

# SESSIONS

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## **S1**    **ANCIENT ECOSYSTEMS TRAPPED IN AMBER**

### **Organizers:**

**Bo Wang** (Nanjing Institute of Geology and Palaeontology, China)

**Vincent Perrichot** (University of Rennes 1, France)

**Edmund Jarzembowski** (Natural History Museum, UK)

Amber-bearing deposits are among the most important Konservat-Lagerstätten, providing unique windows into past ecosystems. Research based on amber has greatly developed in the past decade and is becoming increasingly multidisciplinary, with the integration of new methodological approaches and new fossil discoveries. This symposium will explore all the diverse areas of amber palaeontology; from the description of exceptional arthropods, plants, microfossils, and vertebrates, to the investigation of amber taphonomy, the novel approaches to imaging or chemical characterization of fossils in amber, or the geochemical investigation of amber sources. We believe that this symposium will have broad interest across the palaeontology, attracting the attention of palaeoentomologists, palaeobotanists, palaeoecologists, and most certainly the public at large.

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## S2 ANGIOSPERMS, FROM THE BEGINNING TO THEIR DIVERSIFICATION

### Organizers:

**Anais Boura** (CR2P PARIS, FRANCE)-University Pierre et Marie Curie, France)

**Dario De Franceschi** (CR2P Paris History, France)

**José Bienvenido Diez-Ferrer** (Universidad de Vigo, Spain)

During Lower Cretaceous, emergence of angiosperm is simultaneous with a period of maximum continental dispersion which results in a large climate change characterized by the establishment of an atmospheric zonal circulation. The overall conditions of the emergence of angiosperm, even with recent studies, remain unclear. Indeed, the paucity of the fossil record in the earliest time of angiosperm make difficult to propose stable palaeogeographical scenario for their diversification and their rapid evolutionary radiation within all the environments. This symposium aims to present new finding in the evolution of the angiosperms (e.g. fossil taxonomy, earliest occurrence of the living families) in order to provide palaeobiogeographical scenario to better understand the differences in datation of the angiosperm major clades origin between recent molecular studies and updated fossil identifications with associated accurate stratigraphy.

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## **S3 BACK TO THE SEA: FROM LATE PALAEOZOIC TO CENOZOIC, THE TETRAPOD ADVENTURE**

### **Organizers:**

**Nathalie Bardet** (CR2P Paris, France)

**Valentin Fischer** (University of Liège, Belgium)

**Alexandra Houssaye** (MECADEV-National Museum of Natural History, France)

**Stéphane Jouve** (University Pierre et Marie Curie, France)

**Olivier Lambert** (Royal Belgian Institute of Natural Sciences, Belgium)

**Peggy Vincent** (CR2P Paris, France)

The return to aquatic life is one of the most fascinating events in vertebrate evolution. Having occurred independently in various extinct and extant amniote lineages - mainly in reptiles and mammals during the Mesozoic and Cenozoic eras - it resulted on the one hand in striking convergences, but also, on the other hand, in a high diversity of forms, sizes, feeding strategies, and swimming modes. These iterative evolutionary shifts from a terrestrial to fully aquatic environment imply major morphological, physiological and behavioral modifications that will be explored from a paleontological perspective during this Symposium.

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## **S4    BIG DATA IN PALEONTOLOGY: SHARING KNOWLEDGE FOR LEVERAGING RESEARCH OPTIONS**

### **Organizers:**

**Wolfgang Kiessling** (Humboldt University, Germany)

**Loïc Villier** (CR2P Paris, France)

**Jérémie Bardin** (CR2P Paris, France)

Scientific discovery is increasingly driven by big data. Gathering large amounts of data in a structured way has almost become a prerequisite to address broad scientific questions in palaeobiology. Repositing these data in publicly accessible archives is demanded for transparency, reproducibility, and sustainability of science. While the number and diversity of databases has increased drastically during the past decades, the main challenge remains to promote and share common ontologies of paleontological data, databases structure and inter-databases communication tools. This session invites presentations showcasing the potential of databases for a wide range of palaeontological topics (e.g., taxonomy, morphology, stratigraphy, biogeography, biodiversity, palaeoecology, palaeoenvironment). Discussion will be open on how to formalize standards for paleontological data, how to ensure data availability on the long term and on how to combine efforts for accumulation, sharing and management of data and databases.

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## S5 BIODIVERSITY CHANGES THROUGH TIMES: CRISIS AND RADIATION

### Organizers:

**Sylvie Crasquin** (CR2P Paris, France)

**T. Addatte** (University of Lausanne, Switzerland)

Since the Cambrian explosion of life, the evolution of biodiversity was subjected to many biotic events linked with the geological evolution of Earth. This symposium is devoted to all of these biotic events from the biodiversification and radiation phases up to crisis and extinction patterns, and their ultimate drivers (e.g. large igneous province eruptions, bolide impacts, anthropogenic changes).

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## **S6 BIOMINERALS THROUGH TIME: EVOLUTION, TAPHONOMY AND TRACES IN THE GEOLOGICAL RECORD**

### **Organizers:**

**Andrew H. Knoll** (Harvard University, USA)

**K. Benzerara** (IMPMC-University Pierre et Marie Curie, France)

**Sylvain Bernard** (IMPMC-University Pierre et Marie Curie, France)

Biom mineralization refers to the processes by which life forms biominerals. It is broadly distributed phylogenetically from prokaryotes to eukaryotes and produces a large variety of biominerals, although most skeletons are made of calcium carbonate and phosphate minerals, as well as amorphous silica. Biomineralization processes have been shaped by natural selection through geological time, and biominerals in turn, have both influenced and recorded Earth's environmental history. Fossil biominerals preserved in the geological record thus provide a unique source of information about the evolution of life on Earth and its past environments. This session will present contributions related to the study of biomineralization and biominerals, including studies dealing with their formation and phylogenetic distribution, their functional and biogeochemical consequences, their identification in the geological record, and their use as paleoenvironmental proxies. Recent advances in understanding biomineralization processes and the taphonomy of biominerals are welcome.

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## S7 BIRD IN THE PAST ENVIRONMENTS

### Organizers:

**Delphine Angst** (University of Cape Town, South Africa)

**Anusuya Chinsamy-Turan** (University of Cape Town, South Africa)

The fossil and subfossil birds are known from centuries in the fossil record. During the past decades, numerous new specimens have been discovered in many regions in the world. These new fossils and several new technological methods allow to increase significantly our acknowledges on the extinct birds and provide new information about their biology, and their physiology, and how they could interact with their environment. This session proposes to present, developpe and discuss the new studies and the new information about the paleobiology and the paleoecology of the birds in the past environments.

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## **S8 CENOZOIC PALAEOBIOLOGY OF THE TROPICAL AMERICAS: PALAEOECOLOGY, BIODIVERSITY AND EVOLUTION**

### **Organizers:**

**David A.T. Harper** (Durham University, UK)

**Stephen K. Donovan** (NATURALIS, Leiden, Netherlands)

**Roger W. Portell** (University of Florida Natural History Museum, USA)

The islands of the Caribbean Sea and its margins expose abundant and diverse Cenozoic biotas developed against a background of active tectonics including the closure of the Isthmus of Panama, emergent volcanic chains associated with the edge of the Caribbean Plate and various within plate movements. Across these varied settings, local, regional and global radiations and extinctions have driven biotic change, establishing diversity hot spots and species pumps in the region. We welcome any contributions on the exciting and diverse biotas of the greater Caribbean region and their relationships to regional and global change.



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## **S9 COEVOLUTION OF LIFE AND ENVIRONMENTS: INTEGRATING THE PALEOECOLOGICAL, SEDIMENTOLOGICAL AND GEOCHEMICAL RECORDS**

### **Organizers:**

**Lydia Tackett** (North Dakota state University, USA)

**Lidya Tarhan** (Yale University, USA)

Earth's biosphere is strongly influenced by organism-environment interactions, ranging from habitat engineering and ecosystem development to biotic mediation of sedimentary processes and nutrient cycling. Several dramatic transitions in the history of life can be recognized in the rock record by not only changes in fossil diversity, but also by shifts in the behavioral trace fossil record or by changes in the sedimentary isotope record. A multi-proxy approach to paleontological questions, incorporating paleoecological, sedimentary and geochemical data, has led to major advances in our understanding of how surface processes impact the evolutionary and ecological trajectory of life on Earth. This session aims to explore interdisciplinary approaches to major questions about the evolution of life, through the integration of data drawn from paleoecological, ichnological, taphonomic, sedimentological and geochemical archives.

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## **S10 CONSERVATION PALEOBIOLOGY AND HISTORICAL ECOLOGY OF MARINE ECOSYSTEMS**

### **Organizers:**

**Paolo G. Albano** (University of Vienna, Austria)

**Aaron O’Dea** (Smithsonian Tropical Research Institute, Republic of Panama)

**Martin Zuschin** (University of Vienna, Austria)

Humans have altered marine ecosystems for millennia, a process that has intensified in the last few centuries and rapidly accelerated in the last 40 years. In contrast, even the most extensive systematic monitoring of marine ecosystems rarely encompasses more than the past few decades. Consequently, meaningful benchmarks are hard to define quantitatively and we face challenges to separate anthropogenic impacts from the natural dynamics of ecosystems. Paleoecological data can provide high-resolution records of ecosystem change and variation spanning the whole of human history, enabling the reconstruction of ecological baselines (albeit for incomplete parts of marine communities) and the trajectories of ecosystem states on timescales well beyond the limits of ecological monitoring. Indeed, there is now consensus amongst conservation biologists that to give proper context to modern day conditions we must include historical perspectives. The onus is now on paleontologists, archeologists and historians to provide neontologists with rigorous, replicated and constructive data on past ecosystems in light of present day and predicted future changes. This session is intended to provide a platform for the presentation and discussion of novel approaches and insightful data in the rapidly expanding fields of conservation paleobiology and historical ecology.

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## **S11 DATA, DISPERSALS AND INTERCHANGES THROUGH TIME: A LAND MAMMAL PERSPECTIVE**

### **Organizers:**

**Pierre-Olivier Antoine** (ISEM-University of Montpellier, France)

**Valery Zeitoun** (CR2P Paris, France)

**Lawrence J. Flynn** (Harvard University, Cambridge, USA)

Dispersals and interchanges have long been recognised for fossil land mammals. Such faunal events are known to record contingent conditions (e.g., the disappearance of a physical/ecological barrier) and sometimes highly improbable phenomena (e.g., sweepstake dispersals and rafting events). Some of these events have become milestones for mammalian evolution and biochronology (as «datums»). The main goal of this symposium is to present a wide and up-to-date array of mammalian datums and interchanges through time and space.

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## S12 EARLY ANIMAL LIFE

### Organizers:

**Jean Vannier** (LGLTPE-University of Lyon, France)

**Jean-Bernard Caron** (University of Toronto, Canada)

This symposium aims to address important topical issues concerning the origin and early evolution of animals during the late Precambrian-Ordovician interval including the «Cambrian explosion» itself with the onset of modern-style ecosystems. This symposium welcomes novel and interdisciplinary approaches in particular through the study of exceptional biota, and will bring scientists together around four main themes: 1) Taphonomy, functional anatomy, and evolution; 2) Palaeocommunity analyses and ecology; 3) Biological and environmental drivers and triggers of early animal radiations and extinction events; 4) Molecular phylogenies and the chronology of divergence of major animal groups.

## **S13 EVOLUTION OF INDO-PAKISTAN BIOTAS FROM THE BREAK-UP OF GONDWANALAND (LATE JURASSIC) TO THE INITIATION OF THE COLLISION WITH EURASIA (EOCENE): BETWEEN ENDEMISM AND DISPERSALS**

### **Organizers:**

**Grégoire Métais** (CR2P Paris, France)

**Dario De Franceschi** (CR2P Paris, France)

**Guntupalli V.R. Prasad** (University of Delhi, India)

Since the break-up at about 160 Ma ago and subsequent sequential separation of Gondwanan landmasses, the India-Pakistan Subcontinent apparently experienced a prolonged period of isolation prior to the docking with Asia (~55 Ma ago). The intensity and timing of biotic interchanges between the Indo-Pakistan subcontinent, Africa, Madagascar, and Eurasia are highly debated in the light of molecular, morphological, and paleontological data. Many biogeographic studies have stressed the complexity of faunal and floral assemblages during that interval which are not always at odds with geotectonic models. The proposed symposium is expected to bring researchers working on different aspects of Indo-Pakistani biotas (diversity, evolution and palaeobiogeography) on one platform and offer an opportunity to review and debate over our current understanding of paleobiogeographic issues in the context of geographic isolation of Indo-Pakistan subcontinent, and its subsequent accretion to Asia.

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## S14 EVOLUTION OF TREES AND FORESTS

### Organizers:

**Brigitte Meyer Berthaux** (AMAP-University of Montpellier, France)

**Anne-Laure Decombeix** (AMAP-University of Montpellier, France)

**Philippe Gerrienne** (University of Liège, Belgium)

The tree habit evolved 390 million years ago in several plant lineages. Early trees soon formed complex ecosystems, an event which had major consequences on the Earth System. This symposium is aimed at exploring:

- how tree structure, function and ecology evolved across major plant groups since the Paleozoic;
- how plant- animal-fungi interactions evolved in relation to the evolution of trees and forests;
- how the spatial and temporal evolution of trees and forests through time interacted with global climates and geochemical cycles.

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## **S15 EXPERIMENTAL APPROACHES IN PALEONTOLOGY: NEW DATA FROM OLD FOSSILS**

### **Organizers:**

**Gildas Merceron** (IPHEP-University of Poitiers, France)

**Thomas Tütken** (Universität Mainz, Germany)

**Gilles Bérillon** (HNHP-The Musée de l'Homme, France)

Actualism is the fundamental approach paleontologists use to explore the biology of the past. Based on morphology-derived functional interpretations paleontologists identify plausible gross feeding habits, metabolism, locomotion, and environmental preferences for extinct species. Elongated appendicular skeleton would rather support cursorial adaptations for an extinct ungulates, hypsodont cheek teeth represent an adaptation to grazing for extinct rodents or horses, or thick enamel as an adaptation to forage on hard seeds or tubers for early human ancestors. (Mis-)interpretations of such anatomical features have important consequences not only for the reconstruction of the palaeoecology but also for the identification of the plausible underlying mechanisms driving evolution. To surpass these limitations, paleontologists develop(ed) taxon-free tools to test hypotheses regarding ecology, physiology, function or behavior of extinct species. Among them, dental microwear, stable isotope and trace element analysis, bone microstructure and motion simulation have shown great potential to extract biological and ecological information from fossil teeth and bones. However, these proxies need to be validated on extant vertebrates with known ecological habits. Experimentation provides an appropriate methodological approach to test functional and ecological hypotheses in a controlled framework before any exploration on fossils.

This symposium is primarily dedicated to researchers who developed their working hypotheses based on fossil material, tested them using experimental approaches and put the results back into the paleontological context. We invite contributions from colleagues working on any vertebrate taxa such as fishes and tetrapods, including hominins but also topics from invertebrate paleontology are welcome.

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## **S16 FOSSIL 2D/3D IMAGERY: APPROACHES, ADVANCES, MANAGEMENT**

### **Organizers:**

**Renaud Lebrun** (ISEM-University of Montpellier, France)

**Maëva Orliac** (ISEM-University of Montpellier, France)

**Imran A. Rahman** (Oxford University, UK)

**Isabelle Rouget** (CR2P Paris, France)

**Gaël Clément** (CR2P Paris, France)

Since the mid 1990's, techniques for imaging and analysing specimens digitally and in 3D have grown increasingly popular among morphologists. Standard tomographic techniques (e.g. X-ray computed tomography) and novel imaging approaches (e.g. synchrotron-based fast X-ray scanning and full-field multispectral imaging) are now applied to a wide range of topics in palaeontology including morphology, evolutionary palaeontology, taphonomy and fossil conservation. These developments also raise new questions regarding the management of 3D digital datasets, including the availability, ownership and permitted usage of such data. The aims of the symposium are to address advances in 3D imaging and data processing techniques, and also to tackle issues related to data management (both within and beyond the academic community). This symposium is linked with a mid-congress visit to the IPANEMA Platform, SOLEIL synchrotron and the CT Scan facility AST-RX at the MNHN.



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## **S17 FOSSILS AND RECENT, MOLECULES AND MORPHOLOGY: DIALOGS IN PHYLOGENETICS**

### **Organizers:**

**Guillaume Billet** (CR2P Paris, France)

**Nicolas Puillandre** (ISYEB-National Museum of Natural History, France)

**G. Giribet** (Harvard University, USA)

With the development of molecular phylogenetics on extant and recently extinct taxa, strong agreements with morphological data but also problematic conflicts have come to light in many parts of the tree of life. In order to increase the explanatory power of our hypotheses, it is necessary to reach a state of mutual understanding. This symposium will present case studies based on a dialog between these different approaches and sources of data as well as methods to identify sources of conflict. In short, studies aiming at improving the robustness of phylogenetic patterns, which are critical to infer biological processes, are welcome.

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## S18 FUNCTIONAL MORPHOLOGY OF THE CRANIUM IN VERTEBRATES

### Organizers:

**Catherin Pfaff** (University of Vienna, Austria)

**Jürgen Kriwet** (University of Vienna, Austria)

The head of vertebrates as the control centre of an organism is responsible for food processing by masticatory movements, head motion (connection skull and vertebral column), and also comprises the main sensory system of the organism (e.g., eyes, ear). Morphological adaptations in accordance to the lifestyle thus are evidenced in different anatomical structures (e.g., neck, teeth, vestibular system), which can be used for palaeobiological reconstructions of the respective taxa.

This symposium will focus on biomechanical and functional morphological adaptations of cranial modules related to skull mobility, jaw and tooth functions, and hearing in extant and extinct vertebrates of all major clades. The goal is to gain not only a better understanding of behavioural traits in extinct taxa, but also resolve evolutionary relations in time and space.

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## **S19 HOW TO BUILD A PALAEOLOGICAL COLLECTION: EXPEDITIONS, EXCAVATIONS, EXCHANGES.**

### **Organizers :**

**Eric Buffetaut** (Geology laboratory-Ecole Normale Supérieure, France)

**Irina Podgorny** (CONICET - Universidad Nacional de La Plata, Argentina)

The aim of this symposium is to explore how fossil collections have been built, since the early days of palaeontology to the present. Ways to build a palaeontological collection include fossil collecting, sometimes in the course of expeditions to remote parts of the world, which may involve individual field work as well as large-scale excavations, the funding of which (by institutions, patrons, private means etc.) needs further consideration. A point worth investigating is how some well-known 19th century palaeontologists used the sale of fossil specimens to fund their field work. Another significant way of building and increasing fossil collections, especially in the nineteenth and early twentieth centuries, was through exchange and/or purchase of fossils, either between institutions or between individual palaeontologists or fossil dealers. Exchanges and sales of replicas (especially casts) will also be taken into consideration. Confiscations, especially in wartime, have also been used to expand fossil collections. Transportation of fossils from the field to the museum /laboratory, networks of fossil exchange as well as organization of fieldwork are some of the topics to be discussed.

This symposium will be global in geographical scope, with special emphasis on international expeditions and exchanges, and will cover all types of fossil collections. It is expected that it will be of interest to historians of science, palaeontologists interested in the history of their discipline, and curators of palaeontological museums and collections. We plan to publish the proceedings of the symposium in a suitable international journal.

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## S20 INTIMATE INTERACTIONS

### Organizers:

**Olivier Béthoux** (CR2P Paris, France)

**Ninon Robin** (CR2P Paris, France)

**Torsten Wappler** (University of Bonn, Germany)

In a wide sense, 'intimate interactions' imply the physical contact of two individuals during their lifetime. The concept encompasses symbioses, predation and mating, among others. Their study is very lively in the neontological context, with dedicated scientific communities, congresses and journals. Although some may be difficult to recover in the fossil record, they begin to receive a wider consideration by the palaeontological community. Indeed, fossils might document the early stages of nowadays intricate associations, variation of their intensity and prevalence, or even some interactions that are unknown now. The aim of this symposium is to initiate emulation between paleontologists around these aspects, regardless of a particular periods or taxa. This symposium welcomes communications on interspecific associations, including long-lasting ones such as parasitism (e.g. preserved in amber, or evidenced by exoskeletal deformations), mutualism (e.g. plant-fungi / plant-insect relations) and commensalism (including phoresy, marine fouling), but also short-term associations such as predation (evidenced by biting & drilling marks; gut & coprolite contents). Contributions dealing with intraspecific association like mating or sexual competition (e.g. fights, sexually attractive features) are also welcome.

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## S21 KONSERVAT-LAGERSTÄTTEN

### Organizers :

**S. Charbonnier** (CR2P Paris, France)

**J.T. Haug** (University of Greifswald, Germany)

Konservat-Lagerstätten are special fossil deposits renowned for their exceptional preservation of soft-bodied organisms, complete animals and plants, but also traces. Such exquisite preservation requires specific environmental conditions, such as anoxic sediment that inhibits bacterial decomposition processes for enough time to allow mineral exchange, precipitation, and other chemical processes to form replicas and films of delicate softer body parts. Konservat-Lagerstätten are crucial in documenting important moments in the history and evolution of life. This symposium will explore these extraordinary preservations yielding critical data on major events in the history of life. It will explore frontier research on Konservat-Lagerstätten and will bring together experts in imaging, chemical analysis, organism palaeobiology, sedimentological analysis and experimental taphonomy. Examples of new discoveries and new approaches will be discussed and illustrated.

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## S22 LIFE IN PALAEOZOIC SEAS AND OCEANS

### Organizers:

**Elise Nardin** (GET-University of Toulouse 3, France)

**Vincent Perrier** (LGLTPE, University of Lyon 1, France)

**Thijs Vandenbroucke** (University of Ghent, Belgium)

Life and environmental conditions in Palaeozoic Oceans and Seas were different compared to that in younger time slices. This session offers a forum for all kinds of research on marine Palaeozoic organisms and their interactions with their environment. A special focus could be on the structure of Palaeozoic Oceans and Seas and of Palaeozoic ecosystems. Palaeozoic oceans and seas housed life forms and environmental conditions significantly different from those characterizing younger geological times. This session offers a forum for all research dealing with marine Palaeozoic organisms and their interplay with their environment at various temporal and geographical resolutions. Explorations of the structure of Palaeozoic oceans and ecosystems are especially welcomed additionally to the investigation of bio-/geo-events and quantitative ecological studies.

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## **S23 LIFE IN THE TIME OF PANGAEA: VOLCANISM, WARMING, ANOXIA, ACIDIFICATION AND EXTINCTION**

### **Organizers:**

**Alexander M. Dunhill** (University of Leeds, U.K.)

**David P.G. Bond** (University of Hull, U.K.)

**Paul B. Wignall** (University of Leeds, U.K.)

During the late Palaeozoic and early Mesozoic, all of the world's landmasses were locked together in the supercontinent Pangaea. The Early Permian to the Middle Jurassic interval also witnessed at least seven significant extinction events, including two of the "Big 5": the end Permian and Late Triassic mass extinctions. Each of these crises occurred during phases of Large Igneous Province (LIP) activity, suggesting a causal link via a cascade of environmental effects including global warming, ozone depletion, acid rain, and anoxia, acidification and toxic metal poisoning in the oceans. However, LIPs have been emplaced throughout Earth history and their correlation with major biotic crises outside the time of Pangaea is patchy. This session investigates the causes and consequences of extinction events during the time of Pangaea with a focus on the link between continental configuration, LIP-lethality, and the prevalence of mass extinctions.

This session will unite disparate fields of palaeobiology as the topic of mass extinctions spans the disciplines of palaeoecology, palaeobiogeography, macroevolution, biogeochemistry, stratigraphy, and sedimentology. This session builds on recent topical sessions on the volcanism - mass extinction link at IPC4, GSA (2014-2017) and EGU (2017) that have been well attended. We anticipate a high volume of abstract submissions for both the oral and poster session at IPC5. The Organizers have a large amount of experience hosting sessions at the international conferences described above, and a strong track record of securing funding for speakers. We will apply for funding from various academic societies to cover some of the costs for three invited speakers. All of the invited speakers will be promising Early Career Researchers (PGRs or PDRs) who have yet to secure a permanent faculty position, since these individuals will benefit more than high-profile academics from the prestige of being invited as a keynote speaker in our session.

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## S24 MACROECOLOGY AND THE FOSSIL RECORD

### Organizers :

**Gilles Escarguel** (LGLTPE-University of Lyon, France)

**Emmanuel Fara** (Biogéosciences-University of Bourgogne, France)

**Susanne Fritz** (Goethe University Frankfurt, Germany)

Macroecology is the study of statistical patterns of abundance, distribution and diversity over large spatial scales. Together with the study of macroevolution to which it is intimately linked, the growing field of macroecology proposes fundamental backgrounds and perspectives with respect to modern diversity loss under global changes. The fossil record offers a unique opportunity to test several macroecological hypotheses and predictions that cannot be directly evaluated nor extrapolated from the extant biosphere (e.g., latitudinal diversity gradients, range size determinants, etc.). This symposium aims at illustrating how fossil data can shed light on current macroecological debates, as well as presenting new methodological and conceptual prospects in deep-time macroecology. Contributions from all spatial/temporal contexts are welcome, including approaches mixing fossil and extant data. Proceedings of this symposium will be published in a thematic issue of the paleontological journal *Geobios*.



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## S25 MESOZOIC PALEONTOLOGY AND PALEOENVIRONMENTS OF INDOCHINA

### Organizers:

**Julien Legrand** (Chuo University, Japan)

**Takanobu Tsuihiji** (University of Tokyo, Japan)

**Toshifumi Komatsu** (Kumamoto University, Japan)

Indochina has been the place of great disturbance in both the terrestrial and marine domains from the Late Paleozoic to Early Mesozoic. While Panthalassa was subducting along the eastern side of Asia and the western side of the Americas, a branch of the Paleo-Tethys ocean closed along the southern margin of Eurasia and Indochina collided with the South China Block during the Late Paleozoic to Triassic. The region includes many important sedimentary groups that revealed well-preserved fossils through the Mesozoic, pointing out its importance for understanding the evolution and migration processes of faunas and vegetations in eastern Asia. Indochina has historically been the place of paleontological works with France and in particular the Muséum national d'Histoire naturelle for more than a century and more recently with Japan among others, leading to an increasing development of research in local countries.

This symposium aims at presenting recent discoveries in Indochina in the fields of Geology, Paleozoology and Paleobotany, and encouraging for the development of further collaborative works.

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## **S26 MICROORGANISM EVOLUTION AND INTERACTION WITH BIOGEOCHEMICAL CYCLES AND CLIMATE**

### **Organizers:**

**Annachiara Bartolini** (CR2P Paris, France)

**Sylvia Gardin** (CR2P Paris, France)

**Luis O'Dogherty** (University of Cadiz, Spain)

The co-evolution of life and biogeochemical cycles has been shaped by their deep reciprocal influence. Marine microorganisms, with their diverse biochemical repertoire, are central to this co-evolution. Although small in size, micro-organisms have a paramount effect on how carbon, oxygen, nitrogen, phosphorus and other elements (e.g., sulfur, silicon, iron) cycle around the globe. Their emergence, radiation and diversity changes through time have influenced the structure of marine food webs, sea-water chemistry, global biogeochemical cycles and climate. This session invites contributions which highlight marine bio-geochemical interactions that left clues preserved in long- as well as in short-term geological records, during major palaeoenvironmental changes

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## S27 NEOGENE CONTINENTAL ENVIRONMENTS IN AFRICA AND EURASIA

### Organizers:

**Brigitte Senut** (CR2P Paris, France)

**Loïc Ségalen** (ISTEP-University Pierre et Marie Curie, France)

**Nathalie Fagel** (University of Liège, Belgium)

This symposium will be an encounter focusing on the interface between palaeontology and geochemistry. We will confront the convergences and differences between the diverse approaches which will permit the emergence of a new understanding of palaeoenvironments. Over the past few decades, interest has been focused on the emergence of herbaceous savannah in during the Neogene. The development of geochemical analysis (e.g., stable isotopes of carbon and oxygen, trace elements) applied to the enamel of large mammals and sediments provides information concerning local palaeoenvironments. In addition, the study of structure of herbivore teeth (hyposodonty, wear pattern, for example) yields information about adaptive responses to environmental changes during the Neogene. Furthermore, these approaches allow to propose scenarios on the evolution of the environments at a regional scale. Neogene environments are of particular interest for those researchers working on the evolution of hominoids in Eurasia and Africa, and the origins of our lineage. The aim of the symposium is to bring together the different actors and to present the diversity of data basis and interpretations thereof.

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## S28 NEW TRENDS IN STRATIGRAPHY - STRATIGRAPHIC SECTION (SGF) SESSION

### Organizers :

**Delphine Desmares** (CR2P Paris, France)

**Elise Nardin** (GET-University of Toulouse 3, France)

**Jozsef Palfy** (Eötvös Lorand University, Hungary)

Biostratigraphy has been for long considered as an out-dated discipline. However, assigning ages to rock strata remain essential to apprehend the timing of geological events, and to quantify processes ruling Earth and Life at different timescales. Identifying bio- and geo-events and defining biozones with better resolution are stimulating challenges. In this session, revised or new methods and approaches in biostratigraphy are welcomed as well as the exploration of future developments. We particularly encourage quantitative biochronology or integrated biostratigraphy. Discussions about the diachronism of bioevents are also primordial as such a discrepancy are the fondation of the identification of environmental and evolutionary changes.

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## S29 ORIGINS OF PHYLA AND THE ASSEMBLY OF ANIMAL BODY PLANS

### Organizers:

**Duncan Murdock** (Oxford University Museum of Natural History, UK)

**Imran Rahman** (Oxford University Museum of Natural History, UK)

**Allison Daley** (University of Lausanne, Switzerland)

**Paul Smith** (Oxford University Museum of Natural History, UK)

During the late Palaeozoic and early Mesozoic, all of the world's landmasses were locked together in the supercontinent Pangaea. The Early Permian to the Middle Jurassic interval also witnessed at least seven significant extinction events, including two of the "Big 5": the end Permian and Late Triassic mass extinctions. Each of these crises occurred during phases of Large Igneous Province (LIP) activity, suggesting a causal link via a cascade of environmental effects including global warming, ozone depletion, acid rain, and anoxia, acidification and toxic metal poisoning in the oceans. However, LIPs have been emplaced throughout Earth history and their correlation with major biotic crises outside the time of Pangaea is patchy. This session investigates the causes and consequences of extinction events during the time of Pangaea with a focus on the link between continental configuration, LIP-lethality, and the prevalence of mass extinctions.

This session will unite disparate fields of palaeobiology as the topic of mass extinctions spans the disciplines of palaeoecology, palaeobiogeography, macroevolution, biogeochemistry, stratigraphy, and sedimentology. This session builds on recent topical sessions on the volcanism - mass extinction link at IPC4, GSA (2014-2017) and EGU (2017) that have been well attended. We anticipate a high volume of abstract submissions for both the oral and poster session at IPC5. The Organizers have a large amount of experience hosting sessions at the international conferences described above, and a strong track record of securing funding for speakers. We will apply for funding from various academic societies to cover some of the costs for three invited speakers. All of the invited speakers will be promising Early Career Researchers (PGRs or PDRs) who have yet to secure a permanent faculty position, since these individuals will benefit more than high-profile academics from the prestige of being invited as a keynote speaker in our session.

## S30 PALAEOBIODIVERSITY OF SOUTHEAST ASIA

### Organizers:

**Haiyan TONG** (Mahasarakham University, Thailand and Institute of Vertebrate Paleontology and Paleoanthropology, China)

**Varavudh Suteethorn** (Mahasarakham University, Thailand)

**Julien Claude** (ISEM-University of Montpellier, France)

The remarkable biodiversity of Southeast Asia has a complex evolutionary history which is closely connected to the geology of the region. The area is a composite territory consisting of several units or microcontinents, some of them issuing from Gondwana, which remained separated until the end of the upper Paleozoic, and then collided with each other and with the South China block. Having become a continental marginal area of Asia, located between Mainland Asia and the Australian continent, Southeast Asia was then submitted to subsequent tectonic events and sea-level fluctuations. This long history, which began in the Paleozoic, had profound consequences for the evolution of the faunas and floras. Southeast Asian biodiversity is singular because of its largely endemic character and by the composition of the floras and faunas which define its geographical sub-units. The particular biogeographical resilience of this area makes it a natural laboratory for the study of the evolution of biodiversity.

The symposium will focus on the palaeontology of the Southeast Asian mainland extended to its Chinese northern margin and on its current island components (including the Indonesian and Philippine archipelagos). It will cover all aspects of palaeontology, and the evolution of biodiversity in that region through time, over a long time span, from the Late Paleozoic to the Holocene. Contributions are expected from palaeontologists, biogeographers and biologists interested in the faunal and floral history of the region.

# SESSIONS

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## S31 PALAEOLOGY AND GEOLOGICAL HERITAGE

### Organizers:

**Grégoire Egoroff** (CR2P Paris, France)

**Sylvain Charbonnier** (CR2P Paris, France)

**Apolline Lefort** (The Republic and Canton of the jura, Switzerland)

Palaeontological and geological heritage, also known as Geoheritage, is protected by many projects from regional to national and international levels. Throughout the world, individuals and organizations promote important geosites, Geoparks, Paleoparks, World Heritage sites, and other globally significant sites recognised for their palaeontological values. In this symposium, we will illustrate various aspects focusing on palaeontological objects or sites. We will discuss about the conservation of palaeontological sites (use, protection, practical heritage management and collections), as well as its interpretation through education, training and tourism.

# SESSIONS

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## **S32 PALEODIVERSITY AND EVOLUTIONARY HISTORY OF VERTEBRATES IN AFRICA**

### **Organizers:**

**Noureddine Jalil** (CR2P Paris, France)

**Emmanuel Gheerbrant** (CR2P Paris, France)

**Anusuya Chinsamy-Turan** (University of Cape Town, South Africa)

**Erik Seiffert** (University of Southern California, USA)

This symposium is intended to gather scientists from around the world interested in various aspects of African vertebrate paleontology. The meeting will provide an opportunity to showcase the current state of knowledge of paleontological studies of African vertebrates, from their earliest fossil records to the Neogene. The symposium will focus on the paleobiodiversity, evolution, paleoenvironments and paleobiogeography of African vertebrates in their successive paleogeographic contexts (Pangea, Gondwana, insular Arabo-Africa, Tethys closure and Old World emergence). Besides an in-depth view of the evolutionary impact of this long and remarkable geodynamic history on local evolution in Africa, the symposium will also consider vicariance and dispersals out of Africa. Topics to be addressed include: Vertebrate comparative anatomy, systematics and phylogeny, African origins, endemic evolution and radiations, Paleobiodiversity, macroevolution, faunal crisis and turnover, Paleobiogeographical history and events, African paleoecosystems and paleoenvironments, incl. climatic changes, Faunal assemblages throughout time, faunal correlations and biostratigraphy, Global significance of the African record of vertebrate evolution.



# SESSIONS

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## S33 PALEOBIOGEOGRAPHY

### Organizer:

**Steffen Kiel** (Swedish Museum of Natural History, Sweden)

How biogeography has evolved through deep time is a key question in paleobiology and in biogeography, and the fossil record is the main source of information to address this question. The amount of available data is ever increasing, and so is the diversity of methods to analyze them. This symposium aims to showcase recent developments in this field, regardless of the taxonomic group, the geologic age, and the scale of the analysis. It also aims to broaden everyone's view of the possibilities and to deepen our understanding of biogeography in Earth's history.

## **S34 SHELL BEDS THROUGH TIME: IMPLICATIONS FOR PALEOECOLOGY, TAPHONOMY AND EVOLUTION**

### **Organizers:**

**James H. Nebelsick** (University of Tübingen, Germany)

**Martin Zuschin** (University of Vienna, Austria)

**Adam Tomašových** (Slovak Academy of Science, Slovakia)

A great deal of paleontological data has been gained by studying shell beds through time including general diversity trends, trends in carbonate productivity and recycling, morphological and ecological gradients, evolutionary developments, taphonomic bias, the extent of spatial and temporal averaging, and sedimentological and geochemical implications. In this session, investigations on shell beds originating from both siliciclastics and carbonate environments will be highlighted irrespective of dominant organism types. The presented examples can include shell beds dominated by mass accumulations of monotypic species to highly divergent mixed assemblages. Analysis using qualitative descriptions as well as high resolution quantitative analytic methods for assessing shell beds and their content are welcome. The study of taphonomic features and sedimentological implications with respect to their representation will also be of interest. Presentations can cover both specific examples, deal with trends in shell bed development through time, and/or explore actualistic approaches that evaluate formation of shell beds in present-day environments.

## S35 TESTING AND DEVELOPING PHYLOGENETIC METHODS IN PALAEOLOGY

### Organizers:

**Joseph O'Reilly** (University of Bristol, UK)

**Mark Puttick** (University of Bristol, UK)

**Davide Pisani** (University of Bristol, UK)

**Philip Donoghue** (University of Bristol, UK)

Phylogenetic methods are essential to palaeontology, facilitating tests of diverse evolutionary hypotheses, from the evolutionary assembly of bodyplans, to the dynamics of clade birth and death through the evolution of ancient lineages. The efficacy of these tests is contingent on the accuracy of the phylogenetic method employed. Parsimony is the most widely employed phylogenetic method in palaeontology but recent studies have demonstrated that it is often less accurate than simple model based methods. By implication, much of our understanding of morphological evolution, particularly that inferred from fossil data, may be based on inaccurate phylogenetic hypotheses. The aim of this symposium is to explore the efficacy of competing methods of phylogenetic inference, particularly model-based phylogenetic methods which are starting to become more widely applied in palaeontology. We will explore the theoretical and practical advantages and shortcomings of model-based phylogenetic methods, their impact on empirical phylogenetic hypotheses, as well as the latest attempts to develop realistic models of morphological evolution for categorical and continuous character data.

# SESSIONS

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## **S36 THE CONSERVATION OF PALEONTOLOGICAL COLLECTIONS: CHALLENGE AND PERSPECTIVES**

### **Organizer:**

**Véronique Rouchon** (CRC- National Museum of Natural History, Paris)

Scope : This symposium aims at sharing knowledge and experiences on the conservation of paleontological collections. The values of paleontological specimens deal with different aspects: history, aesthetic, use, science, etc. Monitoring their preservation does not only require a good knowledge of the collection content and history, but also the capacity to anticipate future research developments. Moreover, paleontological remains comprise a great variety of geological materials that are more or less stable when removed from their initial anoxic environment. They may evolve in ambient conditions during exposure to light, humidity, oxygen, or pollution. In addition, these materials are often prepared with chemicals, the impact of which remains poorly documented. Finally, analytical tools used for the characterization of these objects are increasingly sensitive which brings every one to question the criteria to take into account to consider them as «non invasive».

# SESSIONS

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## **S37 THE DEVONIAN: LIFE, ENVIRONMENTS AND TIME**

### **Organizers:**

**John Marshall** (University of Southampton, UK)

**Ladislav Slavik** (Academy of Sciences of the Czech Republic)

**Carl Brett**

The Devonian is a time of significant change in the history of life on Earth. There are two mass extinctions amongst other events, the establishment of the terrestrial carbon cycle following the afforestation of the planet, the evolution of major groups such as the ammonoids, the first tetrapods and the world's greatest ever reef systems. The Devonian Subcommittee, as a diverse group of specialists, provides a focus to study these event. The symposium would also incorporate an SDS business meeting.

# SESSIONS

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## **S38 THE ONSET OF THE GREAT ORDOVICIAN BIODIVERSIFICATION (GOBE): FOSSILS, RADIATIONS AND LAGERSTÄTTEN - IGCP 653 SESSION**

### **Organizers:**

**Thomas Servais** (EVO ECO PALEO-University of Lille, France)

**David A.T. Harper** (University of Durham, UK)

**Bernard Lefèvre** (University of Lyon, France)

**Aaron Hunter** (Curtin University, Australia)

Students and participants from developing countries are suitable to get sponsored by IGCP 653

The 'Great Ordovician Biodiversification Event' (GOBE) comprises the rapid diversification of all marine organisms during the Ordovician Period. It is now clear that this adaptive radiation started for some organisms already in the late Cambrian and continued for others beyond the end of the Ordovician, making the GOBE the sum of a number of diversifications that completely modified marine food webs and that, for the first time in geological times, established modern marine ecosystems. The timing of the radiations varied among clades and palaeocontinents and may have its roots in the Cambrian. In order to complete the picture of the Ordovician biodiversification, we welcome all topics related to the GOBE and its onset, including all data on fossil occurrences of the late Cambrian and Ordovician interval, diversity measures that document the radiations of individual groups, as well as descriptions of elements or full palaeoecosystems preserved in Ordovician Lagerstätten.

# SESSIONS

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## **S39 THE ROLE OF BIOTIC INTERACTIONS IN THE EVOLUTION OF TROPICAL ECOSYSTEMS**

### **Organizers:**

**Jean-Renaud Boisserie** (IPHEP-University of Poitiers, France)

**Faysal Bibi** (Museum für Naturkunde, Germany)

Numerous studies have investigated the relationship between extrinsic factors (climate, tectonics) and macroevolution in Cenozoic vertebrates. These efforts highlighted the major role that climate plays in faunal evolution, notably through its impact on primary production (i.e. vegetation). Responses of morphology and vertebrate community composition to global climatic changes have been documented particularly at mid and high latitudes. Yet, climatic changes do not always correlate with marked evolutionary patterns. In the tropics, high species diversity has been associated with high rates of biotic interaction and competition, and this certainly must have been the case in the past. However, biotic interactions and their macroevolutionary consequences are not easy to test in the fossil record. This symposium will discuss how biotic interactions could be better integrated into the evolutionary histories of tropical ecosystems, alongside classical studies of extrinsic factors. We aim to bring together diverse theoretical and methodological approaches used in examining biotic interactions in the past, with a focus on the Cenozoic vertebrate records of Africa, southern Asia, and the Neotropics.

# SESSIONS

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## S40 TIMETREES

### Organizers:

**Michel Laurin** (CR2P Paris, France)

**G. Didier** (University of Aix-Marseille, France)

The development of molecular dating has resulted in a drastic increase of timetrees in comparative biology, but at the same time, the role that paleontologists play in dating the Tree of Life (TOL) has decreased. However, exciting recent developments show that paleontological data must play a central role in dating the TOL. This symposium will present both empirical and methodological studies that emphasize paleontological data to produce timetrees, or that use paleontological timetrees to study evolutionary patterns (adaptive radiations, extinction events, habitat shifts, etc.).



# SESSIONS

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## S41 VERTEBRATE PALEOPHYSIOLOGY

### Organizers:

**Jorge Cubo** (ISTEP-University Pierre et Marie Curie, France)

**Adam K. Huttenlocker** (University of Southern California, USA)

Recent conceptual and methodological advances allow vertebrate paleontologists to get insights into the physiology of extinct taxa. The multiple acquisitions of endothermy - the ability to generate metabolic heat to regulate internal body temperature- are major events in vertebrate evolution since they modified the energetic relationships between organisms and their environment, and were coincident with major changes in the respiratory and the circulatory systems, as well as in physiological, behavioral and ecological traits. Unsurprisingly, most studies on vertebrate paleophysiology deal with the origins and the evolution of endothermy in Synapsida and Diapsida.

Other aspects of the physiology of extinct vertebrates have received less attention and deserve renewed interest. Two of them are particularly interesting and fundamental to homeostasis in terrestrial vertebrates. First, deciphering the role of bone tissue in regulating the acid–base balance related to excess blood carbon dioxide and/or lactate acidosis in early tetrapods and in Pseudosuchia (crocodylians and other archosaurs more closely related to them than to birds). Second, understanding the role of bone tissue in calcium homeostasis. Although the role of Haversian remodeling in calcium homeostasis has been widely studied, the contribution of medullary bone to this function is far from completely deciphered. Talks dealing with the origin of respiratory turbinates in amniotes and the origin and evolution of unidirectional airflow in sauropsids will be included. The final talk will be devoted to the utility of phylogenetic comparative methods in paleobiological inference of physiological traits.

This symposium is aimed at promoting research in the young but rapidly evolving and exciting field of vertebrate paleophysiology.

# SESSIONS

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## S42 XXIST CENTURY PALEOHISTOLOGY OF MINERALIZED TISSUE

### Organizers:

**Martin Rücklin** (University of Bristol, UK)

**Gilles Cuny** (LGLTPE-University of Lyon, France)

**Damien Germain** (CR2P Paris, France)

**Sophie Sanchez** (University of Uppsala, Sweden)

More than a hundred years after Goodrich erected the term paleohistology, this area of research remains very active and innovative. New techniques of imaging such as microtomography, synchrotron light technology, geochemical analyses etc. underwent a huge development in the recent years and have been adapted to the study of mineralized and hypermineralized biological tissues, without replacing the traditional techniques but completing them. All these studies explore biological tissues of extant and extinct taxa at various observation levels: from the molecular and crystalline to the microanatomical level. This symposium will explore the complementary nature of classical and new techniques in order to pursue the mysteries of mineralized tissue structures and to better understand the origin and evolution of hypermineralized tissues over 500 million years of vertebrate evolution.

# SESSIONS

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## S43 OPEN SESSIONS

### Organizers:

**Dominique Gommery** (CR2P Paris, France)

**Stéphane Peigné** (CR2P Paris, France)

**Marie-Béatrice Forel** (CR2P Paris, France)

Contributions not fitting into the predefined sessions are also welcome. They will constitute an open sessions.