

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The Cenozoic marine successions of the western India are known for its rich diversity in molluscan fauna and is a centre of attraction for decades for paleontologists. The Neogene successions of the Dwarka Basin (western India) has received very little attention until now. Herein, we have done a detailed study on the temporal diversity patterns of the Miocene gastropods of the Gaj Formation of the Dwarka Basin. The Gaj Formation is subdivided into seven members and gastropod diversity of individual members are evaluated. A total of 11,393 gastropod specimens are studied and the gastropod diversity of the basin comprise of a total of 118 species belonging to 86 genera. Five different Miocene gastropod paleo-communities (PC1-PC5) are derived on comparing the taxonomic composition of different members of the Gaj Formation. Apart from a turritelline dominated assemblage (TDA) unit (PC2) belonging to the basal member, all the members have huge abundance of strombid gastropods associated with naticids, cypraeids, conus and ampullinids gastropods, and are typically associated with patchy corals. This indicates an overall warm shallow marine environment prevailing during Miocene. The TDA unit of the basal Nandana Member (PC2) and the Ashapuramata Member (PC4) are marked by the dominance of turritelline gastropods and *Tenagodus* respectively, both of which are suspension feeders. This indicates high nutrient rich environment due to ocean upwelling during their deposition. Ecologically, PC 1, PC 3 and PC 5 are all dominated in abundance by Epifaunal Omnivores followed by Epifaunal and Semi-infaunal Carnivores (Secondary and Tertiary Consumers) while the Herbivore grazers (Primary Consumers) are less abundant compared to them. Thus, their ecological pyramid of number shows an inverted pyramid structure. On the other hand, PC 2 and PC 4, due to the dominance of the Epifaunal and Semi-infaunal suspension feeders (Primary Consumers), the ecological pyramids display normal pyramid structure.

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# MARINE COMMUNITY OF CETACEANS AND CRUSTACEANS IN THE OLIGOCENE OF KUTCH BASIN, INDIA

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The Kutch Basin in western India is a pericratonic basin with a near continuous succession of Cenozoic marine sediments. It has yielded many important vertebrate and invertebrate fossils in the past and is still an important area for studies on Cenozoic fossils. The Kutch Basin is highly regarded for its whale fossils from the Naredi and Harudi formations of Eocene; however, the other formations have also yielded significant vertebrate fossils. Initially thought to belong to the Neogene sediments, recently, a fine-grained reddish-brown sandstone yielded 80 post cranial and cranial fragments of marine mammal fossils from the topmost Oligocene of Kutch Basin, India. The location of the bone bed is unique in the sense that the fossils are typically found in a restricted area of sediments. None of the adjacent areas have any fossils at all. Some of the fossil fragments show bone characteristics similar to that of cetacean fossils reported from other parts of the world. Cetacean fossils have rarely been reported from the Oligocene of Kutch before, making this location an important area of study. The vertebrate fossils were found in close association with crabs. 140 crab claws (crustacea) have been excavated from the sediment mound along with the vertebrate fossils. Crabs are known to travel far in order to forage for food and thus more often than not, their claws are found much further from their original habitat. They are omnivores and they feed on worms, molluscs, detritus material, fungi, algae and so on. Crabs are also known to live close to terrestrial environments, indicating that the place of discovery must have been close to the shoreline. The area of study in question consists of not just a few crab claws, but a significantly large set of crab claw fossils in association with the marine mammal fossil fragments. This suggests a beneficial area of existence for the crabs in terms of food and nutrients. Thus, even though this may not be their original habitat, they constantly scoured this region indicating the presence of a community consisting of marine mammals and crustacea. This area is indicative of a feeding ground for the crustaceans foraging from the dead remains of the Oligocene cetaceans.

# COMPUTER VISION IN PALEONTOLOGY: A BURGEONING FIELD

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Computed Tomography (CT) offers paleontologists a more accurate and time saving alternative to manually isolating, analyzing, and identifying microfossils. AI-based tomographic image analysis software can identify and extract microfossils on its own, rendering supervision throughout the analysis unnecessary. Tomographic image analysis creates a 3D model of a fossil from a sequence of 2D slices. Using tomographic image analysis, a paleontologist's work is reduced to loading a tomographic sample, selecting the correct pipeline, and leaving the procedure to execute throughout the night. All that is left for the paleontologist to do is to evaluate the obtained results and to classify each extracted microfossil. CT is becoming increasingly popular because of its ease of use and for its non-destructive study of microfossils. Because CT preserves samples, paleontologists are leveraging the technology to analyze samples several times. With this innovation, many analyses and simulations can be performed and processes can be automated, providing ease and more precise information to paleontologists. The arrival of AI-based tomographic image analysis in paleontology allows fossils to be characterized in three-dimensions and in extraordinary detail. The automated reconstruction of fossils provides paleontologists the ability to test hypotheses regarding the function of extinct organisms, using rigorous functional analyses of the fossil. Tomographic image analysis is not only useful for extinct organisms. Paleontologists are reaching breakthroughs in anatomical research by using fossils to better understand extant organisms, too. Furthermore, the growing digital library of fossil species is permitting paleontologists to carry out comparative functional analyses and understand trends in functional evolution. Widespread sharing, researching, and understanding of rare fossil material is possible for the first time as a result of digitized datasets. Fossils are now being studied more in-depth and in greater detail than ever before, unveiling and informing different evolutionary theories, hypothesis, and research questions.

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# THE RHINO REMAINS FROM THE LOWER PLEISTOCENE SITE OF TSIOTRA VRYSSI (MYGDONIA BASIN, GREECE)

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This preliminary study concerns the taxonomy of the Rhinocerotidae remains from the fossiliferous site of Tsiotra Vryssi (TSR) in Mygdonia Basin (Northern Greece). The site yielded revealed a late Villafranchian vertebrate fauna dated between 1.78 and 1.5 Ma, a crucial timeframe for the European Lower Pleistocene as it correlates with important mammal migrations and faunal turnovers (Konidaris et al., 2021). Although, the Greek Early Pleistocene Rhinocerotidae record is quite poor and usually represented with scarce material several representatives of the genus *Stephanorhinus* are reported (*S. jeanvireti*, *S. etruscus* and *S. hundsheimensis*); yet their systematic study is still limited. The TSR sample includes 58 dental and postcranial specimens, the most complete of which are presented here in detail. Based on the morphological characters and the biometrical data, as well as on the comparison and direct observations with European taxa, it is suggested that the TSR rhino belongs to the species *Stephanorhinus etruscus*. Taking into account the high intraspecific variability, the morphological characters are similar to *S.etruscus*. The TSR population is placed towards the larger morphotypes of this species.

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# NEW CARNIVORE MATERIAL FROM THE EARLY PLEISTOCENE OF LA PUEBLA DE VALVERDE (SPAIN): A MULTIVARIATE TAXONOMICAL APPROACH BASED ON THE DENTITION UPDATES THE SYSTEMATICS OF THE GENUS *LYNX*

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Despite lynxes were spread throughout Europe, Asia and North America during the Pliocene and Pleistocene, their origin is still far from being understood and some controversy exists about their evolutionary relationships. Here we report and describe a new complete left hemimandible of a medium-sized felid from the Early Pleistocene (MN17, middle Villafranchian, ca. 2.05 Ma) site of La Puebla de Valverde (Teruel, Spain), which is characterised by a slender mandibular corpus and ascendent ramus, absence of the p3-p4 diastema, small canines and elongated p4 and m1. Such a unique finding entails not only significant systematic implications, but also ecological and palaeobiological ones. Thus, our findings update the systematic of the genus *Lynx* and emphasise its (morphological) variability; extends unambiguously its geographical distribution in the Iberian Peninsula; reinforce the view that the Plio-Pleistocene Issoire lynx should be attributed to the genus *Lynx* (instead to *Caracal*); and point to dietary convergence to small/medium preys that fits well with the environmental scenario of the epoch and the evolutionary changes that the lynxes underwent in the Early Pleistocene. Finally, we show how the multivariate analysis play a pivotal role in the correct discrimination at the species level in homogeneous groups such as the *Lynx* genus, with regards to lower dentition.

# REPORT OF ICHNOFOSSILS FOUND IN THE AEOLIAN DUNES AND SAND SHEETS OF LITHUANIA

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As far as we know, there are no documented vertebrate tracks from European Aeolian Sand-Belt (EASB), which extends from England to Russia. However, vertebrate ichnofossils were reported from other similar high-latitude aeolian environments (e. g. D. Lea, 1996; Loope, 1986) and from other environments which are geographically close to EASB (e. g. Huddart et al., 1999, Milàn et al., 2007). This lack of documented ichnofossils from EASB might be due to the lack of research interest and, especially in Lithuania's case, lack of outcrops. Open-pit sand quarries are less prevalent in Lithuania, as most of the EASB area is declared a national park, while natural outcrops are very limited. Thus, we tried pit excavation to explore several forest-covered aeolian locations in Lithuania. The preliminary excavations uncovered a range of bioturbations. The origin of these bioturbations, however, is ambiguous, because they resemble other organic/inorganic structures and were found in a quite shallow subsurface (depth 1 – 1.5 m). However, these bioturbations also resemble vertebrate tracks reported from other locations. Like in many other cases (e. g. Milàn et al., 2006) bioturbations were related to organically enriched sediments/paleosols that were later covered by aeolian sand. Thus, further exploration is needed to uncover undeniable tracks or trackways of vertebrates in Lithuania. However, the preliminary finds demonstrate the potential of pit excavation to discover ichnofossils in outcrop-free areas.

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# LOOKING INTO THE PAST TO BUILD A BETTER FUTURE. CONSERVATION PALEOBIOLOGY AND THE KEY ROLE OF PALEONTOLOGISTS IN CONSERVATION SCIENCE

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The global decline of biodiversity is, together with the ongoing climatic crisis, the main threat to life on our planet for the upcoming decades. Paleobiology provides broad and deep knowledge on the ecosystems of the past, the ways these change over time, and their responses to global and local phenomena. However, the use of geohistorical data studied by this discipline for current and future conservation challenges remains an underexplored option in conservation sciences. Here, we argue for the value of geohistorical data in conservation science by focusing on the perspective conservation paleobiology provides. Conservation paleobiology is a relatively young discipline that aims to supplement conservation efforts by incorporating the information provided by the fossil and subfossil records. Based on a broad bibliographical review, we go over the history of this young field, as well as its goals, the types of data it can employ, and the spans of time over which it works. Furthermore, we examine several cases where the information provided by the fossil/subfossil record was key to guide conservation efforts. Finally, we discuss the valuable perspective that the paleontological community can provide to conservation science, and we reinforce the importance of a coordinated effort between paleontologists, neontologists, and stake holders.

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# EARLY PLEISTOCENE FOSSIL RHINOS, THE CONTRIBUTION OF METAPODIALS TO THEIR IDENTIFICATION

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During the Early Pleistocene three different species of rhinos, belonging to the genus *Stephanorhinus,* occurred in Europe: *S. jeanvireti*, *S. etruscus* and *S. hundsheimensis*. The identification of postcranial remains referable to these species is usually debated and new studies on their morphometric variability are being approached. In this contribution, several third metapodials, normally considered as highly diagnostic in Pleistocene rhinoceroses, are investigated by means on new analyses.

Data on 73 third metacarpals and 63 third metatarsals from different European localities were collected from both direct observations and literature. Box plots, linear correlations and PCAs (Principal component analysis) of the most significant measurements have been elaborated in order to visualize the morphometric variability of the three taxa.

It is observed how single linear measurements are not reliable for a certain identification while linear correlations and above all PCAs can provide more detailed information. Linear correlations between the maximum length of the bone (L) and the trasversal diameter of the shaft (TDS) and the maximum length of the bone (L) and the trasversal diameter of the distal epiphysis (DTD) show a clear distinction between *S. etruscus* and *S. jeanvireti* while *S. hunsheimensis* exhibits a greater variability and falls within the ranges of the other two species. PCAs instead show a clear distinction among all the three species suggesting that measurements on complete bones could provide useful taxonomic information.

# THE MYSTERIOUS MIDDLE DEVONIAN FORAMINIFERA AND MICROPROBLEMATICA FROM MIŁOSZÓW (HOLY CROSS MOUNTAINS, POLAND)

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The earliest multichambered benthic foraminifera still remain to be poorly-known, although the origination of foraminiferal plurilocularity is one of the most significant events in the evolutionary history of the foraminifera. Research on the Middle Palaeozoic, Silurian and Devonian, foraminifera was conducted principally on thin sections and presented mostly by drawings. Moreover, some researchers even assume that more than half of the taxa classified as Devonian foraminifera should be revised and transferred to algae.

Therefore, in order to better understand unique and mysterious Middle Devonian microorganisms, we investigated a relatively diverse assemblage of isolated foraminifera and microproblematica specimens from Miłoszów (Holy Cross Mountains, Poland). As a result, our complex morphological and isotopic studies provided a new insight into primary test texture characteristic and concurrent pieces of evidence for mid-Devonian multichambered calcareous foraminiferal photosymbiosis with photosynthetic microorganisms, representing, as far, the earliest known example of photosymbiosis in protists.

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# MODELING THE EFFECTS OF SEDIMENTARY CONDENSATION AND DILUTION ON PALEONTOLOGICAL DATA

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Fossil accumulations are distinct features of the sedimentary rock record and are easily recognizable in outcrops. They can be evidence for ecologically important events such as increases in productivity or mass mortality. However, they can also be generated by low sedimentation rates, which reduce the amount of sediment placed between individual organismal remains. This sedimentary condensation applies to all types of data that is derived from sedimentary particles.

I present the R package DAIME to (1) incorporate available information on sedimentation rates into paleontological analyses and (2) model the effects of sedimentary condensation and dilution on paleontological data. For visualization, self study, and teaching purposes, the model is available as interactive web application that does not require any knowledge of R Software, available at https://stratigraphicpaleobiology.shinyapps.io/shellbed_condensator/.

I discuss how different types of data such as isotope ratios, skeletal abundances, last occurrences, and changes in morphology are affected by changing sedimentation rates, and discuss the implications for interpreting rates of environmental changes, stratigraphic correlation, diversity analyses, origination and extinction rates and other research applications.

# PALYNOLOGICAL INVESTIGATIONS AND ITS PALAEOENVIRONMENTAL SIGNIFICANCE IN THE EARLY PERMIAN TALCHIR FORMATION OF WEST BOKARO COAL FIELD, JHARKHAND, INDIA

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The present study is based on field data and palynological investigations of the Talchir Formation of West Bokaro Coalfield. The organic residue is dominated by monosaccate pollen grains with rare occurrence of *Leiosphaeridia* sp. (acritarchs).

The Talchir Formation is comprised mainly of conglomerate, sandstones and shales, and it is recognised by its greenish to dark grey and buff colour which sometimes breaks into needles. The acritarch assemblage is identified in this formation includes *Leiosphaeridia minutissima, Leiosphaeridia tenuissima, Leiosphaeridia crassa* and *Leiosphaeridia jacutica* in which *Leiosphaeridia tenuissima* dominates the assemblage. The field investigations revealed well preserved sedimentary structures such as wave ripples (bifurcated), hummocky cross stratified sandstone, thin bedded fine sand- mud alteration, bioturbated mudstone and ripple drift cross lamination.

The dominance of *Leiosphaeroids* along with the pollen grains in the assemblage suggests a definite shallow marine incursion and transgression in the Talchir Formation of West Bokaro Coalfield.

The inferred palaeoenvironment of palynofossils assemblage correspond that *Leiosphaeridia* transported from shallower sites by oceanic currents and/or storm which is also strengthened by the record of several ichnofossils, bioturbation and wave generated sedimentary structures. The formation records glacial to post glacial deposits as well as marine incursion evidences. These significant events led to the rapid retreat of ice and rise of sea level in the depositional basins.The marine transgression in the West Bokaro Coalfield corresponds with the well known global Tethyan marine transgressions during Permian which has ingressed from the eastern side of the Indian Gondwana.

# ROLE OF DERMAL BONES IN THE BUOYANCY OF THE LATE TRIASSIC TEMNOSPONDYL AMPHIBIAN *METOPOSAURUS KRASIEJOWENSIS*

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The bottom dwelling lifestyle is commonly proposed for the Late Triassic stereospondyls, especially the Metoposaurids, where extremely thick dermal bones of the pectoral girdle served as ballast. However, the weight of the bone cannot be determined by only the thickness of the bone, but also its porosity which plays an important role; and both these factors together determine the Bone Mass Increase (BMI). This study investigates if the interclavicles and clavicles of *Metoposaurus krasiejowensis* could have acted as static buoyancy control in their aquatic lifestyle. To check this hypothesis, histological thin sections of five dermal bones of *M.krasiejowensis* have been used to investigate the bone compactness and then BMI. The sample size includes three interclavicles and two clavicles which represent the ontogenetic series, with the estimated age range from about 3-12 years. The compactness of these bones were calculated after transforming the thin sections into black and white images; where black represents bone and white represents erosion cavity.The bone compactness shows a low variation inside one bone, however high variation between tested specimens. The comparison of the data assessed here with the estimated age of the individuals indicates that the average compactness was lower in older individuals, indicating a different BMI allowing the individuals to swim in a particular zone in the water column which may have resulted in separate ecological niches for young and adult individuals. Additionally, the least average compactness is above 50% for all tested bones, which indicates that even the largest bone was relatively heavy and served as ballast. Hence, this justifies that dermal skeleton of *M.krasiejowensis* did function as a static buoyancy control in individuals of all age class, even more so for the juveniles. However, to fully prove the hypothesis, further studies including different taxa will be conducted.

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# HIGH RESOLUTION MAT – MAP ESTIMATES FOR LATE PLIOCENE VEGETATION BETWEEN 3.4 TO 2.6 MA, FROM YERMAK PLATEAU, MARGINAL ARCTIC OCEAN

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The mid-Pliocene warm period (mPWP) during late Pliocene (3.4-2.6 Ma) epoch coincides with modern global warming trends ($CO_2$ - 450 ppm). Therefore, the climate-vegetation relationship recorded in the sediments deposited in the Yermak Plateau, marginal Arctic Ocean has potential to understand the global climate warming challenges in the northern hemisphere. A total sum of 78 sediment samples drilled in borehole IODP-910C in Yermak Plateau, Svalbard span depth interval of 199-276 meters below sea floor corresponding to stratigraphic age of 3.40 to 2.62 Ma. It is further analysed for palynological study, the pollen-based vegetation assemblage (from boreal to tundra) and probable source of the sediments are evaluated with the sedimentological End Members (EM) of the grain size population and multivariate analysis of analysed dataset. The role of different EMs like EM1-EM2 correlated with sortable Atlantic water whereas unsorted EM3 was found correlated with paralic Transpolar Arctic Water. Finally, a high resolution palynological spectrum with 45 pollen taxa, reveals a vegetation based climatic tolerance estimates. Palynological dataset between 3.4 to 3.04 Ma shows alternating *Pinus-Abies-Podocarpus* and *Pinus-Betula* assemblages suggesting climatic fluctuations from cool-wet to warm-wet, respectively. The Co-Existence approach estimates an average MAT decline from 10 to 8 ºC and MAP as ~600 ppm, during 3.4 to 3.09 Ma. Except for sharp decline between 3.35-3.31 Ma, in cool temperate vegetation a steady increase in these is observed throughout between 3.4 to 2.6 Ma (from 25-37%, respectively), whereas $MAT_{min}$ during ~3.33 Ma ranges from 3-5ºC which coincides with MIS-M2 glaciation. The estimate like $MAT_{max}$ is 13 ºC and average MAP is 700 ppm for the interval of 3.27 to 3.09 Ma that is corresponding to mPWP. An interval of 3.08-3.04 Ma shows an increase in *Podocarpus* and *Thuja* assemblage indicates relatively high humidity. A higher MAP (~850 to 550 Ma) and MAT (~15 ºC) is estimated for interval of 3.04 to 2.90 Ma after mPWP. An abrupt occurrence of Impatiens pollen is recorded between 2.82-2.9 Ma along with tundra herbs indicating more available surface water, accompanied with the decline in tree pollen throughout until 2.6 Ma. Later during 2.89 to 2.62 Ma a decline in $MAT_{min}$ (7 to 2 ºC) and $MAP_{min}$ (~200 mm) suggest intense cooling.

# NEW ACANTHOCERATID AMMONITES FROM CZECH REPUBLIC AND THEIR ORNAMENTATION

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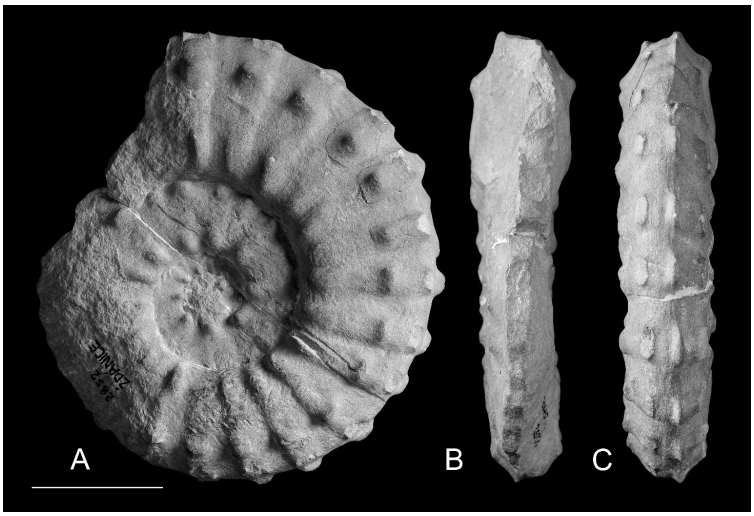
Upper Cretaceous ammonites from the Bohemian Cretaceous Basin (BCB) have been studied for decades, nevertheless revision of deposited material (collected mostly in the first half of the 20th century) within the last years has proven the presence of interesting species so far not known to the science. Especially stratigraphically important index ammonite *Watinoceras coloradoense* (Henderson 1908) which prove presence of the lowermost Turonian eponymous ammonite zone. Another eminent new species from Czech Republic is *Kamerunoceras turoniense* (d'Orbigny 1850) from the southern part of the BCB which is the northernmost occurrence of such Tethydian oriented species in central Europe. Collection of *Kamerunoceras t.* includes ca. 30 well preserved (yet compacted) specimens with typical ornamentation. Ornamentation itself (mainly expressiveness of the ribs) varies, and not only during the ontogenesis of one specimen but intraspecific variability is also present like in the many genera among Acanthoceratoidea. Problematics of the ammonite classification and systematics will be briefly discussed with illustration of extraordinary decorated specimen (*Kamerunoceras t.*) with one part of the shell ornamented clearly with ribs and the other part mainly with tubercules.




*Kamerunoceras turoniense* (d´Orbigny, 1850) scale = 5 cm (Foto O. Kohout)

# ARTHROPODS AND ASSOCIATED FAUNA FROM THE ERRATICS AT THE ORŁOWO CLIFF

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The Orłowo Cliff is situated in Gdynia, along the southern coast of the Baltic Sea. It is built mainly of glacial sediments. The cliff is over 500 m long and up to 60 m high, but its size is still decreasing because of abrasion (Kaulbarsz, 2005). On the beach near the cliff, there are a lot of erratic boulders (transported by the ice sheet during glaciations), which represent igneous, sedimentary and metamorphic rocks. In the sedimentary erratics, numerous fossils of invertebrates (for instance corals, sponges, brachiopods, bivalves, cephalopods and arthropods) and fish can be found. The present work is focused on Arthropoda, especially trilobites and ostracods. They are small in size (from a few millimetres to 5 centimetres) and often are in pieces, but it is possible to recognize them. Erratics come from Scandinavia (mainly from Gotland) and other areas of the Baltic Sea. Most of these rocks are from the Silurian, which is pointed by the presence of ostracods of *Beyrichia* genus (fossiliid.info).

This subject is not fully recognized. The literature comes mainly from the previous century, for example the Neben and Krueger work about Paleozoic fossils (1979) or Ramskold about the Silurian trilobites (1985). There is too little literature about erratics found in Poland. We have a description from southern Poland but it is focused on trace fossils (Chrząstek, Patuła, 2017).

In 12 fragments of rocks there are 26 parts of trilobites (4 pygidium (3 of them belong to the *Calymene* sp.), 16 segments, 3 parts of *Encrinurus punctatus* Wahlenberg 1821, 3 other parts), 94 ostracods, 12 brachiopods and 4 not recognized fragments found.

**Acknowledgements**: I wish to express great appreciation to my supervisor dr hab. Elena Yazykova, prof. UO, for her help and constructive suggestions during this work, to Dawid Mazurek MSc for assistance for his advices, to my friends for help with data collection and to my parents for a new microscope.

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# PRELIMINARY BIODIVERSITY AND PALAEOENVIRONMENTAL CHARACTERIZATION RESULTS OF DIATOMS IN THE MESSINIAN DIATOMITE FORMATION (UPPER MIOCENE, EASTERN DAHRA, LOWER CHELIF BASIN, ALGERIA)

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The diatomite series is highlighted from the Koudiet Elbiodh section located in the Lower Chelif basin (Eastern Dahra, Algeria), attributed respectively to the Messinian. This formation is subdivided into two lithological members distinguished by the facies diversity and stratonomy of the layers, in which kinetic levels are interspersed, indicating significant volcanic activity.

The Messinian diatoms studied in 38 samples of the diatomite formation from the Koudiet Elbiodh were investigated with 119 planktonic and benthic taxa belonging to 53 genera. The planktonic diatoms listed largely dominate the microflora, which can reach 73 species, and also there are 46 determined benthic forms.

Based on CONISS cluster analysis, the constant occurrence along the section of certain known species in the diatom assemblages allows us to appreciate six palaeoecological zones of various oceanographic influences, depending on the succession and/or superposition of marker taxa, which are characterized, alternately, by cold and hot water marine masses, light intensity variations, strong monsoonal activity and nutrient availability. However, the abundance of neritic diatoms suggests an oceanic environment agitated by currents, occurring on the surface or at the deep ocean, which are recorded episodically. These variations are expressed by fluctuations in the abundance of planktonic species (oceanic, neritic-oceanic, coastal), as well as the abundance of benthic species. The rather significant dominance of coastal planktonic species with benthic forms in the upper part of member II reflects a bathymetric reduction, which is relatively less than that mentioned in member I.

# INSIGHT INTO THYLACOCEPHALAN ANATOMY: NEW LOOK AT *CONCAVICARIS WOODFORDI* (EUARTHROPODA: PANCRUSTACEA?) USING MICRO-TOMOGRAPHY

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Known from at least the Silurian to the Cretaceous, Thylacocephala is an enigmatic fossil euarthropod ingroup, often associated to Pancrustacea. Despite the remaining questions on their anatomy and tagmosis, thylacocephalans are characterized by key anatomical features: a folded shield enveloping the body, hypertrophied compound eyes, three pairs of raptorial appendages, a trunk made of eight up to 22 segments bearing appendages, and eight pairs of gills. In order to expand our knowledge on the anatomy of Thylacocephala, it is necessary to apply new approaches.

The upper Devonian Woodford Shale (Upper Fammenian, Oklahoma, U.S.A.) has yielded some fossil euarthropods, including two species of Thylacocephala (Cooper, 1932): *Concavicaris elytroides* and *Concavicaris woodfordi.* We restudied *C. woodfordi* specimen using micro-computed tomography.The µCT-imagery of *C. woodfordi* revealed anatomical details including the structure of its shield, its gills, its posterior trunk appendages and other soft parts. In terms of anatomy, *C. woodfordi* shares similarities with another Fammenian species, *Concavicaris submarinus* (Morocco; Jobbins *et al*. 2020).

The description of the internal anatomy of *Concavicaris woodfordi* provides important information in order to resolve the affinities of Thylacocephala among euarthropods and to reconstruct the evolution of this taxon.

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# MESOPHOTIC COMMUNITY FROM THE FOOT OF THE DEVONIAN AFERDOU EL MRAKIB REEF (ANTI-ATLAS, MOROCCO)

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The southernmost Devonian reefs are those from the NW Gondwana shelf. One of the most prominent localities with reef communities in this area is the Givetian Aferdou el Mrakib reef (Jakubowicz et al. 2019), placed in the Moroccan Anti-Atlas. One of peculiar features of the Aferdou region is the presence of at least 17 small (up to 3m high) bioherms, called "cystiphyllid banks" on the NE reef margin. These build-ups probably developed during the early stage of the Aferdou reef development, close to the Eifelian-Givetian boundary, most likely at a moderate depth of several tens of meters (Jakubowicz et al. 2019). Here we present preliminary remarks on the paleoecology and taxonomy of the reef community from these structures.

A characteristic feature of this community is the abundance of cystiphyllid rugose corals and dominance of platy and encrusting coenitid (e.g. *Roseoporella*, *Platyaxum*) and alveolitid (e.g. *Alveolites*) tabulate corals. Platy morphology of coral colonies is recognized as photoadaptive (e.g. Kahng et al. 2019) and especially common in so-called mesophotic coral ecosystems (MCE; e.g. Kahng et al. 2019), therefore the presence of this growth forms may indicate lower photic zone. The community is enriched by laminar and tabular morphotypes of *Stromatoporella* stromatoporoids, abundant encrusters (e.g. *Rothpletzella*, *Wetheredella*) and accessory fauna (crinoids, bryozoans, brachiopods, gastropods, hydroids). The studied assemblage is the first potential true MCE from the Devonian of Gondwana and potentially shares many similarities with the MCE's from the S Laurussia shelf (Zapalski et al. 2017).

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# NEW DATA ON THE DWARF INSULAR *HIPPOPOTAMUS PENTLANDI* VON MEYER 1832 FROM SICILY

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*Hippopotamus pentlandi* is a dwarf hippopotamus species documented from up to 40 localities in Sicily and restricted to the late Middle Pleistocene and Late Pleistocene. Compared to the continental species such as *H. antiquus* and *H. amphibius*, the skull of *H. pentlandi* is characterized by a more developed occipital region, a more enlarged mastoid process and a shorter dental row (Caloi & Palombo, 1983; Caloi & Palombo, 1986). *H. pentlandi* remains were usually reported on articles and personal notes without detailed morphological and morphometric description. The study of some unpublished specimens collected from the so-called 'Fessura Malatacca' by the Battaini & C Company in 1937, and donated to the Natural History Museum of Milan, allows to re-examine some anatomical traits and a better, updated knowledge of the Sicilian dwarf hippopotamus. The 'falesia of Malatacca-Benfratelli' consists of nine small marine-modelled cavities where fossil vertebrates were firstly reported in 1831 by Scinà. The deposit, mainly yielding remains of hippopotamus, *Ursus arctos*, *Leithia melitensis* and *Sus scrofa,* was completely depleted during the beginning of 20$^{th}$ century. The dwarf hippopotamus specimens here investigated include 10 teeth, a partial vertebra, two tali, two calcanei, 12 metapodials, and 5 phalanges. The calcanei are slenderer, metatarsals are stockier, tali display a more developed and prominent lateral trochlea than in the continental species. These osteological characters indicate a cursorial adaptation of *H. pentlandi*. The description of this original material collected from the poorly known site of 'Fessura Malatacca' allows to increase our knowledge about the Sicilian fossiliferous localities and it also provides new data about the dwarf *H. pentlandi*.

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# CASCADING PALAEOCLIMATE INTERACTIONS AFFECT ORIGINATION RATES OF MARINE GENERA

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Biodiversity dynamics are shaped by a complex interplay between current conditions and historic legacy. While a simple relationship is often used to link evolution with temperature, short-term climate change likely interacts with previous temperature trends when influencing the pace of origination. Such palaeoclimate interactions have been demonstrated for extinction risk but the effect on evolutionary dynamics is untested. Using a dynamic modelling framework, we analyzed the differential origination response of major phanerozoic marine fossil groups after palaeoclimate interactions. We found a substantial effect of these interactions on origination rates, where the effect remains consistent through time and all studied groups. Building on a potential model for the causal relationship between palaeoclimate interactions and origination rates, we identified conditional independencies and tested them using a continental fragmentation index. This proxy for available habitat space in the continental shelve indicated that palaeoclimate interactions act through sea level changes, leading to allopatric speciation and hence an increased origination rate. Our results demonstrate that biodiversity is controlled by a complex array of ecological and evolutionary factors, with mutual interactions. Explicitly integrating these effects within a dynamic modeling framework leads to an improved discernment of origination patterns in the fossil record.

# UPPER CRETACEOUS FOSSILS FROM OPOLE REGION (POLAND) INFORMS EARLY EVOLUTION OF FAGALES

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Two active and many inactive quarries in the Opole region (southern Poland) expose Upper Cretaceous (Turonian-Coniacian) marls and limestones rich in marine fauna – sponges, cephalopods, bivalves, brachiopods, cirripedes, and others. Dropstone land flora is also common, but only recently has it been revisited – Płachno et al. (2018) described both macrofossil and palynological material, while Jurkowska et al. (2018) analyzed plant-lined ichnofossil Lepidenteron mantelli. Gymnosperms dominate in our collection, and we broaden the list of taxa known from the Opole Cretaceous to include possible presence of frenelopsids. Płachno et al. (2018) documented presence of angiosperms, but only with pollen of fagalean affinity. We found two leaves, of which the better preserved can confidently be ascribed to the Fagales. This is one of the oldest records of the Fagales. The "middle" Cretaceous can be viewed as a poorly documented period of major divergences within angiosperms, a time between the origin of the group (Early Cretaceous?) and its later rise to the dominance (Late Cretaceous). Thus, each find from this time period must be considered important.

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# ASSESSING PELVIC INDICATORS OF LOCOMOTION AND SEXUAL DIMORPHISM IN HUMANS (*HOMO SAPIENS*) AND CHIMPANZEES (*PAN TROGLODYTES*)

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The heavy modification of the human (*Homo sapiens*) pelvis from the ancestral ape condition has resulted in a trade-off between reproduction and bipedal locomotion[1,2]. This is evident in the large degree of sexual dimorphism between males and females; the male pelvis is attuned exclusively to the demands of bipedality, whilst the female pelvis must also accommodate the parturition of encephalised offspring. However, despite being our closest living relatives, there is uncertainty about the existence of similar sexual dimorphism in chimpanzees (*Pan troglodytes*). To address this issue, we compared the degree of sexual shape dimorphism between male and female humans and chimpanzees using 3D geometric morphometric analyses. A total of 196 3D landmarks were placed on a sample of 84 3D models (from surface and CT scans) of human (22 females, 43 males) and chimpanzee (13 females, 6 males) hipbones, which enabled us to assess the variation of homologous anatomical points directly associated with sexual dimorphism and locomotion. Results showed expected differences in the hipbone morphology between both taxa. These differences were statistically confirmed by the results of the Discriminant Analysis between species (Procrustes distance: 0.28; p-value < 0.001). Our results also suggest the existence of differences between males and females in both humans and chimpanzees, although to a lesser extent in the latter. Interestingly, both taxa might present a similar sexual shape dimorphism pattern: an overall increase in width of the birth canal in females with a more medially oriented iliac blade and wider subpubic angle. Differences in the hipbone morphology between humans and chimpanzees are not surprising due to their disparate locomotor modes, but the existence of sexually dimorphic commonalities in the pelvis are increasingly reported in previous research in recent years[3], and our analyses supports those studies. Future research will investigate the role of sexual size dimorphism in these sexually dimorphic patterns between humans and chimpanzees.

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# BIOTAXONOMY AND PALEOENVIRONMENTAL SIGNIFICANCE OF MICROPROBLEMATICS FROM DEVONIAN REEF COMPLEXES (POLAND, HOLY CROSS MOUNTAINS)

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There is plenty of calcareous microfossils in sediments of Devonian reef complexes all over the world. The present abstract utilizes the material from many places in Holy Cross Mountains (Poland). Despite the long history of scientific inquiry, the biotaxonomy of many such microfossils remains still an enigma (Racki & Soboń-Podgórska, 1993). Therefore, all of the microscopic fossil remains of organisms with an unclear taxonomic position are placed in a single basket labelled: microproblematics. Researchers have wondered for years over the systematic position and evolutionary relationships of these fossils (Langer, 1979). The traditional methods used so far were based on randomly cut thin-sections investigated with optical microscopes. These methods failed. However, the implementation of modern research methods brings new hope. These methods allow us to isolate individual specimens from the sediment, which could be subsequently analyzed with tests putting in use modern research equipment (e.g., computed microtomography, scanning electron microscope) and 3D digital modelling. The new methodology gives us, for the first time, an opportunity to look inside of the specimen without destroying it. New methods help to determine the chemical composition and the diagenetic modification to the fossil chemical and mineralogical makeup. Eventually, the novel methodology and data sets may help to reveal the systematic position and evolutionary relationships of some of the organisms these enigmatic microfossils represent.

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# THE MIDDLE TO LATE PLEISTOCENE VERTEBRATE ASSEMBLAGE FROM COVA 120 (ALTA GARROTXA, EASTERN PYRENEES)

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Cova 120 is a karstic originated horizontal gallery of approx. 25m located in the southern side of the Eastern Pyrenees at 460m a.s.l. Field surveys conducted from 1985 to 1989 and, more recently, from 2003 to 2006 enabled us to describe a long chronological sequence comprised between the Bronze Age (layers II-III) and the Middle-Late Pleistocene (layers IV-IX, from 57,9 Ka to MIS7) (Agustí et al. 1991; Martín and Terradas, 2007)

Here we describe, for the first time, the vertebrate assemblage from the lower layers of the assemblage (MIS4-7). The preliminary faunal list is composed by: *Panthera pardus, Lynx pardinus, Felis sylvestris, Ursus spelaeus* s.l., *Crocuta* sp., *Canis lupus, Vulpes vulpes, Capra pyrenaica, Cervus elaphus, Bos/Bison, Marmota marmota*, *Oryctolagus cuniculus, Microtus oeconomus, M. nivalis, M. arvalis-agrestis, M. duodecimcostatus, Pliomys lenki, Glis glis, Eliomys quericinus, Apodemus sylvaticus* and *Spermophilus sp.*

The mammal assemblage is composed basically by more than 70% remains of *Capra* and secondarily carnivores, specifically *P. pardus* (3%) and *Ursus* (6%). The primary taphonomic analyses suggest that this accumulation was produced, mainly by leopards as happened in the really close Cova S'Espasa site (Sauqué et al., 2018), however other accumulation agents as hominins or small carnivores as *Lynx* or *Vulpes* are not *a priori* discarded.

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# CRETACEOUS SEA URCHINS FROM THE BRZOZÓWKA SITE NEAR KRAKÓW - SYSTEMATICS AND LIVING ENVIRONMENT.

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The area of the śląsko-krakowska monocline is exceptionally rich in sea urchin fossils. Cretaceous sediments in this area are associated with the sedimentation of coarse-clastic and calcareous-clastic facies. Due to a very warm climate and the transgression in the Cenomanian, which create favorable taphonomic conditions, we have a collection of macrofossils from this period. It gives a wide range of research opportunities in palaeobiology of sea urchins and the description of the palaeoenvironment. In outcrop in the Brzozówka were found six genera of sea urchins, which are already known from the local sites, but never in the same place, which indicate a very diverse ecosystem. An important aspect of the work is to discover how much the structure of sea urchin test is related to their modes of life (water temperature, water dynamics, ways of feeding and diet). It is possible to determine on the basis of functional analysis, for which images from the binocular microscope and statistical analysis are used. Based on the analysis of numerous species, a comprehensive description of terms will be created for the detailed reconstruction of the conditions in which sea urchins lived.

# EOLARVA KUANCHUANPUENSIS IS NOT THE EARLIEST METAZOAN LARVA

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*Eolarva kuanchuanpuensis* was recovered from the early Cambrian Kuanchuanpu Formation in the southern Chinese province of Shaanxi. Eolarva has been presented as the earliest metazoan non-feeding larva found in the fossil record and offered as evidence for the terminal additional theory of metazoan evolution which proposes that the earliest metazoan ancestor had a larval-like body plan and lifestyle. However, the original specimens preserved no internal anatomy and affinities remained unresolved. Through the use of synchrotron radiation X-Ray tomographic microscopy on the original and additional Eolarva specimens, the external morphology preserving biological structure is here further analysed including a pair of biomineralized plates with spikes, and the internal anatomy of Eolarva examined. Potential soft tissue material surrounding a biological cavity was found continuous to an apical invagination and potentially representing a digestive cavity and oral opening, suggesting Eolarva was a feeding organism. An epibenthic lifestyle for Eolarva is proposed facilitated by the presence of spikes for sticking to the sediment. The phylogenetic affinities of Eolarva were constrained via the use of Bayesian inference and maximum parsimony bootstrap analyses which resolved Eolarva as a potential stem or crown coelenterate. The evolutionary implications of Eolarva are reinterpreted in the light of new anatomical and phylogenetic evidence concluding *Eolarva kuanchuanpuensis* is not the earliest metazoan non-feeding larva and therefore cannot be invoked to support the terminal addition theory of metazoan evolution.

# IMAGE ANALYSIS OF MICROBORINGS: DELINEATING ASSEMBLAGES IN THIN SECTIONS TO REGIONAL SEDIMENTOLOGICAL ASSESMENTS

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Microborings are some of the most common evidence of microbial activity in the ancient oceans that contribute to the formation of the carbonate rocks. The distribution as well as the morphological diversification of microichnocoenosis is controlled by the different life strategies of the endolithic microorganisms i.e: light dependent cyanobacteria, chlorophyte and rhodophyte algae, heterotrophic bacteria, fungi and fungi-like organisms. The Upper Triassic benthic associations and their paleoenvironments in the Southern Alps and External Dinarides, Slovenia, are well documented. A systematic study of microborings and their paleoenvironmental implications, however has not been done yet. An extensive sample set of the thin sections from carbonate platform and mixed carbonate ramp environments, has been studied using the image analysis. Observed microboring structures were vector traced, counted, and measured using the computer software. Ratio of the microbored to the non-microbored areas were compared for individual microfacies. Morphometric characters of the individual microboring associations were measured using the shape descriptors: area, outer perimeter or circumference, circularity and the aspect ratio of height/width. We tackled the limitation of two dimensional observations by coupling of the measured and calculated characters with the statistical tests and provided insight into distribution of Upper Triassic microborings between carbonate platform and mixed carbonate ramp settings. Results show that microborings are more frequent in the both shallow marine settings proximally to the shore, while their abundance declines distally. Moreover, we could show that the individual microborings are larger in carbonate platform setting and discerned a specific assemblage in lagoonal setting on carbonate ramp. This technique represents a novel approach to the ichnofacies studies as a supplementary technique to the well-established sedimentological and microfacies analyses.

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# DYNAMICS OF OSTRACODS ACROSS THE MULDE/LUNDGRENI EVENT: CONTRASTING PATTERNS OF SPECIES RICHNESS AND PALEOCOMMUNITY COMPOSITIONAL CHANGE

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This study presents the first integrated stratigraphical high resolution ostracod paleocommunity analysis of The Mulde/ *lundgreni* event (Wenlock), which was one of of the most prominent turnover episodes in the Silurian period in the Gėluva-118 core section (South Baltic). This research revealed, that the effects of this event with respect of taxonomic extinctions was negligible - not a single species of ostracods completely disappeared during it. Rather different pattern emerged, the whole transition, beginning from the mid- *lundgreni* graptolite Biozone and up to the end of the Wenlock, was characterized by a steady increase in local species richness. The event itself was of rather short duration (~30-40 Ka), and in the core material is characterized by the sudden decrease and ultimately complete temporary disappearance of all ostracods during the maximum of the event. The maximum stress interval corresponds to approximately 1/3 of the 5$^{th}$ order cycle duration caused by the short eccentricity variations. The application of novel dynamical systems techniques, which are based on the recurrence patterns of ostracod communities, revealed that the only statistically significant decrease in the local recurrence rates occurred during the Mulde event and it was most probably caused by almost perfect matching of lows of both 4$^{th}$ and 5$^{th}$ order sea level cycles (interpreted as caused by long and short eccentricity cycles). This study suggests that the major change points in ostracod community dynamics are correlatable with Milankovitch scale climate and sea level perturbations. Furthermore, current study reveals that the orbital forcing was a major factor not only in the evolution of the pelagic and hemi- pelagic Silurian ecosystems, but also for the evolution of the shelly benthic ecosystems too. In addition the recurrence plot analyses revealed that the Mulde event had an impact on the community assembly dynamics, making the assembly dynamics more predictable in its aftermath. Therefore, the Mulde/lundgreni event was the cause of a state shift in benthic ecosystem functioning, which could be explained by so called "sloshing bucket" theory of community dynamics which states that sudden transitions of ecosystems to alternative states happen after certain threshold levels of the external forcing are crossed.

This study was supported by the Research Council of Lithuania grant S-MIP-19-15 "Ecosystem construction and collapse in the Silurian – survival of biodiversity in the extreme climate", and the project PRG836 'Tracing the origins of early Paleozoic stable carbon isotope excursions – global, regional and local drivers' from the Estonian Science Agency and Estonian Ministry of Education and Research. This is a contribution to the project IGCP 652 "Reading geologic time in Paleozoic sedimentary rocks".

# MORPHOLOGICAL ASSESSMENT OF PTYCHOPARIID TRILOBITES *AGRAULOS LONGICEPHALUS* HICKS, 1872 AND *AGRAULOS CETICEPHALUS* BARRANDE, 1846 FROM THE DRUMIAN OF SPAIN AND THE CZECH REPUBLIC.

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Order Ptychopariida has always been a problematic group concerning the taxonomic classification of Cambrian trilobites, and even though the temporal distribution of this group is well known, the difficulty for classifying ptychopariids and the relation between this group with others have led to diverse problems in the phylogenetic classification of this, and other primitive orders of trilobites. *Agraulos* is one of the genera belonging to this order and is a usual middle Cambrian group. Morphological knowledge about this taxon could help analyse morphological patterns among other species from the genus and even other genera inside the family Agraulidae, and even more, about the superfamily Ellipsocephaloidea. This work performs a statistical morphological assessment, based on landmark geometric morphometric techniques, on cephalons of two species belonging to this genus, *Agraulos longicephalus* Hicks, 1872 and *Agraulos ceticephalus* Barrande, 1846, from the Drumian stage of Spain and the Czech Republic, respectively. Results suggest that, even though these species are morphologically similar and the shapes of their cephalons are relatively simple, there are significant differences in the morphology regarding the facial suture and the glabella of both species. In general, the influence of allometry in the samples seems to be an irrelevant factor related to a morphological variation on both taxa. The results obtained from this study may contribute to future similar studies interested in analyzing the morphology of other species, genders, or even families inside order Ptychopariida.

# ENVIRONMENTAL, SPATIAL AND TEMPORAL DISTRIBUTION OF *TANYSTROPHEUS* (REPTILIA: ARCHOSAUROMORPHA)

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*Tanystropheus* is a Triassic reptile known from numerous complete skeletons. Its mode and habitat of life remains a subject of debate, despite a long history of investigation on that matter. The main factor contributing to the complexity of the research problem is the uniquely bizarre anatomy of the neck of tanystropheids. Some of the 13 cervical vertebrae of *Tanystropheus* are extremely elongated, to an extent paralleled only by some of the pterosaurs. Neck of *Tanystropheus* reached up to nearly half of the length of the body. These characteristics make the biology of the genus difficult to understand due to lack of modern analogues.

The aim of this study was to analyze all the localities where any material assigned to *Tanystropheus* has ever been found, to determine the spatial, temporal and environmental distribution of the genus. Over 50 sites from Europe, Asia and North America were identified with use of literature data and grouped based on the quantity and quality of reported *Tanystropheus* fossils. One additional, yet undescribed, site from Silesia (Poland) was also included. The unique finds from that locality, consisting of numerous, well 3D preserved and sometimes articulated remains of a gigantic (~7m total body length) *Tanystropheus* may prove to be the key to solving the mystery of the biology of the genus.

Bauplan of *Tanystropheus* has proven to be relatively successful. Representatives of the genus were widespread and long lasting. Thus, *Tanystropheus* was most probably an important element of trophic webs of the Middle Triassic faunas, yet its mode of life still remains relatively enigmatic. Anatomical and taphonomical data suggest that it inhabited near coastline environments, however some scarce fossil finds prove that interpretation to be not entirely correct. Based on the current state of knowledge regarding *Tanystropheus* we can hypothesize that it lived in shallow, both freshwater and marine settings, but its ability to venture on land cannot be fully excluded.

**Acknowledgements**: I thank Mateusz Tałanda for his supervision during my work on the presented research problem and Tomasz Sulej for providing access to the fossil material.

# INFLUENCE OF ECOMORPHOLOGICAL TRENDS IN THE PALEOZOIC TRILOBITE BIODIVERSITY PATTERNS

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Enrolment is an adaptative behaviour identified in a significant number of metazoans through time. This behaviour was used by trilobites, since Cambrian times until their extinction in the late Permian. Evolution processes currently imply changes in animal shape in order to generate adaptative mechanisms for survival. However, morphological changes also lead to changes in behaviour, in which defensive movements (e.g., enrolment) play an important role. The morphological disparity is linked to the concept of geometrics morphometrics to achieve more precise and accurate ecomorphological patterns. In this work we analyse six enrolment types, as well as various ecological and environmental characters with high influence in the biodiversity and abundance, such as latitude, bathymetry and substrate type. Furthermore, statistical and morphometrical analyses were carried out based on a dataset made up of *ca.* 400 different species of trilobites, which includes early Cambrian to late Permian case studies belonging to all trilobite orders, latitudes and environments. Results expose clear patterns and changes in morphological diversity and disparity during the Palaeozoic. Available data suggest that effective enrolment types with better adaptations and modifications persisted in trilobites throughout the whole Palaeozoic. Thus, trilobites with specific enrolment types evolved to occupy new ecological niches during key episodes of the Palaeozoic diversification, such as the Great Ordovician and the Carboniferous-Permian Biodiversification Events.

# ANALYZING THE VIRTUAL DENTAL PATTERN OF SPALACINAE, PRELIMINARY RESULTS BASED ON PLIOCENE SPECIES

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The study of the phylogenetic relations between the species stands among the major topics of the natural sciences. In order to do that, paleontologists use the morphological similarity between the fossils. Studying the dental pattern has proven to be a valuable tool towards that goal, but problems may arise when dental morphology changes with wear. This holds particularly true for the Spalacinae.

The Spalacinae include a specialized group of micromammals, adapted to a fossorial mode of life. The subfamily appears in many rodent assemblages but it is usually represented by a few elements per locality only. Moreover, the occlusal morphology of the high-crowned spalacine molars changes rapidly as the molars are worn down. This hampers the detailed study of the group and can mislead paleontologists. Whereas some researchers over the years studied the taxonomy and phylogeny of the Spalacinae (e.g. Şen & Sarica, 2010), the boundaries between the different groups are a source of debate. The taxonomy of the group is complicated, even at the suprageneric level.

X-ray microtomography provides new insights to the changes in dental morphology of the species with wear. Combining this technology with visualization and analysis software, like Avizo, enables the examination of virtual occlusal surfaces of the molars mimicking the various wear stages. Preliminary studies using this technology on the Spalacinae assemblages from the Pliocene localities of Tourkobounia-1 (Greece) and Afşar (Turkey) allows to define the wear stages of their species. This method enables the effective comparison between the spalacine species, which will lead to the update of their phylogenetic relations.

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# SYMBIOTIC RELATIONS BETWEEN TUBE-DWELLING POLYCHAETES AND HYDROIDS: CASE STUDY FROM THE JURASSIC OF THE POLISH BASIN

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Tubes of sessile, tube-dwelling polychaetes (commonly known as serpulids) bearing traces after hydroids, have been investigated. The fossils are derived from different stratigraphic intervals spanning the Middle and Upper Jurassic, representing different paleoenvironments of the Polish Basin. Although fossil colonial hydroids classified to the species *Protulophila gestroi* are a commonly occurring symbiont of sessile polychaetes during the late Cretaceous and Cenozoic (Scrutton, 1975; Niebuhr & Wilmsen, 2005), they seem to be less frequent during the Jurassic and limited to specific paleoenvironments. The hydroids described are represented by traces after a thin stolonal network with elongated polyp chambers which open to the outer polychaete tube's surface with small, subcircular apertures. Small, chimney-like bulges around openings are an effect of the incorporation of the organism by *in vivo* embedment (bioclaustration *sensu* Palmer & Wilson, 1988) within the outer layers of the calcareous tube of the serpulid worm (see Scrutton, 1975). Among abundant fauna representing Jurassic sessile polychaetes, only specimens of the genus *Propomatoceros* have been found infested, whilst representatives of other genera (e.g. *Glomerula*, *Metavermillia*) seem to not be affected, what may indicate that *P. gestroi* was selective in the choice of its host. A commensal relationship is compared with the recent symbiosis between the hydroids of the genus *Proboscidactyla* and certain genera of sabellid polychaetes (Scrutton, 1975).

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# DEVONIAN ROOTS OF THE ENIGMATIC CARBONIFEROUS CONODONT *DOLLYMAE*

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The newly described species of conodont - *Dollymae* sp. nov (Świś 2021)occurs in the late Famennian sediments of the Kowala locality in the Holy Cross Mountains (Central Poland). This makes it the oldest memeber of *Dollymae* genus so far. The other valid species are known only from Carboniferous sediments. The anatomy of $P_1$ of new species shows primitive features in comparison to the other members of that genus and shows an evolutionary transition in the number of element branches. Being the oldest member of the lineage and having features plesiomorphic for *Dollymae*. *This* Devonian new species is most probably ancestral to the rest of the species. This confirms the idea of monophyly of the group argued by previous authors. In my presentation I also revise the phylogeny and the evolutionary traits showing how diverse were advanced *Dollymae* in the peak of their diversication. The forms like *D. spinosa,* break from the general trend of the thickening platform, and simplify their $P_1$ elements by means of lateral branch reduction. The other *Dollymae* made its platform more robust by: thickening of single denticles (*D. sagitulla* ), lateral branche expansion and structural reinforcement (*D.bouchbaerti*, *D. linearata*, *D. reticulata*) or by fusing denticles (*D. hassi*, *D. rudenoda*, *D finoda*).

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# postcranial anatomy and palaeohistology of *cyclotosaurus intermedius* from the late triassic OF Krasiejów (SE Poland)

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*Cyclotosaurus* is an aquatic to semi-aquatic Late Triassic representative of a large clade of stereospondyl Temnospondyli, the Capitosauria. Cyclotosaurids are known mainly from Central European locations, but also from Greenland and Thailand. Despite numerous established genera, the remains of *Cyclotosaurus* are known mainly from cranial material without associated postcranial material, thus the details about bone morphology are lacking. Therefore, it raises a problem of a correct taxonomical assignment of the postcrania, when *Cyclotosaurus* is co-occurring with other stereospondyls, especially with *Metoposaurus*. Both taxa were found in the Late Triassic Krasiejów deposits. As far as vertebra, humeri and shoulder girdle elements possess a characteristic shape or ornamentation pattern, other long bones are difficult to distinguish. A method which may help to test morphological determination is paleohistology. Metoposaurids and cyclotosaurids occupied different ecological niches, thus the histology might show different microanatomical framework and growth pattern. Here we describe the osteology and histology of the temnospondyl amphibian *C. intermedius* based on two humeri (UOBS 02431 and 02193) and one femur (UOBS 02597). The humeri were distinguished from *M. krasiejowensis* by size and morphologic features as the torsion between the proximal and distal heads (prominent in *Metoposaurus*) and the shape of the distal head (very wide and fan-shaped in *Metoposaurus*). The femur was assigned to *Cyclotosaurus* based on its large size. Both, femoral and the humeral thin sections, show the same histological framework, with a medullary region filled with trabecular bone. The cortex is built up by parallel-fibred bone. The vascularization consists of simple vascular canals, primary and secondary osteons. The vascular density is high and the simple vascular canals are mostly longitudinal to reticular. All sections show an advanced bone remodeling with erosion cavities distributed around the cortex. The outermost cortex is stratified with three sequences of fast-growing zones and slower growing annuli, separated by Lines of Arrested Growth (LAGs). Most part of inner cortex is highly remodeled and thus the counting of lacking growth marks is not possible. While comparing those sections to *Metoposaurus*, *Cyclotosaurus* shows presence of the LAGs in the outermost cortex. However, it is not excluded that this character is related to the ontogeny, as the advanced remodeling of the studied bones imply a rather adult age of the specimens. However, from the Krasiejów locality only juvenile forms of *Metoposaurus* are known. The sampled bones show rather fast-growing specimens. Moreover, the study shows, that based on the histological features, the two co-occurring genera can be distinguished from each other.

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# LATE PLEISTOCENE *LYNX PARDINUS* REMAINS FROM AVENC DEL MARGE DEL MORO (GARRAF MASSIF; NE IBERIAN PENINSULA).

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During 2011, an international team of scientists successfully obtained for the first-time Ancient DNA data from different samples of *Lynx* remains from the Iberian Peninsula. These results undoubtedly show that these remains belong to the species *Lynx pardinus* which is, at present, one of the most critically endangered felids (Rodríguez et al., 2011). One of the remains sampled in the former study comes from a small chasm called Avenc del Marge del Moro in the Garraf Massif, with an estimated absolute chronology of 21 ka. Further morphological studies reinforced the last evidence, corroborating the presence of *Lynx pardinus* from the Early to Late Pleistocene in Southern Europe (from 1.6 to 0.4 Ma; Boscaini et al., 2015; Mecozzi et al., in press).

Here, we describe in detail the remains from Marge del Moro, which consist in a remarkably complete fossil skull of *Lynx pardinus*, as well as, several dentognathic and post-cranial remains. Our preliminary morphological results, based on cranial specimens, detected the presence of a short sagittal crest, long and well-separated lyre-shaped temporal ridges, the confluence in the same cavity of the jugular and hypoglossal foramina and the absence of the P4 ectoparastyle. All the former features are in accordance with the morphology displayed by recent and fossil specimens of the Iberian lynx.

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# MORPHOLOGICAL DISPARITY AND EVOLUTIONARY RADIATION OF EARLY JAWED VERTEBRATES

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Most of the clades of highly diversified vertebrates, such as teleosts (31 939 living species), snakes (3 619 living spp.), and birds (10 331 living spp.), originated from evolutionary radiations (often referred to as adaptive radiations) characterized by a rapid increase in the number of species and in the diversification of their forms and ecologies. Jawed vertebrates, or gnathostomes, represent 99 % of the extant vertebrates and appeared during the Silurian period (444—419 Ma). Jawed vertebrates were represented by four major groups of fishes—"placoderms", "acanthodians", chondrichthyans and osteichthyans—that experienced their first major diversification during the Devonian (419— 359 Ma) and Carboniferous (359— 299 Ma). However, the evolutionary radiation that could be associated with the origin of the jaw in early vertebrates has never been tested properly. Morphological disparity (*i.e.,* the diversity of forms) could be used to characterize species diversity of radiations. The present study aims to quantify morphological disparity of the four major groups of Silurian, Devonian and Carboniferous early jawed vertebrates to describe evolutionary changes (or shifts) through time and to compare with events of diversification. Two different methods are used to measure morphological disparity. Phylogenetic matrices are used for discrete-character analyses to measure the phenotypic disparity among early jawed vertebrates. 2D geometric morphometrics analyses on body shape were performed, with 11 landmarks digitalized on published paleontological reconstructions of more than 80 osteichthyan species (corrected when needed). We obtained the first morphospace for the phylogenetic data in which the four major groups are clearly distinguishable. "Acanthodians" and chondrichthyans are closely packed and seemed to be less disparate than osteichthyans that occupied the larger portion of the morphospace. Geometric morphometrics revealed a shift in osteichthyan body shape between actinopterygians and sarcopterygians. Actinopterygians were shorter and deeper, whereas sarcopterygians had a more elongated and fusiform body shape. Furthermore, actinopterygians occupied a much larger portion of the morphospace during the Carboniferous than the Devonian, suggesting that an increase of morphological disparity occurred during their period of major diversification. Our preliminary results on osteichthyans suggest the recognition of at least one evolutionary radiation in early jawed vertebrates.

# A LOWER TOURNAISIAN CONODONT STRATIGRAPHY OF THE MORAVIAN KARST (CZECHIA) AND MONTAGNE NOIRE (FRANCE)

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Early Tournaisian was a time of transition from the Devonian warm to the Carboniferous cold climate. The climate transition was related to several biotic crises including the Hangenberg events at the Famennian/Tournaisian boundary. This contribution is focused on the interval between the Hangenberg events and the mid-Tournaisian glacial pulses.

Two lower Tournaisian sections were studied – Lesní lom quarry located at the Moravian Karst (Czechia) and Col des Tribes at the Montagne Noire (France). These sections represent two different palaeogeographical domains – southern Laurussia and northern Gondwana, respectively. In total 11 795 conodont elements belonging to 63 conodont taxa (*Bispathodus, Branmehla, Polygnathus, Pseudopolygnathus, Protognathodus* and *Siphonodella* genera) were found in 38 samples. A detailed conodont biostratigraphy was established for both studied sections. *Si. hassi* Ji – *Si. quadruplicata* biozones were determined at Lesní lom and *Pr. kockeli* – *Si. quadruplicata* biozones were determined at Col des Tribes. Siphonodellid–polygnathid biofacies representing relatively deep environment of a basinal to shelf slope environment was documented at the limestones of the Lesní lom. Transition from protognathodid (radiation event related to the Hangenberg crisis) to polygnathid and polygnathid–pseudopolygnathid (environment of the outer shelf and upper and middle part of the slope) to deeper siphonodellid (environment of the ocean basin and lower part of the continental slope) biofacies were recorded at Col des Tribes. Based on the biofacial analysis gradual deepening of the sedimentary environment is interpreted in both sections and seems to reflect glacioeustatic sea-level rise.

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# LUNGFISH FROM THE UPPER TRIASSIC OF GREENLAND AND REMARKS ABOUT PALAEOBIOGEOGRAPHY

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We present a description of the new lungfish remains collected from the upper Norian (Upper Triassic) of Jameson Land, East Greenland (Pawlak et al., 2020). We found isolated dental plates and skull bones in the lacustrine Carlsberg Fjord Formation. Lungfish are common components of the Late Triassic freshwater faunas; however data about their cranial anatomy are rare. Therefore, described fossils constitute one of the most complete lungfish materials from the Upper Triassic worldwide. Morphology of the studied fossils indicates that they belong to *Ptychoceratodus rectangulus*, previously known from the middle–upper Norian Löwenstein Formation, Germany. We regard recently described from the same Greenland strata *Ceratodus tunuensis* as the younger synonym of the *P. rectangulus*, due to lack of the diagnostic characters for *Ceratodus* and similarities with better preserved *P. rectangulus* material. New reconstruction of the skull roof supports previous hypothesis about its anatomy, and is enriched by the XYZ bone morphology. Morphology of the calvarium center still needs further research. Our findings suggest a biogeographical exchange between the Germanic and the Jameson Land basins. Recently improved chronostratigraphic studies on Jameson Land Basin (Kent & Clemmensen, 2021) confirm our correlation between Carlsberg Fjord and Löwenstein formations, and support short temporal distance between *P. rectangulus* populations from these units.

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# POSTER PRESENTATIONS

# CLAY TEMPLATES IN EDIACARAN ALGAE – IMPLICATIONS FOR BURGESS-SHALE TYPE PRESERVATION

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One of the main questions regarding the formation of exceptionally preserved fossils is the role of clays during early diagenesis. Here, we studied the preservation mechanisms of the Ediacaran algae *Vendotaenia* from the late Ediacaran Tamengo Formation, Brazil. Our results show for the first time an association of unusual 'asbestiform' clays with carbonaceous fossils. These fibrous clays are up to 100 µm elongated crystals, with <10 µm in width and <1 µm thick. Specifically, mineralogical, geochemical and petrographic data demonstrate that the clays are composed of chlorite-smectite mixed layered minerals, with >50% Mg-chlorite. Interestingly, the long axis of the minerals follows the orientation of tectonically oriented clasts and shear fractures. According to these results, these clays likely formed in the late-diagenetic zone to lower anchizone during burial diagenesis; thus, not being related to the preservation of the fossils. Instead, the original preservative pathway was limited to the organic matter conservation in reducing fine-grained sediments, similarly to other Burgess Shale-type deposits. These results corroborate the hypothesis that authigenic clay minerals did not play a role in the formation of BST *Lagerstätten*. The formation of late-diagenetic clays onto organic templates is probably a more widespread phenomenon than previously thought.

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# Peacock caught again in amber - the second record of the Tuckerellidae family (Acariformes, Prostigmata) in Baltic amber

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The peacock mites, named by their feather-like setae, are representatives of the monotypic family Tuckerellidae of the Tetranychoidea. Extant species inhabit different climates and geographical regions (Oriental, Palearctic, Nearctic, Australian, Afrotropical, Pacific Islands, Neotropical), feeding on under or aboveground parts of the wide range of plant hosts. The fossil record of the family comes from the Cenozoic era and contains two extinct species – *Tuckerella fossilibus* Khaustov, Sergeyenko et Perkovsky, 2014 and *Tuckerella weiterschani* Sidorchuk et Khaustov, 2018, represented only by three specimens. Those fossils are preserved as inclusions in three types of fossil resins: *T. fossilibus* was found in Rovno (Eocene) and Bitterfeld amber (Eocene or Miocene), *T. weiterschani* is known only from inclusions in Baltic amber (Eocene).

Another finding of Tuckerellidae specimen from Baltic amber is presented in this work. The specimen differs from previously described species but the systematic position requires verification. Inclusions in fossil resins are usually well preserved, showing a great number of taxonomic characteristics. In this case, even the best preservation of specimens does not result in the identification of life stages, which might mislead the final interpretation. More findings and work over already found specimens is required to solve the taxonomical issues and interpreted the ecological position of the Tuckerellidae in the so-called “amber forest”.

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# MICROCOMPUTED TOMOGRAPHY IN EXTINCT RODENTS FROM CERRO DE LOS BATALLONES (UPPER MIOCENE, MADRID, SPAIN)

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Micro-computed tomography (µ-CT) is a non-destructive technique allowing to obtain high-resolution 3D models from angular x-ray 2D images. The µ-CT analysis facilitates the study of the inner structure of skeletal parts and its differentiation from the surrounding matrix in a non-invasive way, demonstrating its usefulness for the study of fossil materials. In this study, we applied the µ-CT analysis to the exceptionally preserved rodent fossils from several sites in the Cerro de los Batallones (Upper Miocene, Madrid, Spain). These fossil localities have produced an unusually complete and well-preserved cranial material of fossil micromammals. In order to prevent any damage in the collecting process, these skulls were extracted with the embedding matrix. Therefore, µ-CT analysis is the most adequate method to study this extremely fragile material. We applied this technique to Hispanomys moralesi, a cricetid only recorded in this butte. We study nine skulls of H. moralesi from two different sites, Batallones 10 and Batallones 4. The process to obtain the 3D models of the nine skulls includes: preparing the skull material for the µ-CT analysis; generate the 3D model with a µ-CT Scan Nikon- XTH 160, generate a stack of 2D images for the segmentation (the process by which the matrix from the fossil is removed); and the mounting the 3D model only with the fossil material. The nine 3D models of cricetid skulls were used to study their unknown inner morphology. In addition, this technique allows the use of geometric morphometric analysis for the taphonomic exploration of the material to determine predominant deformations caused by the fossil diagenesis, as well as biomechanical studies of the skull and mandible to analyze biting forces.

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# INSIGHTS INTO AN UNDESCRIBED ICHNOFOSSIL ASSEMBLAGE FROM THE EARLY CAMBRIAN LE ROZEL FORMATION (N-W FRANCE)

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The Ediacaran-Cambrian transition (*ca.* 541 Ma) is marked by an increase in trace fossil diversity, and drastic changes in the way the seafloor ecospace was used by the early animals. The importance of ichnology to reconstruct Early Cambrian ecosystems has been exemplified by the definition of the Cambrian GSSP at the first appearance of the ichnofossil *Treptichnus pedum*[1]. Since then, the Ediacaran-Cambrian boundary has been the subject of many studies worldwide (*e.g.* Canada, China, Norway, USA). In NW France, recent field investigations have revealed that the Le Rozel Formation from Normandy displays a promising ichnofossil assemblage in a thick (*ca.* 1700 m) siliciclastic succession that includes the ichnogenera *Archaeonassa, Helminthopsis, Hormosiroidea, Nereites, Palaeophycus Psammichnites* and various treptichnides. Previous studies[2,3] also mentioned a trace fossil assemblage typical of the early Cambrian (*e.g. Diplocraterion*, *Monomorphichnus*, *Neonereites*, *Phycodes*, *Planolites*, and *Taphrhelminthopsis*). However, no formal ichnotaxonomic description of this assemblage has been done so far, and some of the ichnotaxonomic affiliations need to be re-evaluated (for instance, *Neonereites* and *Taphrhelminthopsis* are now considered junior synonyms of *Nereites* and *Psammichnites*, respectively). Consequently, the main objectives of this study are to critically review the trace fossil assemblage from the Le Rozel Formation in terms of ichnotaxonomy and ichnodiversity as it could potentially unravel the early stages of the metazoan diversification.

In addition, the age of Le Rozel Formation needs to be reassessed. This succession is located stratigraphically below the first occurrence of trilobites and archaeocyathans of Cambrian Age 3[2,3] and was deposited unconformably on top of an ignimbrite that yielded a poorly constrained Pb evaporation age of 531± 20 Ma[4]. Consequently, U-Pb radiometric dating will be performed on detrital zircon grains from sandstones sampled within the formation as well as on magmatic zircon from this volcanic rock. The ultimate goal of this study is to compare these ichnofossils with the Ediacaran trace fossils assemblage described previously in the same paleogeographic region[5] (Brittany). A chronology and the stratigraphic distribution of trace-making behavior through the Ediacaran and Early Cambrian deposit will be used to shed light on the Early Cambrian ecological turnover commonly referred to as the Agronomic Revolution[6].

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# VIRTUAL PALAEONTOLOGY IN OUTREACH AND EDUCATION: 3D MODELLING OF THE FOSSIL PLANT HERITAGE OF THE CANARY ISLANDS

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Nowadays, 3D methodologies have become an indispensable tool for different fields of palaeontology, and a remarkable example is the photogrammetry (Cunningham, 2021). The models created with this technique offer potential advantages in conservation and teaching palaeontology: they are cheap to produce, can be easily shared and allow rare and delicate specimens to be brought to the public without endangering their preservation. In recent years, the first digitization work has been carried out on the fossil collections of the Palaeontology Area of the University of La Laguna. This work began with invertebrates (gastropods, bivalves and arthropods) and marine plants (calcareous algae) from the Canary Islands using surface lasers. In a second phase, drone photogrammetry was used by scanning marine and terrestrial palaeontological sites from Tenerife. We are now scanning a small representation of vertebrate and terrestrial plant remains with photogrammetry, the latter being the objective of this presentation. The fossil record of plants in the Canary Islands is not well-known despite being as abundant as the one of other groups. This record consists of a large number of leaf and branch impressions embedded in a matrix of ash and accretionary lapilli related to volcanic deposits.

The aim of these works is to expand digital fossil collection which can be used in different educational levels (e.g. primary, secondary and university education) and the rest of society. With the help of the generated 3D models, we are developing educational workshops to explain different topics (taphonomy, palaeobiodiversity, climate changes, …) related to the Canarian fossil record.

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# EXTINCT GIANT TORTOISES AND THEIR MEGAHERBIVORE ROLE IN THE MACARONESIAN ISLANDS

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Giant tortoises have been an indispensable component of the terrestrial vertebrate fauna on many islands around the world. They have even become ecosystem engineers, being the main herbivore of oceanic islands where many taxa are absent, shaping the landscape, favoring seed dispersal and even co-evolving depending on diet. Nowadays they survive in only two archipelagos: the Galapagos Islands and the Seychelles. The extant closest relative of the Macaronesian giant tortoises is *Centrochelys sulcata*, which currently inhabits the Sahel region.

Macaronesia is a group of five volcanic archipelagos (Azores, Madeira, Selvages, Canaries and Cape Verde) located on both sides of the Tropic of Cancer in the North-eastern Atlantic Ocean. It is believed to have reached some paleo-islands of Canarias or Cape Verde archipelago, on a vegetation raft or floating, swept by sea currents. Although it has also been observed that *C. sulcata* is able to direct swimming, which would greatly facilitate its arrival on the islands. This work reviews the fossil record of giant tortoises from Macaronesia and makes a preliminary analysis of a possible paleoecological role of these extinct macroherbivores as seed dispersers. Fossil record of tortoises consist in osteological and oological remains from Canary Islands and Cape Verde archipelago. With the bones record three species of extinct tortoises of the genus *Centrochelys* have been described: *C. vulcanica* from the Pliocene of Gran Canaria (Canary Islands) and *C. burchardi* and *C. atlantica* from the Pleistocene of Tenerife (Canary Islands) and of Sal (Cape Verde Islands), respectively. With respect the oological, the eggshells from Gran Canaria, Lanzarote and Fuerteventura (Canary Islands) are assigned to the oofamily *Testudoolithidae* and Maio eggs (Cape Verde Islands) have not yet been studied.

Macaronesian tortoises, as the Aldabra or Galapagos giant tortoises, may have played an important role as seed dispersers, moving the seeds over long distances and expanding the ecological niche of these plants. The fossil record shows that these tortoises may have been migratory animals that moved between nesting areas corresponding to low arid zone with sandy substrates (coast zone from the Lanzarote and Fuerteventura) and the middle arid zones where they obtained their water resources from succulent plants or paleolakes (low-middle zone from Tenerife, Gran Canaria and Sal). Although the giant tortoises have been reintroduced to restore the ecological role of extinct species, such as the case of giant tortoises from Española Island (*Chelonoidis hoodensis*) introduced on Santa Fe Island (Galapagos Islands). In the case of Canary Islands, more archaeological sites need to be reviewed to confirm an early extinction (Pleistocene) before the arrival of humans to the islands to can evaluated the possibility of attempting a reintroduction.

# DIGITAL RECONSTRUCTION OF TOOTH REPLACEMENT FROM SERIAL TOMOGRAMS OF A DESTROYED HOLOTYPE

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*Scalopocynodon gracilis* was a late Permian cynodont from South Africa (currently recognised as a synonym of *Procynosuchus delaharpeae*) represented by a single specimen (BP/1/1821) that was destroyed through serial grinding in the 1960s. Prior to sectioning, BP/1/1821 was identified as a scaloposaurid therocephalian. However, during the sectioning process it was discovered that BP/1/1821 exhibited several uniquely cynodont characters, and was consequently described as a new basal cynodont. Although the original fossil was destroyed, pencil drawings of each section were recorded during the grinding process. These drawings have been previously digitised and used to reconstruct BP/1/1821 virtually. The pencil drawings also preserve internal features, such as positions of replacement teeth, which were not included in the previous virtual reconstruction of BP/1/1821. We reconstructed the complete dentition of the virtual specimen BP/1/1821 from the digitised drawings using the SPIERS software suite. We assessed the extent of tooth replacement depicted in the pencil drawings versus our reconstructions, testing the accuracy and completeness of the features recorded in these drawings. Little evidence for replacement of the incisors was apparent in the upper and lower jaws. Each maxilla bore two large canines of similar size. These resemble the two distinct tooth families of lycosuchid therocephalians, however, evidence for the resorption of the distal tooth in each pair suggests that the mesial tooth represented a well-developed replacement. Small germs of a second replacement tooth were present lingual to each distal maxillary canine. A similar germ was also present lingual to the left mandibular canine. The original description identified 15 replacement postcanines in the mandible, whereas our reconstruction recovered only six replacement postcanines. This discrepancy in the extent of replacement activity recorded highlights the importance of creating accurate records of a specimen prior to, and during the execution of destructive studies. This is especially important for potential restudy of specimens as new technologies and additional specimens become available.

# PALAEOENVIRONMENTAL, PALAEOCLIMATIC AND PALAEOECOLOGICAL SHIFTS THROUGHOUT THE MN12-MN13 TRANSITION IN CENTRAL-EASTERN IBERIAN PENINSULA

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This study is based on the analyses of the $\delta^{13}C$ and $\delta^{18}O$ values of mammalian tooth enamel from five late Miocene fossil sites. The karstic site Corral de Lobato is located on the Iberian Range, while Cerro de la Garita, Los Mansuetos, El Arquillo 1 and Las Casiones are located in the Teruel Basin. All of them are dated close to the end of the MN12 and the beginning of the MN13 (from ~7.7 to 6.7 Ma) (Morales et al., 2018). Four genera are shared by two or more fossil sites: *Tragoportax*, *Hipparion*, *Pliocervus* and *Hippopotamodon*. Significant statistical differences were observed when comparing both $\delta^{13}C$ and $\delta^{18}O$ values in their tooth enamel. This implies some variability in the vegetation cover structure and temperature/precipitation regime. Although the $\delta^{13}C$ values from the five sites are in the range of a $C_3$ vegetation-based diet, the higher $\delta^{13}C$ values at Corral de Lobato point to more arid conditions. This suggests a more open environment. $\delta^{18}O$ values of the obligate-drinking taxa from Corral de Lobato are lower than those of the other sites. This may be due to the fact that i) the water bodies in the karstic Corral de Lobato area were fed by groundwater and did not suffer as intense evaporation as in the basin, and/or ii) the palaeotopographic effect (Araguas-Araguas et al., 2000), as Corral de Lobato was located at a slightly higher altitude than the rest of the selected fossil sites at the end of the Miocene. The statistical differences found between the Corral de Lobato site and the others might be also related to a cooling climatic pulse recorded on a global scale at MN12-MN13 boundary (Holbourn et al., 2018).

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# CAVE BEAR (URSUS SPELAEUS (ROSSENMULLER)) FROM CANETOVA AND SAMAR CAVES, SE SERBIA

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Cave bear is the dominant species in Serbian cave sediments of the Upper Pleistocene. In this paper material that belongs to the species - Ursus spelaeus (Rossenmuller) will be presented. Fossil remains were collected in Canetova cave and Samar cave in October 2002 and during the summer 2013. The material is now a part of the Cave bear collection at the Faculty of Mining and Geology in Belgrade. The Canetova cave is located in the Zamna River (Eastern Serbia) and it belongs to a group of dry caves. There are three entrances to this cave, and the total length of its canals is 280m. The other cave – the Samar cave (Southern Serbia) is a tunnel cave type that was created after the withdrawal of the Neogene lake and it also have three entrances and the length of the studied channels is 3167m. Smaller-sized fossils from the Canetova Cave are large and predominantly compacted, also mostly fragmented. At the other hand, remains from the Samar Cave are modest in content, and much more damaged. Fossil content from both caves was recorded and all identifiable material was extracted. The determinations were made according to the atlases listed in the literature and the collection of fossil remains of the cave bear at the Department of Palaeontology. The material is described and measured and the result obtained is shown in the tables.

# NEW CRANIODENTAL MATERIAL OF RHINOCEROTIDS (PERISSODACTYLA, RHINOCEROTIDAE) FROM THE LATE MIOCENE OF SAMOS ISLAND, GREECE

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The rich and diverse Late Miocene fauna excavated from the Mytilinii Formation on Samos Island, Greece, consists of an impressive number of mammalian taxa, including three different rhinocerotid genera. In this report, previously undescribed specimens housed at the collections of the Museum of Palaeontology and Geology in Athens (AMPG), excavated in1903 by Prof. Theodoros Skoufos, are evaluated. The small-sized hornless rhinocerotid *Chilotherium schlosseri*, represented by numerous specimens, is characterized by the flattened frontals, the retracted nasal notch, as well as by the markedly widened mandibular symphysis featuring two strong and tusk-like second lower incisors. The tandem-horned rhinocerotid *"Diceros" neumayri* is also well-represented by several specimens in the AMPG collections, whereas *Dihoplus pikermiensis* is relatively scarce. The fossils were still embedded in their original sediments, which can be distinguished to either a tuffaceous conglomerate or a calcitic sandstone. These distinct sediment types indicate that the specimens comprising the AMPG collection may have originated from at least two different fossiliferous horizons of the Mytilinii Formation. In Samos, "*D.*" *neumayri* emerges as the dominant horned species, hornless *Chilotherium* is notably present, and *D. pikermiensis* is rare. On the contrary, in the classical locality of Pikermi, *D. pikermiensis* is the dominant horned species, "*D.*" *neumayri* is less frequent, whereas *Acerorhinus* is the sole hornless rhinocerotid taxon present. These marked differences observed in the relative distribution and abundance of rhinocerotid taxa among the Turolian localities of Greece and adjacent regions appear to have been primarily influenced by environmentally controlled provincial differences. The relatively slender and brachydont *Acerorhinus* and *D. pikermiensis* seem to have preferred more closed and temperate niches, whereas the more robust and specialized "*D.*" *neumayri* and *Chilotherium* appear to have favoured more open and dry habitats.

# GEOCHEMICAL SIGNAL DISTRIBUTED IN THE DERMAL BONES OF METOPOSAURUS KRASIEJOWENSIS FROM THE LATE TRIASSIC OF KRASIEJÓW

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The Late Triassic (Norian) Krasiejów locality is famous for its numerous fossil finds. However, no complete skeletons are preserved in this Lagerstätte, and all material comes in a disarticulated form. Nevertheless, the locality gives a unique window into the Late Triassic ecosystem. There are representatives of aquatic and terrestrial fauna known from Krasiejów. The most abundant finds are of the temnospondyl amphibian *Metoposaurus krasiejowensis*, however, there are also finds of another temnospondyl *Cyclotosaurus intermedius.* The reptile fauna is well-represented by the aquatic phytosaur *Paleorhinus cf. arenaceus* and the terrestrial aetosaur *Stagonolepis olenkae*. Moreover, less numerous finds are preserved of the terrestrial rauisuchid *Polonosuchus silesiacus,* the dinosauromorph *Silesaurus opolensis* and a protorosaur *Ozimek volans*. Due to the outstanding quantitative and qualitative preservation of the skeletal material from the Krasiejów clay pit, complex and sometimes destructive analyses e.g., histological or geochemical analyses, are possible to conduct. Here, a pilot geochemical analysis was conducted, hence to study the impact of the environment on the individual growth visible in geochemical analyses. An interclavicle UOBS 02458 of *Metoposaurus krasiejowensis* previously sectioned for paleohistological purposed was analyzed here geochemically. Core drills from six positions of one specimen were taken. Later, those sections were coated with a gold sputtering and analyzed separately in a Hitachi TM 3000 Scanning Electron Microscope (SEM) with an Energy Dispersive Spectrometer (EDS) by Quantax 70. In each sample, an average of twelve points was measured, providing percentual element concentrations. From each point an element concentration of Calcium, Phosphorous, Iron, Carbon, Sulfur, Silicon and Barium were obtained. This method was used to study the geochemical imprint and its variability preserved in the fossil bones. Moreover, the utility of applying geochemical method was studied in light of paleoclimatological context, showing slight variation in the element concentration inside one specimen.

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