Science Program

Genome ? Organism ? Environment

Assessing the underlying causes of speciation and evolutionary adaptations pose fundamental challenges to evolutionary biologists. Science Program Genome ? Organism ? Environment focuses on the study of the genetic and phenotypic adaptations of organisms, both extant and fossil, in relation to their ecology and evolutionary history.

More specifically, research in this Science Program aims at deciphering the relationship between genes, life history, and phenotype, the genetic basis of speciation, and the causal factors triggering morphological evolution. Study systems include genes involved in the speciation process, behavioural traits and their genetic basis, phenotypic character complexes such as sensory organs, but also novel baupläne such as snake-like body forms. Size of the study systems ranges from populations to species-rich clades, both in recent and deep time.

Evolutionary core questions of the Science Program are as follows:

- What is the genetic basis of speciation?
- What is the relationship between development and evolutionary change?
- What is the connection between a taxon?s life history and phenotype?
- What is the relationship between evolutionary form and function?

The investigated projects build upon previously generated phylogenetic hypotheses, as performed in Science Program Discovery of Biodiversity, which are used as foundation from which the respective evolutionary process is analyzed. There is also a close connection to Science Program Diversity Dynamics, in which results from Science Program Genome ? Organism ? Environment may be analyzed on a large-scale (e.g.

community) level. At the same time, results from Science Program Diversity Dynamics, such as studies on historical biogeography and adaptive radiations, can be used for investigations performed in Science Program Genome ? Organism ? Environment.

Research in Science Program Genome ? Organism ? Environment is specimen-based, taking advantage of scientific collections both at the Museum für Naturkunde and elsewhere, and focuses on natural systems rather than traditional model organisms such as the mouse or Drosophila. As such, this Science Program is also strongly linked to Science Program Collection Development.

Projects of the Science Program

- Phylogeny and diversity of Synapsida at the transition from Palaeozoic to Mesozoic (Dr. Jörg Fröbisch; Sofja Kovalevskaja Award of the Alexander von Humboldt Foundation)
- A brachiopod's eye-sight (Dr. Carsten Lüter)
- GENART: functional genomics of biological speciation (Funktionelle GENomik biologischer ARTbildung) (Dr. Frieder Mayer; funding via the Senate Competition Committee, SAW, of the Leibniz Association)
- Developmental stability and evolution of the ichthyosaur fin (Prof. Dr. Johannes Müller)
- The evolution and paleobiology of the early Reptilia (Prof. Dr. Johannes Müller)
- Dinosaur pelvis evolution (Dr. Daniela Schwarz-Wings)
- Sauropod computer-aided engineering (Dr. Daniela Schwarz-Wings)
- Changes of hyobranchial apparatus (Dr. Florian Witzmann)

Speaker

Prof. Dr. Johannes Müller