

BOTANY



Dr. Nathalie Nagalingum, Associate Curator, McAllister Chair
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Nathalie Nagalingum received her doctoral degree from the University of Melbourne, Australia, and will begin at the Academy in early 2017. Her research is focused on understanding the long-term persistence of ferns and cycads—ancient lineages that have survived through multiple episodes of radiation and extinction. To address the history of and processes involved with these episodes, Nathalie has a multi-disciplinary research program that incorporates fossil data, microscopy/morphology, molecular DNA sequencing, big data and patterns of distributions. Nathalie is particularly interested in adopting novel approaches and techniques in her research.

Starting points for projects center around Australian ferns and cycads, and include:

- 1) Patterns of evolution of ferns. Generate DNA sequences for inferring phylogenies—what are the morphological and biogeographic patterns of Malaysian ferns?
- 2) Resolving the identity of a cycad species. Digitize and mathematically describe leaf shapes (morphometrics)— are there two species or is there simply a morphological variant of one species?
- 3) Genomics of the cycad genus *Cycas*. Using genomic sequence data—do different genome-assembly programs produce different phylogenies? (with Brian Simison, CCG).

For Nathalie's webpage see: <http://www.evolutionofplants.org/>

ENTOMOLOGY



Dr. Lauren Esposito, Assistant Curator, Schlinger Chair

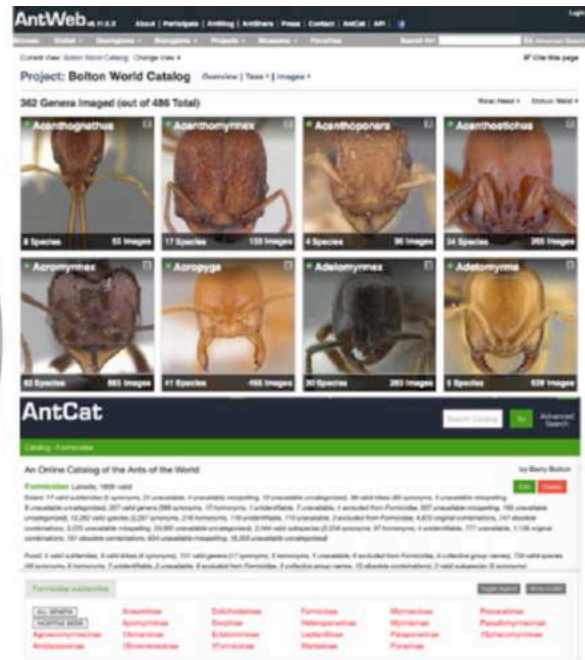
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Lauren Esposito received her PhD in 2011 through the American Museum of Natural History/ City University of New York collaborative program, and joined the Academy in 2015. Lauren's research is focused on the systematics and evolution of arachnids, in particular scorpions. Her research has taken her on expeditions around the world, but much of her focus is on the arachnid communities in the Caribbean, Baja California, and the southwestern USA. Lauren uses a combination of methods including genomics, venomics, morphology, morphometrics and niche modelling to answer questions and test hypotheses about the biogeography, diversification, cryptic speciation, and adaptive radiations of arachnid life. Additionally, Lauren is the co-director of a non-profit organization, Islands & Seas, that is dedicated to promoting research, education outreach, and sustainable development in special places on earth. In 2015, there are two travel opportunities for interns: attending the tri-annual International Congress of Arachnology in Denver, CO; participating in a field course and field research in Baja California. Current research projects in the Arachnology Lab include:

- 1) Adapting to a life of salt: using genomics to understand the adaptation and diversification of arthropod communities on post-pleistocene salt flats in western North America.
- 2) Biogeography of Caribbean Arthropods: testing biogeographic hypotheses concerning the timing and colonization of the Caribbean using genetic datasets from multiple arthropod groups.
- 3) Cryptic Scorpions: Using genetic and morphological information to describe new species of scorpions.

ENTOMOLOGY



Dr. Brian L. Fisher, Curator
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Brian Fisher is Curator of Entomology at CAS and adjunct professor at Univ. of California, Berkeley and Research Professor at San Francisco State University. He has specialized on ant systematics, bioinformatics and the application of biodiversity research to conservation planning. He created the annual Ant Course in 2001, AntWeb in 2002, and the Madagascar Biodiversity Center in 2004. He has published over 135 articles on ants, and trains dozens of international graduate students in the taxonomy and natural history of ants, skills enabling them to use ants as an important indicator of biodiversity across the globe.

Museum collections were the first big data project undertaken by scientists. AntCat.org and Antweb.org provide a window into efforts to create a virtual museum of global biodiversity data including types, specimens, images, taxonomic history, and literature.

Potential projects include:

Exploration of ways to visualize and interact with large-volume biodiversity data found in AntCat.org and AntWeb.org.

Dr. Fisher is looking for an intern that combines an interest in evolutionary biology and computational and visualization skills. Ideally the candidate is familiar with JSON, HTML, CSS, Leaflet, D3, and jQuery. The student will develop queries to the APIs in AntCat and AntWeb to explore and analyze biodiversity data housed in the CASC ant collection and help provide a direct outcome of biodiversity data held in museum collections.

fisherlab.org

INVERTEBRATE ZOOLOGY & GEOLOGY



Dr. Rebecca Albright, Assistant Curator
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Dr. Albright is a coral reef biologist with expertise in coral reproduction, physiology, and biogeochemistry. Her research focuses on the capacity of coral reef organisms to cope with changing environmental conditions, specifically ocean warming and acidification. Dr. Albright uses a combination of laboratory and field experimentation to understand how changing environmental conditions impact the organisms that live in and on reefs and what this means for the ecosystems as a whole.

Potential projects include:

- 1) Population genetics analysis of coral communities of Palau.
- 2) Microstructural analysis of coral skeletons using scanning electron microscopy.

You can learn more about Dr. Albright's research at:
www.rebecca-albright.com

INVERTEBRATE ZOOLOGY & GEOLOGY



Dr. Terrence M. Gosliner, Senior Curator

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Terry's research on the systematics, phylogenetics and comparative biology of nudibranchs and other sea slugs focuses on the implications of phylogenies in understanding evolution of shell-loss, mimicry, and other comparative aspects of the evolution of these animals. He has studied the diversity of these mollusks along the California coast for more than 40 years. Most recently, this work employs evolutionary studies to develop new strategies for conservation of Philippine reefs in the center of the center of marine biodiversity. He develops key collaborations with research institutions, conservation organizations, and large public exhibits to bring these findings to diverse audiences. Potential projects include:

- 1) Systematics of Indo-Pacific nudibranchs.
- 2) Descriptions of new species of Philippine nudibranchs using molecular and morphological techniques.

You can learn more about Dr. Gosliner's research at:

<http://research.calacademy.org/izg/staff/tgosliner>

INVERTEBRATE ZOOLOGY & GEOLOGY



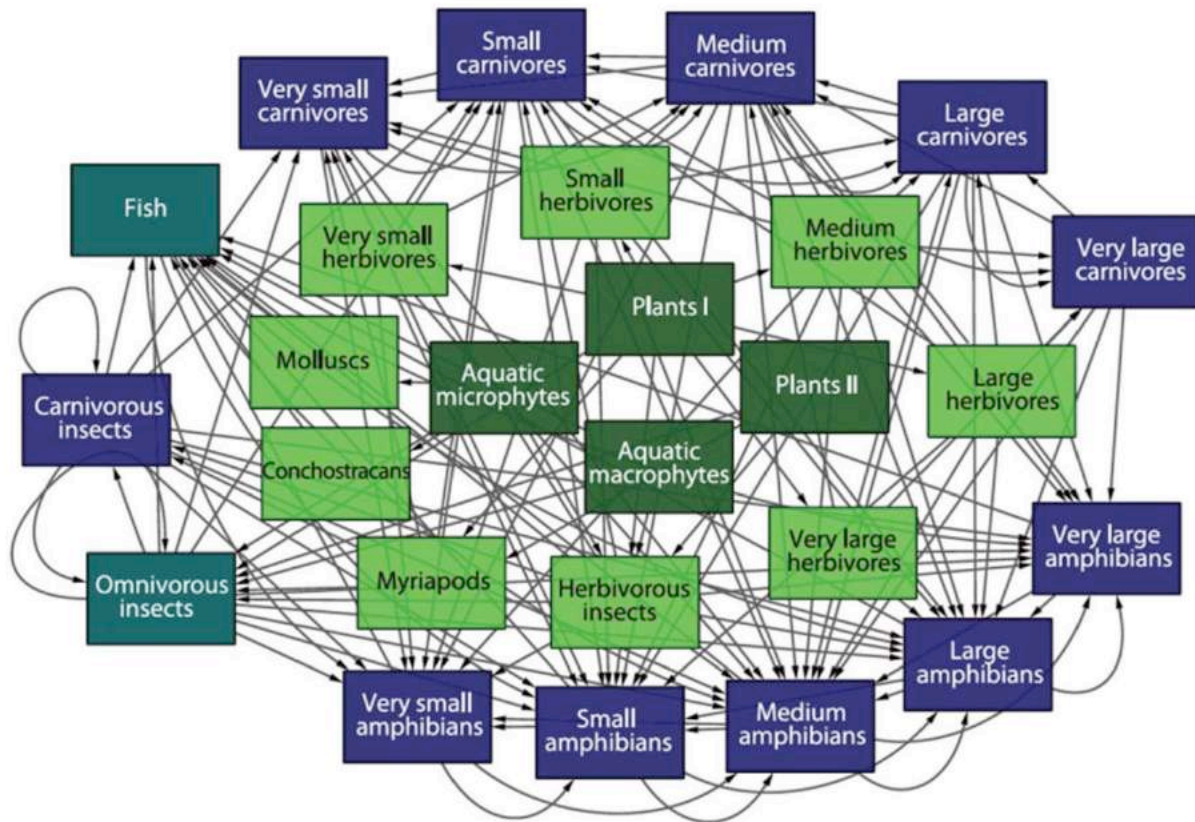
Dr. Rich Mooi, Curator and REU Site Director
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415-379-5270

Rich Mooi received his Master's and Doctoral degrees from the University of Toronto, Canada, and has been with the Academy since 1990. He studies the systematics, phylogeny, paleontology, and biogeography of echinoderms, particularly sea urchins and sand dollars. His field work has included submersible dives off the Bahamas, paleontology in Alaska, ship-based collecting in Antarctica, and shallow- and deep-water expeditions in the Philippines. His research can be summarized as the study of the origins of evolutionary novelty, for which the Echinodermata constitutes an excellent model system. These studies are culminating in a theory that describes the homologies and evolutionary relationships among major clades throughout the phylum Echinodermata.

Potential projects include, but are not limited to:

- 1) Origin and evolution of the northeastern Pacific sand dollar fauna (Clypeasteroidea: Echinoidea). An examination of both Recent and fossil genera to develop cladistic and morphometric analyses that will examine the origins of this fauna.
- 2) Phylogenetics of specific echinoid groups such as heart urchins, sand dollars, and other taxa. Morphometrics, molecular, and morphological analyses can be applied to develop characters for a phylogenetic analysis.
- 3) Phylogenetic placement and biogeographic studies of Philippine sea urchins from any of a variety of major groups collected during the expeditions of 2011 and 2014 - 2016.
- 4) Origin and evolution of elements of the deep-sea echinoid fauna.
- 5) Exploring the evolutionary significance of iridescent spots in certain sea urchins, and can these be detected in fossils?

INVERTEBRATE ZOOLOGY & GEOLOGY



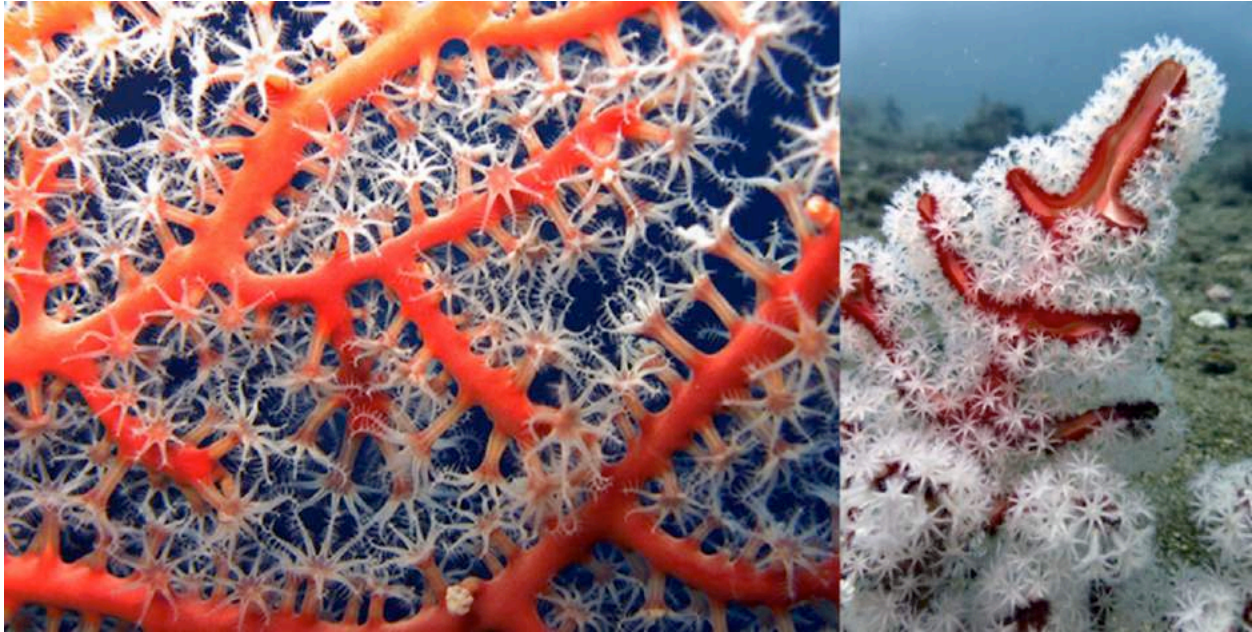
Dr. Peter Roopnarine, Curator
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415-379-5271

Peter Roopnarine received his Ph.D. in Geology from the University of California Davis, and also holds degrees in Biology and Oceanography. He has been with the Academy since 1999. He studies a variety of topics in paleontology and evolutionary biology, including the dynamics of extinction, modelling ancient and modern ecosystems, and the evolutionary paleoecology of tropical American marine molluscs. Together, these topics focus on developing a theoretical basis for understanding the role of ecological diversity in the evolution and extinction of species. Potential projects include:

- 1) Morphometric description and biogeography of a widespread genus of marine bivalves in the tropical western Atlantic, ranging from the Oligocene to the Recent.
- 2) Building a food web for the San Francisco Bay and related offshore habitats, including more than 1,300 species, using the Academy's collections and other data.
- 3) Examining evolutionary and ecological change in Miocene-Pliocene marine communities of the Dominican Republic using morphometric analysis, quantitative ecological analysis, and multiple species of molluscs.

More information can be found at <http://zeus.calacademy.org/> and <http://zeus.calacademy.org/roopnarine/peter.html>

INVERTEBRATE ZOOLOGY & GEOLOGY



Dr. Gary Williams, Curator of Invertebrate Zoology
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Gary Williams studies the systematics, evolutionary biology, and biogeography of octocorals, a group of corals found worldwide and at all latitudes, on coral reefs as well as in the deep-sea. His work involves coral communities from various parts of the world from shallow water tropical coral reefs to ocean depths exceeding 6000 meters (20,000 feet). Octocorals include some of the most beautiful and morphologically diverse animals in the world's oceans – these are the soft corals, sea fans, and sea pens. They are a group of corals that represent two thirds of all coral species and are characterized by having eight feathery tentacles surrounding the mouth of each polyp.

Potential projects include:

- 1) Molecular phylogenetics of gorgonian and pennatulacean corals from coral reefs of the western Pacific Ocean.
- 2) Morphological and molecular phylogeny of octocorals using the Academy's scanning electron microscope and Center for Comparative Genomics.
- 3) Using biological illustration to portray morphological diversity in corals of the world.

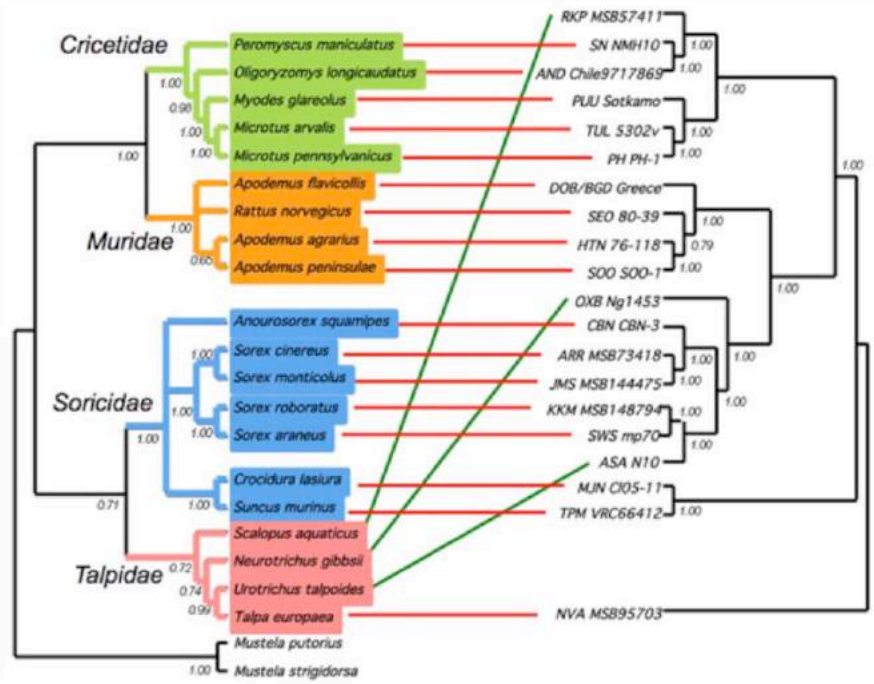
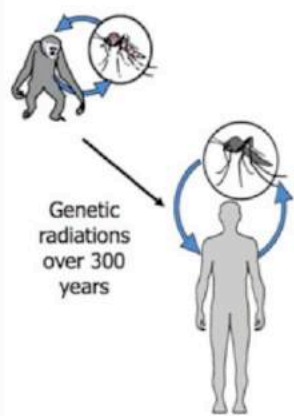
Additional information on Dr. Williams' research can be found at:

http://researcharchive.calacademy.org/research/izg/orc_home.html

<http://coralsandcoralreefs.blogspot.com/>

<http://www.calacademy.org/staff/ibss/invertebrate-zoology-and-geology/gary-williams>

MICROBIOLOGY



Dr. Shannon N. Bennett, Associate Curator, Patterson Scholar

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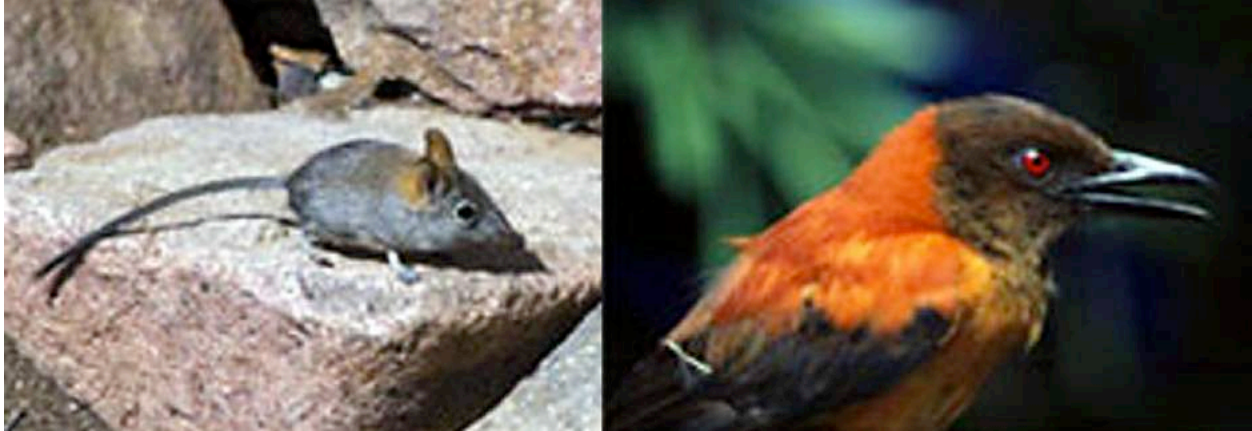
415-379-5334

Shannon Bennett received her Ph.D. from the University of British Columbia in 1999 and has been with the Academy since 2011. Her research focuses on the evolution, ecology and molecular drivers of viral diversity and emergence, integrating a combination of molecular biology, bioinformatics, virology, and invertebrate animal models of infection. She is particularly interested in the comparative molecular diversification of fast-evolving RNA viruses under different epidemiological and ecological conditions, transmission dynamics and life history modes.

Projects might include, but are not limited to:

- 1) Metagenomic analysis of mosquito-borne micro-organisms.
- 2) Identifying the phylogenetic structure and molecular drivers of diversification in dengue virus.
- 3) Exploring the biodiversity of Hantaviruses across small mammal populations.

ORNITHOLOGY & MAMMALOLOGY



Dr. Jack Dumbacher, Curator
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415-379-5377

Information about Dr. Dumbacher's research and academic interests can be found at:
<http://research.calacademy.org/om/staff/jdumbacher>

Information about Dr. Dumbacher's research and academic interests can be found at:
<http://www.jackdumbacher.com/research.html>

Dr. Dumbacher's research focuses on describing the diversity in bird and mammal species and understanding the factors that cause species to diversify. Using samples from an array of bird and mammal species, including birds from Papua New Guinea, owls from North America, and sengis (aka elephant shrews from Africa), he uses genetic tools to describe biodiversity and to understand evolutionary relationships. Much of this work is calculated to ask conservation-related questions about populations that may need attention in the wild.

Potential projects include, but are not limited to:

- 1) Studying plumage and morphological variation in western populations of Barred Owls (*Strix varia*). The Academy has nearly 200 specimens of Barred Owls collected from northern California, and these show interesting variation in plumage and other characters.
- 2) Studying the genetic relationships of sengis – especially the genera *Petrodromus* and *Elephantulus*, found in Africa. The Academy has samples from multiple species whose relationships are poorly understood, and simple phylogenetic analyses will be helpful in determining their genetic distinctness.
- 3) Working on aspects of the genetic evolution of sodium channels in poisonous birds (the voltage-gated sodium channel is the target of the toxin, batrachotoxin, that poisonous pitohui birds carry). Dr. Dumbacher is currently assembling sequence data from the different sodium channel genes to understand whether there is genetic resistance to batrachotoxin binding.