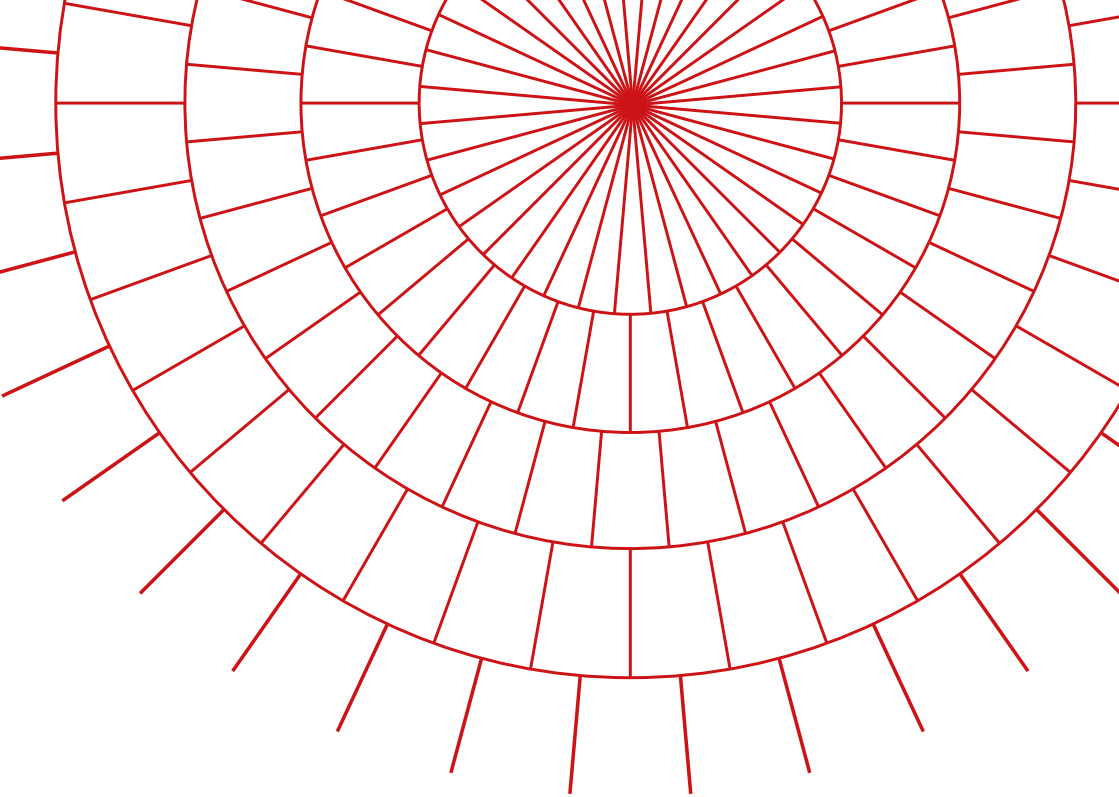

SYMPOSIUM

LABELS, CATALOGUES, AND ARCHITECTURES: THE ART AND SCIENCE OF MODERN SYSTEMATICS

VENUE

SCHLOSS HERRENHAUSEN
HANNOVER, GERMANY

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TITLES, ABSTRACTS, AND SHORT BIOGRAPHIES

Isomorphology: The Artist as Morphologist

Gemma Anderson

University of the Arts London and Falmouth University, UK

Gemma Anderson is an Artist, PhD researcher and Associate Lecturer of Drawing at Falmouth University. After studying Fine Art Printmaking at the Royal College of Art and Falmouth University and working on collaborative projects with mathematicians and natural scientists, I am now completing a practice based PhD studentship. Amongst my recent projects are 'Portraits: Patients and Psychiatrists' and the 'Jerwood Foundation Visual Artist in Residence' programme in London.

Morphology, which is generally understood as the study of form and transformation, is now associated with scientific practice (biology) and not generally associated with the arts. 'Isomorphology'* is the study of the shared forms and symmetries of animal, mineral and vegetable species through drawing practice and the subject of my practice based PhD Research. I will discuss the kinds of morphological questions that observational drawing generates and the knowledge that it produces. I propose the artist, as morphologist, can create an alternative system of order through drawing which uncovers natural affinities between organisms and contributes to our knowledge of the natural world. Further, the relationship between drawing, Goethe's original conception of Morphology, and D'Arcy Thompson's theory of transformations is explored. I interpret specific drawings by Paul Klee as abstract ontogenetic series and evidence how this concept can be developed in conjunction with Thompson's 'Theory of Transformations' and William Latham's 'Formsynth' through my own drawings. Building on this, I reveal an experimental drawing algorithm that I have developed to evolve primitive forms and discuss the possibilities for exploration of this approach in other disciplines. I will conclude with examples of drawing workshops and other forms of reification which share these ideas.

* term coined by Anderson (2013)

Preserve, organize, mobilize: Systematics, evolutionary morphology and the dualism of representing and intervening

James Griesemer

UC Davis, University of California, USA

James Griesemer is Professor of the Department of Philosophy at the University of California, Davis, Past-President of the International Society for History, Philosophy and Social Studies of Biology and a member of the Konrad Lorenz Institute for Evolution and Cognition Research in Altenberg Austria. His primary interests are philosophical, historical, and social understanding of the biological sciences, including models and practices in museum-based natural history.

In this talk, I explore the art and science of modern systematics practiced in the Museum of Vertebrate Zoology at UC Berkeley. I discuss findings from a long-term case study of 20th and 21st century U.S. museum-based scientific natural history in order to challenge and trouble dualisms of representing and intervening for understanding science in practice. Museum-based or specimen-oriented sciences collect, preserve, and organize specimens to mobilize for research, for example in evolutionary systematics and evolutionary morphology. Much of that research seems now to be dominated by sophisticated mathematical models, information archived in databases accessible via internet, and molecular analysis of information such as DNA sequences and morphometric measurements stored online. Indeed, many research practices of modern evolutionary systematics and morphology seem not to involve contact with specimens at all. I argue, however, that there is no representing without intervening and conversely no intervening without representing, and that the distinction marked by this idealized division of conceptual labour reflects no division of real labour in scientific practice.

Continuities of knowledge. Tools and manuals of microbial classification in the short 20th century (c. 1920 – 1990)

Mathias Grote

Humboldt University, Berlin, Germany

Mathias Grote is lecturer in history of science at the Department of History, Humboldt University, Berlin. He is interested in the history and epistemology of the 20th century life sciences, especially the history of classifying microorganisms at the crossroads of microbiology, medicine and botany.

Couched between the botany, medical bacteriology and environmental microbiology, the development of microbial classification provides an historically and philosophically interesting case. Microbes have often been considered "misfits" of taxonomies throughout the preceding century. This was due to the lack of morphological characters and fossils, the requirement for laboratory cultivation and not least the specific, changing conceptions of microbial heredity and evolution. And yet, microbiology has thrived throughout the period. How have researchers made sense of the microbial world in spite of these theoretical shortcomings? I will present the historical development of microbial classification along two axes: First, the tools used to cultivate these organisms in the laboratory (requirement of their identification), and second the organization of classificatory practice by written documents such as manuals. My focus will be the interaction of received ("old") knowledge with innovations (e.g. the rise of molecular genetics). This problem is central as a main interest of classificatory practice is the stability of its categories. This allows me to interrogate novelty-centered narratives of scientific development in the last century. Moreover, the case of microbes sheds new light on the entanglement of taxonomy and the study of phylogeny that has been at once central and problematic to the life sciences since Darwin. What other, non-phylogenetic ways of ordering microbial diversity have existed and how did they contribute to the current status quo?

Ordering Markets, Ordering Nature: Botanical Exchange Networks in 19th-Century Central-Europe

Nils Güttler

Federal Institute of Technology (ETH), Zurich, Switzerland

Nils Güttler is a postdoc at the Federal Institute of Technology in Zürich (ETH) and has held positions at Huntington Library (San Marino), Harvard University and the University of Erfurt. His PhD research dealt with mapping practices in nineteenth-century botany and his current research interests range from the history of geographical publishing and local knowledge production in the life sciences to the environmental history of infrastructures.

My paper focusses on the emergence of botanical barter trade networks in 19th-century natural history in Central-Europe. These barter trades were organized by amateurs and they became hubs – or "peripheral centres of calculation" – for the circulation of botanical specimens, ranging from regional to "exotic" collections. They created a huge market for natural history specimens that has remained unnoticed by most historians of science so far. At the same time they shaped collecting practices, so my assumption, far beyond the realm of amateur science, because their material soon infiltrated into major reference collections at botanical gardens. Most regional and national floras as well as works on plant geography of the mid-19th century referred to specimens that circulated on the market. Following the works of Anne Secord and others, my paper is thus a contribution to the history of "popular" collecting practices and their interaction with "official" classifications. The Herbarium Haussknecht, today located at the University Jena, will be my central case study.

Duplicates: Economies of Collections at the Museum für Naturkunde Berlin

Ina Heumann

Museum für Naturkunde Berlin, Germany

Ina Heumann is an art historian and co-directs "PAN. Perspectives on Nature: An Initiative for Nature, Knowledge and Culture in Context" at the Natural History Museum in Berlin. She is interested in natural history museums are hybrid organizations that mediate science and society, and currently works on the history of the duplicate in the nineteenth-century.

In recent years, interest in collections has been increasing, both in scholarly circles as well as in science policy. After the archive was rediscovered, both as problem and as theorem, in cultural studies in general, scientific collections are experiencing an enormous boom as a study object in the history of science. Alongside interest in the materiality and practice of science, these studies are united by questions relating to the epistemological value of collections. In this paper, I follow up this question as well, but extend it by looking at economic dimensions of collections as well. At the centre of my considerations, I place the duplicate as an emblem of both (dis-)order and redundancy. The history of the duplicate allows us to reconstruct a history of natural history in which imaginations of the valueable and the useless, phantasms of completeness and redundancy of museum collections, as well as ideas of representation and order play a role.

Species, Genus, Order: The Reality of Linnaean Ranks and How Natural History Became a Quantitative Science

Staffan Müller-Wille

University of Exeter, UK

Staffan Müller-Wille teaches History and Philosophy of the Life Sciences at the University of Exeter, and is Associate Director of the Centre for the Study of the Life Sciences (Egenis). He has published extensively on the history of natural history, heredity, and genetics. More recent work deals with the paper technologies that Carl Linnaeus (1707 – 1778) and his followers used to assemble and cross reference information on plants and animals.

The Linnaean hierarchy of taxonomic ranks has long puzzled philosophers, and in contrast to the other key innovation of Linnaeus, binomial nomenclature, its significance for the historical development of the life sciences is poorly understood. There seems to be no property that organisms belonging to genus x share with organisms belonging to genus y, and ranks therefore seem to be ontologically empty categories, if at all, having pragmatic value only. In this paper, i will argue that it is precisely the "artificial," and in a sense, arbitrary nature of Linnaean ranks that explains their epistemic value. Taking my examples from European post-Linnaean natural history up to 1830, I will argue that they structured representations of biodiversity into a nested set of equivalence classes that facilitated exchange among naturalists, but also allowed for statements like "region x is particularly rich in species of family y," "genus a is less diverse than genus b" etc. Linnaean ranks, that is, not only organized collections and exchange, but also brought to the fore patterns in nature that would have gone unnoticed otherwise.

Möbius' coloured geography – Objects, labels, and order

Michael Ohl

Museum für Naturkunde Berlin, Germany

Michael Ohl is Head of Entomological Collections and Deputy Head of Science Programme, Collection Development and Biodiversity Discovery at the Museum für Naturkunde in Berlin. Alongside his work on the taxonomy, phylogeny, and evolution of holometabolous insects, with special emphasis on Hymenoptera and Neuropterida, he is also interested in the theoretical and methodological foundation of biological systematics, with special emphasis on taxonomy, as witnessed by the recent publication of a book on nomenclature (Die Kunst der Benennung, Berlin 2015).

In the alcohol collections of the Museum für Naturkunde Berlin (MfN), many historical glasses and vials wear labels of different sizes with a frame in different colours and colour combinations. These labels were introduced to the MfN collections by Karl August Moebius (1825-1908), who was the director of the Zoological Museum in Berlin since 1888. He supervised the relocation of the zoological collections from the main building of the Humboldt University at Unter den Linden in Berlin to the new museum building at Invalidenstrasse. Möbius intensively reflected on how to reorganize the collections in the new building with significantly more space to meet the requirements of collection care and future collection development. Möbius decided to continue and improve a labeling system for alcohol specimens, with specific colours indicating geographic origin. In 1891, he suggested 28 colour combinations reflecting the major zoogeographic regions of the world, both terrestrial and marine. This colour code was applied to the alcohol collection of the MfN for some years, but it did only partly persist until today.

Physical collection objects are always accompanied by written information. The written object information is usually stored away from the physical object, in card and other catalogs, lists, monographs, and even computer databases. Labels, which are attached to the object, bridge between the physical object and the written information. If the available information is limited, e.g., the geographic origin, it is usually directly attached to the object. Möbius' label system was an attempt to standardize the geography of the world and to apply it to collection objects. His labels, however, having a colored frame, were supposed to bear further handwritten information, particularly the species name. The reason for the failure of Möbius' system was largely the misinterpretation of the way how labels work. Möbius tried to tie as much as information and as closely as possible to the objects, overloading the labels with a complex information content, which made them virtually unusable.

In my talk, I will present Möbius' colour code for geographic regions and its application in the collection. I will also present how labels work as "materialized words" and how they serve as a bridge between physical objects and available information.

The nature of naming nature: questioning taxonomy through art

James Prosek

Peabody Museum of Natural History, Yale, USA

James Prosak is an artist, writer, naturalist, who graduated from Yale University. Prosek's work have been shown at the Philadelphia Museum of Art, the Smithsonian American Art Museum and the National Academy of Sciences in Washington, DC among others, won a Peabody Award in 2003, and has written for The New York Times and National Geographic Magazine. Prosek is a curatorial affiliate of the Peabody Museum of Natural History at Yale, and a member of the advisory board of the Yale Institute for Biospheric Studies.

James Prosek's work as a visual artist and a writer questions accepted notions of how we understand and interpret the natural world. Examining the ways in which we name and order nature, the systems we use to try to harness nature, our classifications and taxonomies, and the limitations of language in describing biological diversity, Prosek invites us to reflect on what these systems say about our culture, our priorities, and our values. Prosek will discuss his obsession with naming nature since a child and his paintings, sculptures and other works which take their inspiration from the long history of humans depicting things in nature—from paintings on cave walls 40,000 years ago to the works of Albrecht Durer, William Blake, and John James Audubon. Prosek is interested in realms that science cannot quantify or solve, the space between physical objects, the power and relevance of personal experience. Although not a trained as a scientist Prosek is interested in the scientific process, joining collecting trips and biological expeditions to places as diverse as Suriname and Kyrgyzstan, in roles resembling scientist and artist.

Linnaeus never wrote a description, why do we? The pros and cons of DNA-based diagnoses and their role in facilitating the future identification of plants

Susanne Renner

Ludwig-Maximilians-Universität, Munich, Germany

Susanne Renner holds the Chair for Systematic Botany and Mycology at the Ludwig Maximilian University in Munich and is Director of the Nymphenburg Botanical Garden and Botanical State Collection. Her research focuses on angiosperm phylogenetics, sexual system evolution and biogeography, with a long-standing interest in the evolution of dioecy, heterodichogamy, and sex change.

Museomics, a term coined in 2008, is the genetic study of museum specimens, and while museomics is not the same as DNA barcoding, the two approaches urgently need to be brought together. This is because the utility of the barcode library of life on Earth for identifying organisms depends on the correct identification of the sequenced reference material. For tropical organisms, it would be time-efficient to retrieve genetic information directly from museum material, ideally type material (or equivalent specimens), instead of recollecting material that needs to be identified before sequencing (!). The lacking inclusion of types may be one reason why barcoding has not yet led to an increased rate of species naming (Pante et al., Systematic Biology 64: 152 – 160. 2015). Another is that 50-60% of available names may be synonyms, and only sequencing of types will clarify which names are useful. An approach that could greatly contribute to faster naming of new species, esp. from the tropics where collection of complete material may require many years, is DNA-based formal naming. There is a reason Linnaeus never wrote a description, but only diagnoses! The Codes of Nomenclature only require diagnosis or description, but most taxonomists feel it their duty to write both, even when admitting that "a picture is worth a 1000 words." I will discuss the pros and cons of DNA-based formal naming, as exemplified in Westheide and Hass-Cordes, 2001: Polychaeta; Edgecombe and Giribet, 2008: Chilipoda; Gittenberger and Gittenberger, 2011: Gastropoda; Filipowicz, Nee, and Renner, 2012: Solanaceae; González, Köhler, and Borsch, 2013: Buxus; Jörger and Schrödl, 2013: Heterobranchia; Petzold et al., 2014: Testudines).

A combination of

(i) sequencing of tropical type material from herbaria,
(ii) DNA sequences and electronic specimen images for every new name, and
(iii) diagnoses instead of ever longer descriptions,

would seem the best use of our limited time and funding, especially since computer vision and object detection systems will soon be able to use the millions of correctly named plant images already online (JSTOR). The future of speedy and reliable naming is in the combination of images and barcodes, not in descriptions.

The instrumentalist turn in modern systematics

Olivier Rieppel

The Field Museum, Chicago, USA

Olivier Rieppel earned the venia legendi in Vertebrate Paleontology at the University of Zurich. He is currently Rowe Family Curator of Evolutionary Biology at The Field Museum in Chicago, and Adjunct Professor of Biological Sciences at Northwestern University, Evanston. He has published extensively on the anatomy and evolution of living and fossil reptiles, and on the history and philosophy of comparative biology.

Scientific realism holds that scientific theories make an ontological commitment to the world they describe and explain. Instrumentalism eschews such ontological commitments, evaluating scientific theories in terms of 'empirical adequacy' instead. This works well for experimental sciences, but is a criterion that cannot be applied to historical sciences such as phylogenetic systematics. Phylogenetic systematics was originally firmly grounded in scientific realism. The phylogenetic system, for Willi Hennig, was an enkaptic hierarchy that represented the successive species lineage splitting events that causally explain the nested hierarchy of sister-groups. With the development of Anglo-American cladistics, there emerged a school of 'pattern cladism' that uprooted systematics from its ontological grounding in evolutionary theory. This laid the ground for an instrumentalist turn in systematics, one that was completed with the advent of Big Data. Genomics and Phenomics pose problems not only for data storage and management, but also for data manipulation and analysis. Emphasis has shifted from the reconstruction of the Tree of Life on the basis of careful character analysis to the development of ever more powerful algorithms, which measure support for phylogenetic hypotheses in terms of statistical 'goodness of fit' of often-indiscriminate data.

From Specimen Catalogues to Data Bases: How Palaeontology Became 'Palaeoinformatics'

David Sepkoski

Max-Planck-Institut für Wissenschaftsgeschichte, Berlin, Germany

David Sepkoski is a Senior Research Scholar at the Max-Planck-Institut für Wissenschaftsgeschichte in Berlin. His work focusses on the history of paleontology, evolutionary biology, and data collection and analysis in natural history. He is currently writing a cultural and intellectual history of the relationship between biodiversity and extinction, and he is co-leader of the MPIWG working group "Historicizing Big Data."

In recent years, much attention has been paid to a shift in the biomedical sciences from 'traditional' experimental approaches to one characterized by (often automated) collection and analysis of large data sets. The so-called 'informatics' or ‚-omics' revolution is most apparent in fields like molecular genetics, but it has also had an impact on more traditionally natural historical disciplines such as palaeontology. Indeed, some palaeontologists have recently argued that the term 'palaeoinformatics' is the appropriate label to characterize an important recent trend in palaeontology centered around analysis of large – often global – fossil databases. However, while it is undeniable that computer-assisted data collection and analysis has profoundly influenced palaeontology in recent years – by providing new tools, new opportunities for collaborative investigation, and new divisions of labor, for example – it is also the case that palaeontologists have collected and worked with large, abstracted data sets for over 150 years. Indeed, ever since paleontologists began seriously collecting fossils they began producing catalogues and taxonomic compendia, which have served as the basis for the global, and now digital, databases on which quantitative analyses of the history of life are based. This paper will examine the historical and current relationship between local and global data sets in palaeontology, and it will argue that ultimately, while 'palaeoinformatics' may be a new term, the practices and epistemic goals it encompasses have long been central to palaeontology.

Growing a New Tree of Life: Visual Representations of Macroevolution in Education and Public Communication

Bruno J. Strasser & Kostas Kampourakis

University of Geneva, Switzerland

Bruno Strasser holds a Chair for Science Education and History of Science at the University of Geneva. His research focuses on the history of the life sciences and science education. He is currently working on a new book project on collections and data banks in 20th century life sciences.

Kostas Kampourakis is a researcher at the University of Geneva (Section of Biology and IUFE), currently working on projects relevant to the teaching and the public understanding of genetics. He also is the Editor of the Springer book series "Science: Philosophy, History and Education."

Ever since Darwin sketched an evolutionary tree in his notebook in 1837, the tree has been the most widely used representation of the evolutionary relationships among organisms. For professional biologists, this type of representation, especially cladograms, constitute a powerful tool to study and understand the history of life. But evolutionary trees are also widely used in education and, as researchers in science education have shown, they can reinforce, or even induce, a number of misconceptions about macroevolution among a lay audience. A number of particular conceptual difficulties that students face in interpreting and constructing evolutionary trees have also been documented. In a collaborative project between historians, evolutionists, science educators, and designers, we have attempted to rethink a new design for evolutionary trees that would incorporate our latest knowledge about macroevolution and address the challenges of teaching and communicating macroevolution. After presenting the results of our conceptual and visual explorations, we will invite participants to an interactive session in an attempt to find new solutions to this intractable problem.

Dismissing Taxonomy: Labels as Illocutionary Acts

Antonio Garcia Valdecasas

Museo Nacional de Ciencias Naturales, Madrid, Spain

Antonio G. Valdecasas is Senior Researcher at the Biodiversity Department of the Museo Nacional Ciencias Naturales, Madrid. He is a specialist in world wide water mite taxonomy, and also interested in methods for taxonomic identification, repository and retrieval, morphometrics methods, as well as science diffusion and literacy.

In this talk I will review the image of Taxonomy within the scientific community and in literature, popular science books and articles. The image found therein frequently lacks conceptual basis and tends toward stereotype. Concepts play an important role in science, where they delimit and specify objects, activities, processes and abstractions. Vague terms that mean different things to different persons cease to be concepts and may become labels. A label is "a word or phrase that is used to describe somebody or something in a way that seems too general, unfair or not correct" (Oxford English Dictionary).

Labels are common in science and have become abundant in Taxonomy: *alpha-taxonomy, integrative-taxonomy, iterative-taxonomy*, etc. are just a few examples. The label *alpha-taxonomy* became popular simultaneously with the concept *alpha-diversity* in ecology. Labels like alpha-taxonomy have a negative connotation in Taxonomy. They seem to have contributed both to the detriment of taxonomists' careers and to a naïve and insubstantial misconception of Taxonomy as a scientific discipline. Misunderstanding of the theoretical basis of Taxonomy promotes caricature and labeling. As such, this may lead to illocutionary acts curtailing financial support of Taxonomy by government and agencies due to poor assessment of taxonomists' work.

Barcoding Nature: The Material Assemblages of Digital Taxonomy

Claire Waterton

Lancaster University, UK

Claire Waterton teaches in the Sociology Department at Lancaster University and directs the centre for the Study of Environmental Change. She currently works on environment-society relations, especially using the theoretical resources of Science and Technology Studies (STS), and has lead a research project bringing together social and natural scientists to explore contemporary innovation in the taxonomic sciences, especially DNA bar coding.

DNA Barcoding has been promoted since 2003 as a new, fast, digital genomics-based means of identifying natural species worldwide. Barcoding therefore overlaps extensively with the work of taxonomists, although the boundaries between taxonomists and barcoders are blurred in interesting ways. The fear that species are becoming extinct before they have ever been known fuels barcoders; and a key goal is to accelerate the pace by which humanity documents planetary biodiversity. In the process key qualitative and quantitiative changes in the collecting, organizing, analyzing, and archiving of biological specimens and biodiversity data are underway. This paper will look in detail at some of those changes, charting the new geographies, cultures, and politics of material organisation that are required to feed barcoding's global digital database.

The Science of Taxonomy and the Art of Survival

Quentin Wheeler

State University of New York, Syracuse, New York, USA

Quentin Wheeler is Director of the International Institute for Species Exploration and President of the College of Environmental Science and Forestry at State University of New York. His research interests include the morphology, taxonomy and phylogeny of beetles, systematic biology theory, and the role of taxonomy in biodiversity exploration and conservation.

Taxonomy is done best when it is done for its own sake, out of pure curiosity about what kinds of organisms exist and how they came to be. Taxonomy is to the life sciences as cosmology is to the physical sciences: the only discipline audacious enough to explore the origin and history of the astonishing diversity we see around us. A single monograph or revision is a sweeping panorama of evolution spanning the continents and millions of years. Taxonomy is a necessary counterbalance to reductionism, daring to read the fascinating story of phylogeny through the improbable complexities of anatomy, behavior, and development. Descriptive taxonomy offers to us an advanced course in survival. Even extinct species were once successful under different environmental conditions and can teach us valuable lessons about adapting and the consequences of failing to do so. Biomimicry is our best hope for meeting current human needs without destroying options remaining to future generations. And taxonomy is our only hope for discovering and documenting millions of biomimetic models before they disappear.

Thinking outside the box: post-Linnaean taxonomic practice and the shifting ontology of taxon identity

Joeri Witteveen

Utrecht University, The Netherlands

Joeri Witteveen is a post-doc in philosophy at Utrecht University in the Netherlands. In 2013, he obtained a PhD degree in History and Philosophy of Science from the University of Cambridge with a dissertation on biological type concepts and the typology/population dichotomy.

In this paper, I analyze how a series of eminently practical changes in nineteenth century classification technologies, collection practices, and labeling procedures have had profound and enduring metaphysical implications. My account proceeds from the observation by Staffan Müller-Wille and colleagues that Linnaeus divided the pages of his botanical manuscripts into 'boxes,' each of which represented one abstract genus concept. Linnaeus filled in the contents of genera by means of 'dropping' species into these boxes. This approach allowed for the possibility of 'reshuffling' genus contents on a later occasion, according to changing taxonomic judgment. On this approach, even the first species added to a genus could be reassigned to another genus down the line. Linnaeus implemented essentially the same method in a materially distinct form at the species level, using his herbarium cabinets. In the course of the nineteenth century, this Linnaean approach to naming and classification was altered in a seemingly minor way. Taxonomists came to agree that a genus name should be assigned to the first species attributed to a genus, or, at the species-level, be attached to the first described specimen by means of a name label. This new approach to naming not only rendered it impermissible to reassign the first element attributed to a taxon to a different taxon (of the same rank), but effectively made such an act impossible. A name-bearer cannot be removed from its taxon, because it fixes the taxon's identity. Thus, a deceptively minor change in taxonomic naming practice ushered in a new ontology of taxon identity. What Linnaeus would have regarded as the same taxon following certain acts of reshuffling counts as a different taxon by our standards.

Commentators

Joel Hagen

is professor of biology at Radford University. His research has included historical studies of experimental taxonomy, the introduction of computers in systematics, tropical research stations, and the origins of ecosystem ecology. He is the author of An Entangled Bank: The Origins of Ecosystem Ecology and is co-author of Doing Biology. He is currently writing a history of late twentieth-century ideas of homeostasis and biological regulation.

Matthew H. Haber

is Associate Professor at the Deprtment for Philosophy, University of Utah. His work has primarily focused on philosophical and conceptual issues in systematics, particularly those stemming from a commitment to phylogenetic thinking.

Anke te Heesen

holds the Chair of History of Science at Humboldt-University of Berlin. She is interested in the history of museums, collections and exhibitions, and the role media play in the accumulation and organisation of knowledge.

Ohad Parnes

is Research Coordinator and Research Scholar at the Max Planck Institute for History of Science in Berlin. He is a historian of the life sciences, with a focus on the history of cytology, immunology and epigenetics.

Thomas Reydon

is Professor at the Department for Philosophy of the Leibniz University of hannover. He is a philosopher of science with a background in physics, philosophy, and (theoretical) biology, and a research focus in theoretical (as well as, to some extent, practical) philosophy of the life sciences.

Georg Toepfer

directs the research group "LebensWissen" at the Centre for Cultural and Literary Studies in Berlin. He is a philosopher of biology with a particular interest in the history and theory of foundational concepts in biology, as well as discourse across the border between cultural and natural sciences.

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