7th ANNUAL SYMPOSIUM OF THE METROPOLITAN SOCIETY OF NATURAL HISTORIANS

Hosted in conjunction with the Science Research Mentoring Program, American Museum of Natural History

Sunday, March 3, 2019
2–4 PM
Linder Theater
American Museum of Natural History

SCHEDULE

2:00 PM	**Glenn Doherty**	**Welcome**
2:10 PM	**Phillip Skipwith**	**The Evolution and Origins of Reptiles and Amphibians**
2:20 PM	**Karin Kiontke**	**What Worm Tails May Tell Us About Puberty**
2:30 PM	**Stephanie Schmiege**	**Coniferous Conundrums: The Curious Case of a Tropical Conifer**
2:40 PM	**Amane Tajika**	**Nautilus on the Brink of Extinction?: What are they? Where are they born?**
2:50 PM	**REFRESHMENTS**	
3:20 PM	**Sarah Aliahmad**	**Crime Scene Inhabitants: Investigating the Use of Dermestid Beetles in Forensic Entomology**
3:30 PM	**Henry Towbin**	**Studying Volcanic Processes with Crystal Clocks: How Single Crystals Record Magmatic Conditions Deep in the Earth in the Months and Minutes Before Eruption**
3:40 PM	**Klara Norden**	**Diversity of Iridescent Structural Colors in Modern and Fossil Birds**
3:50 PM	**Luciana Gusmão**	**Anything But Simple: The Evolution of Burrowing Sea Anemones**

Organizers

Dr. Stephanie Loria, President, The Metropolitan Society of Natural Historians (MSNH)
Dr. Maria Strangas, Manager, Science Research Mentoring Program, American Museum of Natural History (AMNH)
Dr. Harald Parzer, Vice President, MSNH
Glenn Doherty, Treasurer, MSNH
Dr. Alexandria Moore, Conservation Research and Teaching Fellow, AMNH
Crystal Schneider, Operations Manager, Youth Initiatives, AMNH

Funding

Funding for conference participation of students in the Science Research Mentoring Program of the American Museum of Natural History is supported by the Doris Duke Charitable Foundation.

About The Metropolitan Society of Natural Historians

The Metropolitan Society of Natural Historians (MSNH), is a 501(c)3 charitable organization based in New York City that is dedicated to science education for the public benefit. Since its founding in 2011, the MSNH has hosted 78 events attracting more than 1,500 people. Monthly events include free tours of natural history collections, research labs and exhibits led by scientists from renowned institutions across New York City including the American Museum of Natural History, New York Botanical Garden, City University of New York, Rutgers University, Columbia University, and Rockefeller University. Additionally, the MSNH hosts guided nature walks and hikes in Central Park and nearby state forests.

About Science Research Mentoring Program

The Science Research Mentoring Program (SRMP) provides New York City high school students with the opportunity to undertake year-long research projects with scientists from the American Museum of Natural History (AMNH). Students conduct research in the divisions of Astrophysics, Earth and Planetary Sciences, Vertebrate and Invertebrate Zoology, Conservation Biology, and Anthropology. Designed by AMNH educators and scientists, SRMP curriculum connects content, theory, and methodologies to the cutting-edge research of Museum scientists. The program also focuses on building networking and professional development skills, and provides exclusive opportunities to engage with professionals across a range of scientific fields.

PRESENTATION SUMMARIES

The Evolution and Origins of Reptiles and Amphibians

Phillip Skipwith

Postdoctoral Research Scientist, Richard Gilder Graduate School,
American Museum of Natural History, New York, NY

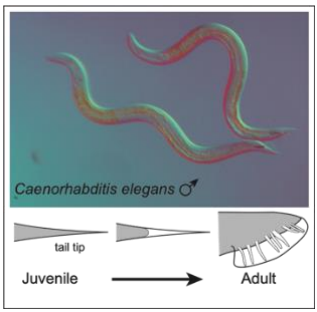
Dr. Skipwith will be talking about the evolution of reptiles. Reptiles constitute a major component of vertebrate (animals with backbones) diversity with more than 20,000 species. He will focus on how different groups of reptiles have achieved their current distributions across the world.

Dr. Phillip Skipwith is an evolutionary biologist at the American Museum of Natural History working on snake and lizard evolution. He received his Masters from Villanova University in 2011 and his Ph.D. from the University of California, Berkeley in 2017. Dr. Skipwith's research has taken him across the world and, to date, he has done fieldwork in Chile, Mexico, Australia, New Caledonia, New Zealand, Dominican Republic, and Madagascar.

What Worm Tails May Tell Us About Puberty

Karin Kiontke

Senior Researcher, Department of Biology, New York University, New York, NY



During animal development from fertilized egg to adult, many events must happen in a well-timed order. Changes in this order can be detrimental, although they have also led to evolutionary novelties. Here, I focus on the juvenile-to-adult (J-A) transition, an event known as puberty in humans. To investigate the molecular mechanisms that time the J-A transition, we use a genetic model organism, the roundworm *Caenorhabditis elegans*. During the J-A transition in *C. elegans* males, the long tip of the larval tail undergoes morphogenesis and becomes short and round. Studying mutants in which this event happens too late or too early, we found a cascade of six genes that are acting as negative regulators of one another. Related versions of these genes exist in mammals, and some are known to function in developmental timing. Therefore, understanding how these genes interact in worms can tell us how they may interact in humans.

Dr. Karin Kiontke studied Biology at Freie Universität Berlin (Germany) and earned her master and doctorate degrees under Prof. Walter Sudhaus, working on the ecology, morphology, taxonomy, systematics and evolution of rhabditids, a group of free-living roundworms that includes the model organism *Caenorhabditis elegans*. She was fascinated by the life-cycles of worms that live in temporary habitats such as cow dung, carrion, or rotting cacti, which she studied for her doctorate. To learn molecular techniques, Dr. Kiontke moved to the lab of Prof. David Fitch at NYU, where she is now a senior researcher. Here, she is interested in the genetic basis of evolutionary change. To address this complex question, she studies a simple structure, the tail tip of male rhabditids, which is long and pointed in some species and short and round in others. Using phylogenetics, genetics, genomics and molecular biology, Dr. Karin studies how the rhabditid male tail tip changed shape repeatedly during evolution.

Coniferous Conundrums: The Curious Case of a Tropical Conifer

Stephanie Schmiege

Ph.D. Candidate, Columbia University, New York, NY and New York Botanical Garden, Bronx, NY

One does not usually associate lacey-needled conifers with dark tropical forests dominated by broad-leaved angiosperms (flowering plants). Yet, the Central Highlands of Vietnam present a unique diversity of conifers with different biogeographical histories. Pines hail from the northern hemisphere, podocarps are found mainly in the southern hemisphere. These families exhibit opposite leaf morphologies affecting their ability to survive in densely canopied tropical forests. Podocarps have flattened leaves and are relatively successful in tropical forests; whereas pines have needle-like leaves and have been thought to be unable to penetrate tropical shady expanses. One exception to this is *Pinus krempfii*, a flat-leaved pine endemic to the Central Highlands of Vietnam. As climate is predicted to become hotter and drier, we are increasingly concerned about the vulnerability of this unique tropical pine to harsh conditions. Here, we explore the vulnerability of this pine and demonstrate that it may be remarkably resilient to harsh conditions.

Stephanie Schmiege is a Ph.D. candidate at Columbia University's Department of Ecology, Evolution and Environmental Biology and at the New York Botanical Garden. Her research focuses broadly on understanding the physiological responses of conifers to global climate change. So far, her work has taken her from Arctic Boreal treeline, to high elevation Chilean forests to the Central Highlands of Vietnam in order to study the world's conifers. Schmiege completed her undergraduate degree in Biology at Bowdoin College in Brunswick, Maine where she fell in love with the never-ending expanses of conifers in the Northwoods in Maine. After graduation, she spent two and a half years teaching Science at an elementary school in rural Tanzania before returning to the United States to pursue her interest in plant physiology and ecology. She worked as a research assistant in North Carolina and in New Mexico before embarking on her Ph.D. at Columbia.

Nautilus on the Brink of Extinction?:
What are they? Where are they born?

Amane Taijka

Postdoctoral Research Scientist, Division of Paleontology, American Museum of Natural History, New York, NY

Nautilus are a group of cephalopods (which include squids and octopuses) with external shells. Because their shell morphology has been relatively stable for hundreds of millions of years, they are often dubbed a "living fossil". While the general public appreciates *Nautilus* for the beauty of their chambered shell, paleontologists study them to understand the mysterious ecology of an extinct group of externally-shelled cephalopod ammonoids. In recent years, however, it has been reported that their populations are declining and, as a result, that they are now considered an endangered species. This is attributed to overfishing and trade for economic values of their shells. Although conservation movements for this group are growing, many aspects of *Nautilus* ecology are still unknown. I introduce a geochemical approach to detect breeding and hatching areas as a means of protecting existing communities, and forming a greater understanding of these marine animals.

Amane Tajika is a postdoctoral fellow funded by the Japan Society of the Promotion of Science, working in Paleontology at the American Museum of Natural History. He received his Ph.D. in natural sciences at the University of Zurich in 2017 and was awarded the Oswald-Heer-Preis in 2018 for his contribution to better understanding of the natural history in Switzerland. His research interests include paleoecology and macroevolution of extinct and modern cephalopods (ammonoids, coleoids and nautiloids), community paleoecology and macroecolgical changes in Earth's history. He carried out fieldwork in France, Germany, Japan, Morocco, Switzerland and USA (Montana and South Dakota) to answer questions regarding the above-mentioned topics.

Crime Scene Inhabitants: Investigating the Use of Dermestid Beetles in Forensic Entomology

Sarah Aliahmad

Master's Student, City University of New York: John Jay College of Criminal Justice

Forensic entomology is the study and application of insect information in legal matters, particularly in death investigations as insects utilize decomposing remains as a food source to complete their life cycle. Beetles belonging to the Dermestidae family are of considerable forensic importance since their larvae are typically found on human corpses during the dry and skeletal decomposition stages. Dermestid beetles can be useful in estimating the post-mortem interval (PMI) of a cadaver in cases of advanced decomposition. The purpose of this study is to investigate the mechanism underlying the colonization (egg-laying) behavior of *Dermestes maculatus*; specifically, the study examines whether *D. maculatus* colonize during the later decomposition stages due to a resource preference for dry, aged tissue or due to competitive effects resulting from the presence of *Lucilia sericata* blow flies. The results support previous findings that *D. maculatus* prefer to colonize aged resources, and that the presence of blow fly eggs appear to be a deterrent. The findings from this study aim to provide greater insight into their recruitment and colonization behavior to increase their utility as forensic tools.

Sarah Aliahmad is a graduate student in the Masters program at John Jay College of Criminal Justice studying forensic science with a specialization in forensic toxicology. She completed her Bachelor's degree in chemistry at St. John's University. Her graduate thesis project is in forensic entomology working with her mentor, Dr. Jennifer Rosati. Sarah's research is a developmental study on *Dermestes maculatus*. The objective of her experiment is to investigate the mechanisms underlying the colonization behavior of dermestid beetles; specifically investigating the effects of resource quality (aged versus fresh liver) and species interactions (presence/absence of blow fly eggs) on colonization.

Studying Volcanic Processes with Crystal Clocks: How Single Crystals Record Magmatic Conditions Deep in the Earth in the Months and Minutes Before Eruption

Henry Towbin

Graduate Student, Lamont-Doherty Earth Observatory, Columbia University, New York, NY

Volcanic processes are often hard to study because we cannot directly measure processes happening deep in the earth. In addition, these processes can be extremely slow and very fast. For instance, a volcanic system can take years to fill with magma prior to eruption, while the magma's ascent to the surface can take minutes. Magmatic crystals are one of the few records we have capable of capturing these processes while they occur. They can record subtle chemical changes in the magmatic system and through careful analysis we can reconstruct what happened deep in the volcano. These techniques add to our toolbox for understanding the awesome power of volcanos and will hopefully bring us closer to making better assessments of volcanic hazards.

Henry Towbin is a graduate student at Columbia University's Lamont-Doherty Earth Observatory. He is studying volcanic processes recorded in magmatic crystals and rocks transported from earth's mantle. He grew up in Brooklyn and has always loved exploring the incredible juxtaposition of city life and nature found in New York City. Prior to his work at Columbia, he worked in the American Museum of Natural History's Microscopy and Imaging lab, where he used electron microscopes and x-ray computed tomography to visualize the microscopic world in incredible detail.

Diversity of Iridescent Structural Colors in Modern and Fossil Birds

Klara Norden

Ph.D. Candidate, Department of Biology, Princeton University, Princeton, NJ

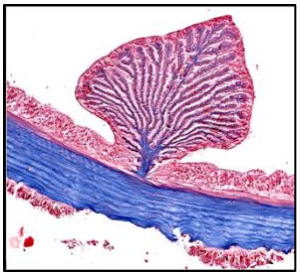
Iridescent bird plumage produces some of the most dazzling color displays in nature, such as the brilliant gorget of a hummingbird and the shimmering blue and green of a peacock's tail. These colors are not produced by pigments, but by nanoscale structures in the feather filaments, acting as photonic crystals. The nanostructures producing iridescence in bird feathers are very diverse, but little is known about this diversity and time of their origin. For her research, Klara Norden sampled 97 modern bird species with iridescent feathers, to quantify and map this diversity onto the bird tree. She used this database to search for iridescence in the fossil record, focusing on two lineages with iridescent plumage today – trogons and swifts. She found that iridescent structures are more diverse than any other type of coloration, and that similar structures have evolved multiple times independently in birds.

Klara Norden is a first year Ph.D. student in the Department of Ecology and Evolution at Princeton University. Her background is in paleontology, and she received her BSc and MSc at the University of Bristol (UK), where she became fascinated with bird coloration while working on a project to detect iridescence in fossil feathers. Norden's current research interests lie in understanding the diversity and evolution of iridescence, which produces some of the most varied and vibrant colors of the natural world. Why are some bird clades more colorful than others? How do different color mechanisms constrain or facilitate color evolution? She applies a multidisciplinary approach to her work, combining optics, biomechanics, visual modelling and macroevolution to understand how color evolves in birds – and other dinosaurs.

Anything But Simple: The Evolution of Burrowing Sea Anemones

Luciana Gusmão, Ph.D.

Postdoctoral Research Scientist, Division of Invertebrate Zoology, American Museum of Natural History, New York, NY



Sea anemones (Order Actiniaria) are solitary invertebrates found in all marine habitats, depths, and latitudes, despite their structural simplicity. Within Actiniaria, burrowing sea anemones are the simplest: they are typically small, slender and elongated, with a rounded aboral end, reduced or absent musculature, and few tentacles and mesenteries. Unlike most other anemones, they burrow in mud, sand, or gravel, keeping only the tentacle crown exposed. Burrowing anemones are diverse, often with multiple species co-occurring at a single site. These anemones have traditionally been classified in a single group, but recent phylogenetic (evolutionary) analyses based on molecular data have shown that morphology-based classifications for the order are inadequate. In this presentation, Dr. Luciana Gusmão will explore current hypotheses for the relative simplicity of burrowing sea anemones and discuss adaptations, morphological convergence, and loss of characters associated to a burrowing habit.

Dr. Luciana Gusmão is a marine biologist interested in describing the diversity of sea anemones and understanding their distribution and evolutionary relationships. To study these animals, she has travelled the world for the past 15 years SCUBA diving and visiting museum collections. In the laboratory, Dr. Gusmão combines morphological data (dissections, histology, microscopy, and CT-scanning) with DNA analysis using phylogenetic (evolutionary) methods to estimate relationships among sea anemones. Her work has focused on broad analyses within Order Actiniaria, as well as specific groups such as hermit-crab symbiotic anemones, deep-sea Venus flytrap anemones, burrowing anemones, and anemones from her native country, Brazil. More recently, Dr. Gusmão has also focused on studying nematocysts, the venomous stinging cells found in cnidarians. An important part of her work is to mentor students (high school, undergraduate, graduate) and speak to the general public about invertebrates and the marine realm.

MSNH Contact Info

To learn more about the MSNH or to be added to our email list, please contact us at metropolitannaturalhistory@gmail.com. Or visit us online:

Website: www.metropolitannaturalhistory.org
Facebook: https://www.facebook.com/groups/258831564151843/
Meetup: http://www.meetup.com/The-Metropolitan-Society-of-Natural-Historians/

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