

# Evolutionary research

*Bavarian State Collection for Paleontology and Geology (BSPG)*

## **Light long-necked ones**

Dinosaurs, especially those belonging to the group of long-necked dinosaurs, were impressive animals. The impact of their sometimes huge physical dimensions on metabolism, mobility and biomechanics is being studied by researchers of the Bavarian State Collection for Paleontology and Geology (BSPG). For instance, an examination of sauropod dorsal vertebrae reveal , a stable, lightweight bone structure containing numerous air-filled cavities instead of massive bone tissue.

Corresponding publication: *Rauhut, O.W.M. 2005a. 40 m lang und 100 t schwer – Der Gigantismus der sauropoden Dinosaurier. Fossilien 22 (4): 208-213; 5 Abb.*

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*The Bavarian State Collection of Zoology Munich (ZSM)*

## **Beetle evolution**

The Bavarian State Collection of Zoology Munich (ZSM) investigates the question of how biodiversity is developing in time and space. To accomplish this, modern methods such as DNA-analysis, and micromorphological examinations, as well as comparative examinations using the collections are employed. In order to better understand the evolution of diving beetles, about 20,000 bugs were collected during several expeditions in New Guinea and Australia. In this way, a precise picture of the evolution of beetles in the respective area can be revealed.

List containing diverse [publications concerning the research of diving beetles in New Guinea and Australia](#)

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## **How new species develop**

Clever fish hybridise: the emergence of new biological species is the core of evolution. Zoological collections are the basis for research on the evolution of new species. New methods including DNA-analysis, sometimes lead to surprising results, such as the speciation research on cichlids from a small crater lake in Cameroon by ZSM scientists. Some of the indigenous species did not develop in the usual way through genetic mutation, but by hybridisation of different species (as it is the case with many plants). These so called hybrids often occupy extraordinary ecological niches, such as the sponge consuming cichlid *Pungu maclareni*, which has a very special set of teeth and powerful masticatory musculature.

Link to the corresponding publication:

*Bavarian State Collection for Paleontology and Geology (BSPG)*  
**Evolution of teeth**

Teeth are typical features of vertebrates (including humans) and outstanding products of evolution. Each of their properties, such as shape, function, microstructure and biogeochemistry is the result of over 500 million years of evolution. Depending on the ecological, anatomical and physiological conditions, countless types of teeth were created, which are adapted to the respective needs of the individual species. Therefore, teeth not only provide important information about the nutrition and life history of their owners, but also for their identification. Because tooth enamel is the hardest biomineral in the world, teeth can survive thousands and millions of years after death, providing insights into their natural history.

All we know about the existence of many extinct mammals, their distribution and biology, a research focus at the Bavarian State Collection of Paleontology and Geology, is mainly based on their fossilized teeth. Dentists and dental technicians derive criteria for optimal implant therapy, that is based on the knowledge of the evolutionary history of teeth developed by BSPG scientists.

Links to the corresponding publications:

<https://link.springer.com/article/10.1007/s10914-015-9313-x>  
<https://zslpublications.onlinelibrary.wiley.com/doi/full/10.1111/jzo.12518>

<https://www.tandfonline.com/doi/abs/10.1080/08912963.2018.1525366>

[https://epub.ub.uni-muenchen.de/40474/1/21\\_roessner\\_359\\_367.pdf](https://epub.ub.uni-muenchen.de/40474/1/21_roessner_359_367.pdf)

<https://www.sciencedirect.com/science/article/pii/S1616504711000814>