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KERNER VON MARILAUN SYMPOSIUM – DIVERSITY UNDER PRESSURE 2020

BIODIVERSITY: A SCIENTIFIC AND SOCIETAL CHALLENGE

SHORT BIOGRAPHIES AND ABSTRACTS

COMMISSION FOR INTERDISCIPLINARY ECOLOGICAL STUDIES

MICHAEL J. BENTON
was elected Fellow of the Royal Society in 2014 for his fundamental contributions to understanding the history of life, particularly biodiversity fluctuations through time. He is fascinated by the transformation of palaeobiology from a speculative subject to testable science and led one of these discoveries – how to determine the colour of dinosaurs, rated as one of the top scientific discoveries of the 2010s. Michael Benton has written some 400 scientific papers and more than 50 books on a broad range of palaeontological topics. He has supervised more than 70 PhD students.

Extinction and mass extinction in the past

More than 99 % of all species are extinct. The fossil record shows great detail on how species originate and go extinct, and extinction is a constant. However, from time to time, external drivers cause more dramatic events, where many species die out at the same time, and the largest of these events are the big five or six mass extinctions. Such events were often very rapid, and two models for extinction have emerged – events driven by massive volcanic eruption and at least one by asteroid impact. These killing models, and the careful tracking of how life recovered after the crisis can feed useful data into our current understanding of threats to life.

ULRICH TECHNAU

studied Biology at the Universities of Würzburg, Mainz, Toulouse and Munich and obtained his PhD at the University of Frankfurt in 1995. After his Postdoc at the University of California at Irvine, he worked at the University of Darmstadt (1998-2004), where he obtained his habilitation. In 2004, he became group leader at the Sars Centre for Marine Molecular Biology in Bergen, Norway. Since 2007 he is Professor for Developmental Biology at the University of Vienna. Ulrich Technau is a corresponding member of the Austrian Academy of Sciences and was until 2020 President of the German Society of Developmental Biology.

The origin and diversification of major animal body plans – an EvoDevo perspective

There is a stunning diversity of life forms on this planet. Among animals, we find organisms as diverse as fish and mammals, but also invertebrates like worms, sea stars and jellyfish. How the diversity of major animal body plans evolved is one of the big questions in biology. Using experimental and modern genomic methods, the discipline of evolutionary developmental biology – short EvoDevo – seeks to reconstruct the common ancestor of the various animal groups and to trace the genetic changes that have occurred to generate this diversity of body plans during evolution.

WALTER SALZBURGER

is Professor for Zoology and Evolutionary Biology at the University of Basel in Switzerland. He received his doctoral degree in Zoology from the University of Innsbruck in Austria. The research of Walter Salzburger focuses on the question of how variation in the DNA translates into organismal diversity and on the identification of the patterns and molecular mechanisms that underlie adaptation, evolutionary innovation, and diversification. Salzburger's main organismal study systems are the exceptionally diverse adaptive radiations of cichlid fishes in East Africa. He received an ERC Starting Grant in 2008 and a Consolidator Grant in 2013.

Explosive diversification in Darwin's Dreamponds: The cichlid fishes in the African Great Lakes

Owing to their spectacular taxonomic, phenotypic, ecological and behavioral diversity and propensity for explosive speciation, the assemblages of cichlid fishes in the African Great Lakes Victoria, Malawi and Tanganyika are prime role models in evolutionary biology. With the release of five reference genomes and many additional genomic resources, the cichlid system has fully entered the genomic era. The in-depth genomic exploration of the African cichlid fauna — in combination with the examination of their ecology, morphology and behavior and information on the geological history of the lakes — permits novel insights into the way how organisms diversify and how adaptive radiations progress.

PETER SCHÖNSWETTER
received his doctorate in 2002 at the University of Vienna. A postdoctoral stay at the National Center for Biodiversity at the University of Oslo followed. From 2001 to 2009, he has been working as a contract assistant at the Faculty Center for Biodiversity at the University of Vienna. Peter Schönswetter became full university professor of systematic botany at the University of Innsbruck in 2010. In his research, Peter Schönswetter examines the spatiotemporal evolution of the southern European mountain flora. Another research focus is speciation through polyploidy, the multiplication of chromosome sets.

Speciation and diversification in alpine plants

The flora of the Alps has been shaped by a variety of different processes acting at different time horizons. In my talk, I will first address the obviously important role of allopatric differentiation, which took place at different taxonomic levels. Second, I will give examples illustrating the eminent importance of speciation via polyploidy, the multiplication of chromosome sets within species or following hybridization. Finally, using the well-investigated example of Heliosperma, I will highlight the importance of ecological differentiation and ecotype formation. The latter is not only important in the speciation continuum but also poses virtually unresolvable problems for taxonomy.

NAOMI PIERCE

studies the ecology and evolution of species interactions, and how parasitic and mutualistic life histories can influence the evolutionary trajectories of each partner. Her work has ranged from field studies measuring the costs and benefits of symbioses between ants and other organisms, to genetic analyses of biochemical signaling pathways underlying interactions between plants, pathogens and insects. Pierce and her students have used molecular phylogenies to analyze life history evolution in bees, ants and butterflies. Naomi Pierce was appointed Hessel Professor of Biology in the Department of Organismic and Evolutionary Biology and Curator of Lepidoptera in the Museum of Comparative Zoology in 1991. She has been a member of National Geographic's Committee for Research and Exploration, and was elected a Senior Fellow of the Harvard Society of Fellows, and Fellow of the American Academy of Arts and Sciences. She has received honors such as a Fulbright Fellowship, a MacArthur Award, the Edward O. Wilson Award from the American Society of Naturalists and most recently the International Prize for Biology.

The evolutionary consequences of ecological specialization

One of the reasons for the great success of insects is their ability to form relationships. Insect symbioses have given rise to adaptive radiations where novel associations have facilitated diversification through the exploitation of new ecological niches. Specialized symbioses have also created constraints on the evolution of partners that must coordinate their respective capabilities in order to function together. I will discuss three kinds of specialized insect relationships that have had evolutionary repercussions for the partners involved.

ANDREAS SEGERER

studied biology at the University of Regensburg with main focus on microbiology and published his PhD thesis on hyperthermoacidophilic Archaea. In the 1990ies, he was head of microbiology in an academic teaching hospital of the Ludwig-Maximilian-University Munich. He changed to the Bavarian State Collection of Zoology (ZSM) in 1999, since then taking care of the world's largest collection of Lepidoptera, where he is designated vice director. His current research includes DNA barcoding, distribution and responses of micro-moths to environmental changes in Bavaria and Perú. His popular science book on insect decline gained the Salus Media Price in 2019.

Insect decline and global biodiversity crisis: Welcome to Easter Island

A massive decline of insect abundance, biomass and species is documented from different parts of the world – part of an anthropogenic ecological crisis currently overwhelming planetary boundaries. Although being complex in detail, the main drivers of insect loss are known (in part described even >150 yrs ago), but warnings of consequences, having the potential to severely affect whole societies, have been largely ignored by the authorities. The presentation briefly sums up extent and principal causes of insect decline, with a major focus on the situation in Germany, and makes an attempt to classify the relative impact of the drivers.

KATRIN BÖHNING-GAESE

@ Michael Frank

is director of the Senckenberg Biodiversity and Climate Research Centre, professor at the Goethe University and vice president of the Leibniz Association. She studies the relevance of biodiversity for the coupled earth-human system. Her main focus lies on the influence of climate and land use change on ecological communities and ecosystems including their multiple contributions to human well-being. The objective of her research is to provide knowledge and solutions towards a sustainable relationship between nature and people.

Global change, biodiversity and people

The impact of humans on nature is increasing, leading to a serious loss of biodiversity and natural ecosystems. The most important drivers of this change in terrestrial systems are land-use change, exploitation of natural resources and climate change. Some contributions of nature to people are increasing, mostly material contributions such as food and timber. This increase, however, comes at the expense of many regulating and non-material contributions, such as seed dispersal, forest regeneration or human health and well-being. In my presentation, I offer an overview over the links in the social-ecological system of biodiversity, nature's contributions to people, human-well being and impacts of humans on biodiversity. I will point towards the crucial role of institutions and governance for developing more sustainable relationships between nature and people.

STEFAN DULLINGER

@ rossboth

is Professor of Vegetation Science at the University of Vienna. He is particularly interested in understanding and predicting the effects of human driven environmental change on the biogeography and biodiversity of plants, but also of other taxonomic groups, at local to global scales. In his research, he uses field data and experimental methods as well as macroecological analyses and modelling approaches. Many of his studies have been concentrated on mountain ecosystems, particularly those of the European Alps.

Data vs. models of alpine plant species re-distribution under climate change

Climate change will likely reshape the flora and vegetation of mountain landscapes. Empirical research on this issue has so far concentrated on either detecting range changes that have already taken place in the recent past, or on modelling these changes for the decades to come. However, these two lines of investigation remain loosely linked so far. In my talk I will present results of both recent re-survey and modelling studies. I will thereby seek for consensus and try to interpret apparent contradiction.

JANE HILL

Her research examines the impacts of climate change and habitat loss on biodiversity, and explores ways to help species respond and adapt to changing climate. Jane studied for her BSc and MSc at the University of Manchester, her PhD at Bangor University, and joined the University of York in 2001. Jane is a trustee of the SE Asia Rainforest Research Partnership (SEARRP), and a trustee and member of the Board of the British Ecological Society. She received a Marsh/ZSL Award for Conservation Biology in 2011 and is an Honorary Fellow of the Royal Entomological Society.

Responses of species to climate change

The climate is changing and many species are shifting their distributions, expanding into new areas that become suitable, but disappearing from other locations that become too hot and dry. There is a wealth of information documenting changes in biodiversity over many decades in the UK, especially for insects. This information helps us examine factors responsible for variation among species in their responses, and solutions to reduce declines. Recent media reports about 'insectageddon' together with the IPBES estimate that 1 million species are threatened with extinction, makes it imperative to understand which species are winners and losers in the anthropocene.