

The 7th International Palaeontological Congress



Evolution of brain and cranial anatomy through five major extinctions

The end is the beginning! The history of life on Earth has been punctuated by five major extinction events—the Ordovician-Silurian, Late Devonian, Permian-Triassic, Triassic-Jurassic, and Cretaceous-Paleogene extinctions. These cataclysmic events profoundly reshaped ecosystems and drove significant evolutionary changes in surviving lineages. Among these adaptations, the evolution of brain and cranial anatomy stands out as a crucial factor influencing species survival and ecological dominance. This symposium seeks to explore how mass extinction events have influenced the trajectory of brain and cranial evolution across diverse taxa, highlighting the interplay between environmental pressures, functional morphology, and neural complexity (and its role if any but not restricted to evolution of blood brain barrier mechanism).

This symposium will bring together experts from palaeontology, evolutionary biology, neuroscience, Statistics and data science, medical science and comparative anatomy to:

1. Examine how major extinction events acted as selective filters shaping cranial and brain morphology.
2. Analyse fossil evidence and modern analogues to understand adaptive radiations following extinction events.
3. Explore the link between ecological niches, sensory adaptations, and brain complexity in post-extinction survivors.
4. Foster interdisciplinary collaborations to uncover patterns and mechanisms driving the evolution of neural and cranial traits.

The symposium will be organized into six thematic sessions, each addressing a specific extinction event and its impact on brain and cranial evolution:

1. Ordovician-Silurian Extinction: Early Vertebrate Innovations This session will explore how the first major extinction influenced cranial adaptations in early jawless and jawed vertebrates, including sensory capsules and braincase development.

2. Late Devonian Extinction: Challenges and Innovations in Early Tetrapods Discussions will center on tetrapod emergence and the diversification of cranial structures, with an emphasis on neuroanatomical changes linked to life in fluctuating aquatic-terrestrial environments.

3. Permian-Triassic Extinction: Survival of the Brainiest Known as the “Great Dying” this extinction set the stage for the dominance of amniotes. Topics will include the evolution of sensory modalities and increased encephalization in therapsids and early archosaurs.

4. Triassic-Jurassic Extinction: Dinosaurs and Mammals in Focus This session will examine how this event catalysed the divergence of dinosaurs and mammals, with an emphasis on comparative cranial and neural adaptations in these lineages.

5. Cretaceous-Paleogene Extinction: Seeds of Modern Neuroanatomy The focus will be on avian and mammalian brain evolution following the extinction of non-avian dinosaurs, exploring how sensory specialization and cranial flexibility enabled ecological success.

6. Developmental constraints mapping of neural complexity: The stages of brain development that have outlived the five major mass extinctions and the recognition of their morphometric patterns in relation to the emergence of cognitive disabilities will be the main topics of discussion.

Conveners:

- Dr. Sanjukta Chakravorti (sanjukta.chakravorti@smns-bw.de)

If you are interested in this symposium, please contact the conveners.