Max-Planck-Institut für Ornithologie

Max Planck Institute for Ornithology

Seewiesen Colloquia / Speaker invited by Dept. Gahr

Thursday, March 21, 2013, 13h, House 4, Lecture Room

Integrative evolutionary biology: a need for interdisciplinary studies of development, ecology and population genetics

Ralf J. Sommer
MPI for Developmental Biology, Tübingen

Life on Earth shows an astonishing diversity of form and phenotype. But our understanding of how this diversity was generated as a result of historical processes is still limited. We use a highly interdisciplinary approach that integrates development, evo-devo, ecology and population genetics to unravel the mechanistic changes that give rise to evolutionary alterations and novelty. For this to be achieved well-selected model organisms with a sophisticated analytical toolkit for functional investigations have to be developed. We established the free-living nematode Pristionchus pacificus as a model system in evolutionary biology. P. pacificus allows in a unique manner to combine laboratory studies building on genetic, genomic and transgenic tools with field work in ecology and population genetics. Evo-devo resulted in fundamental insight into the evolution of developmental mechanisms, but they also necessitate a synthesis with other areas of evolutionary biology: Synthesis with "population genetics" can reveal how phenotypic evolution is initiated at the micro-evolutionary level and synthesis with "evolutionary ecology" can add an ecological perspective to these evolutionary processes. P. pacificus has a well-defined ecological association with scarab beetles that we have investigated in great detail. More than 700 strains of P. pacificus have been isolated from around the world. In the last few years, our biogeographic work focused on La Réunion, a young volcanic island in the Indian Ocean that harbours the complete worldwide genetic diversity of P. pacificus due to independent invasions of this nematode with different carrier beetles. Thus, La Réunion represents a microscosm for studies of population genetic and ecology. I will first provide an conceptual introduction for the need for integrative studies in evolutionary biology. I will than report from our most recent work focusing on the evolution of morphological novelty. P. pacificus forms teeth-like denticles involved in predatory feeding on fungi and other nematode species. We are studying the regulation of this mouth form dimorphism, combining genetic studies with natural variation and macroevolution. I will describe a master switch gene of teeth regulation that couples microevolution and macroevolution. These case studies will highlight the importance of integrative approaches in modern evolutionary biology.

Who is Ralf J. Sommer?

1992	PhD University of Munich, (LMU), Germany
1993-5	Research fellow, California Institute of Technology, Pasadena, USA
1995	Independent Group Leader, Max-Planck Institute for Developmental Biology, Tübingen
1999	Director, Max-Planck Institute for Developmental Biology, Dept. for Evolutionary Biology
2002	Adjunct Professor University of Tübingen, Germany

Selected publications:

- Bumbarger, D. J., Riebesell, M., Rödelsperger, C. & Sommer, R. J. (2012): System-wide circuit reorganization underlying behavioral differences between predatory and bacterial feeding nematodes. Cell, 152, 109-119. IF: 32.4
- Bento, G., Ogawa, A. & Sommer, R. J. (2010): Co-option of the endocrine signaling module Dafachronic Acid-DAF-12 in nematode evolution. Nature, 466, 494-497. IF: 36.2
- Sommer R. J. (2009): The future of evo-devo: model systems and evolutionary theory. Nature Rev. Genetics, 10, 416-422. IF: 32.7
- Dieterich, C., et al. (2008): The Pristionchus pacificus genome provides a unique perspective on nematode lifestyle and parasitism. Nature Genetics, 40, 1193-1198. IF: 36.3
- Zheng, M., Messerschmidt, D., Jungblut, B. & Sommer, R. J. (2005): Conservation and diversification of Wnt signaling function during the evolution of nematode vulva development. Nature Genetics, 37, 300-304. IF: 36.3

Co-ordinator: Nicole Hoiss - hoiss@orn.mpg.de - 08157 - 932 240