

Iliana Baums- Professor of Biology

Baums is a leader in the broad field of coral reef research, a field that has become critically important to the future health of the world's oceans, nominators said, adding that she led the field in developing tools for rapid genetic identification in corals.

Colleagues said Baums' work has bridged the gap between basic population genomics and more applied aspects of coral restoration for coral reefs in decline due to climate change.

By developing tools for rapid genetic identification in corals, Baums' work enables basic and applied research. She is the leading scholar in the Caribbean on coral genetic rescue and adaptation of corals to climate change. Her research on population genetics and conservation guides researchers in many fields outside of coral reef ecology, colleagues said.

"Research like hers is extremely important because corals are the foundation species of one of the most diverse communities on earth, because coral reefs provide sustenance, economic and physical stability to many countries, and because healthy coral reefs are necessary for a healthy ocean and planet," a nominator said.

Baums' research focuses on the evolutionary ecology of cold-water corals and the population dynamics of symbiotic tropical corals. She relies on an extensive network of collaborations both at Penn State and with several national and international organizations devoted to the conservation of coral reefs.

Colleagues said her results and ongoing work have profound implications for aiding endangered coral populations and species, adding that Baums' numerous and diverse funding sources highlight both the severity of the problems coral reefs face and her ability to produce research results that pinpoint solutions.

Carina Curto- Professor of Mathematics

Curto, who uses applied math to help explain neural network theory and coding, has made several advances helping us understand how the brain communicates with the outside world. Her work, nominators said, has been internationally recognized for its originality and promise.

"Curto's research is marked by striking originality," a nominator said. "She focuses on fundamental questions in neuroscience and uses her mathematical expertise to make profound contributions to the field."

She used topology to better understand the role of place cells of the hippocampus, which are thought to be the global positioning system of the brain. These place cells fire when an animal is near a familiar location. Curto's work shows the overlap of the firing patterns of groups of place cells inform the brain of its environment including its topology and a metric that defines the distance between any pair of places.

Curto also investigated how neurons encode auditory information. Her work shows how the brain can take massive amounts of data and summarize it using a simple, two-variable model used for single neurons that work in a complex system of neurons. Another key finding is how the brain can switch the way it responds to these neurons, depending on its state.

Curto also unveils the math behind how memories are encoded. She uses a firing-rate model for individual neurons and describes the network as a whole as a nonlinear system of ordinary differential equations for the firing rates as a function of time. When a particular set of neurons fires, the memory is identified. Curto is researching the limits of these systems in their ability to store and recall memory.

“Curto is a superbly original and strongly interdisciplinary mathematical scientist whose work employs mathematics at the highest level to interpret the results of experimental neuroscience,” a nominator said. “The questions she asks are fundamental, and the answers she obtains are profound and important contributions.”

[Jennie Noll- Professor of Human Development and Family Studies](#)

Noll, an expert in child maltreatment and advocacy, joined Penn State in 2013 tasked with forming researchers and educators around the Penn State Child Maltreatment Solutions Network, which she helped to create and now directs as a unit of Penn State’s Social Science Research Institute.

Through the network, Noll’s research addresses research that transforms the health and development trajectory of abused and neglected children. The goal is produce research that informs treatment and policy change while educating the next generation of experts in the field.

Interdisciplinary network faculty are in the departments of psychology, biobehavioral health, sociology and criminology, pediatrics, educational psychology, human development and family studies and the School of Nursing.

Nominators said Noll’s advocacy and research is active at all levels, from local to international. Noll advocates the importance of research in the social and behavioral sciences and has presented at the committees in both chambers of U.S. Congress.

To help make Penn State a leader in the field, Noll and her team were awarded the first National Institutes of Health-funded P50 Capstone Center for Childhood Maltreatment Research and Training via a nearly \$8 million grant. All told, Noll has secured more than \$30 million in research funding as a principal investigator.

“Her leadership and vision has brought together a dedicated, talented group of faculty who are contributing to the network’s continued success with their own seminal work as well as through partnering with Noll on the P50 Center grant,” a nominator said. “Her own research on the long-term impact of early child maltreatment on mental, physical, and emotional

health, and on mechanisms by which maltreatment is inter-generationally transmitted is prolific, formidable, cutting-edge and driving the field."

[Marica Tacconi- Professor of Musicology](#)

Tacconi is a pre-eminent scholar on the music of 15th-, 16th- and 17th-century Italy, especially Florence and Venice. Her work shines light on the political and cultural history of the Italian Renaissance and early Baroque. Nominators said the way Tacconi combines the arts and humanities into her research is truly remarkable and qualifies her uniquely for the honor.

Last fall, Tacconi presented at Penn State the lecture-recital "Musical Gems from Three Newly Uncovered Venetian Manuscripts," which was based on material she uncovered while on sabbatical in Venice, Italy, in Fall 2018. While there, she studied three music manuscripts preserving works that, in some cases, had not been heard in nearly 400 years. Tacconi transcribed several of the compositions into modern notation and brought the music back to the concert stage, performed by internationally acclaimed soprano Liesl Odenweller and harpsichordist Marija Jovanovic, both based in Venice. Additionally, she has collaborated with Grammy Award-winning early music ensemble Apollo's Fire (The Cleveland Baroque Orchestra), exposing audiences to less familiar styles of music.

"These recent lecture-recitals exemplify the kind of integrative work Tacconi excels in," a nominator said. "She is a humanist but also someone who fully embraces the arts in her endeavors. This is most evident in the way she works with internationally acclaimed musicians to bring her research findings back to life through public performances. Her research roars back to life not only through scholarly publications but also by way of musical performances."

Nominators said Tacconi's analytical writings on music manuscripts reflect how musical works of the time could have wider, political purposes. One example of this, the nominator said, is when the Medici family returned to Florence after a long period in exile. The re-establishment of their power is reflected in the manuscripts produced at the time. Tacconi's work shows that music, too, served as an instrument of political propaganda and consolidation.

"Her impact as a researcher, teacher and performer exemplifies the role of a world-class arts and humanities scholar," a nominator said. "Tacconi negotiates access to rare work that leads to world recognition in her field, and collaborates with performers to make early music come alive for modern audiences, while expanding her research agenda, making new discoveries that impact the scholarship and interpretation in the field."

[Donghai Wang – Professor of Mechanical Engineering](#)

Wang has earned this distinction through his efforts in enhancing lithium battery technology. As a key researcher in the Battery and Energy Storage Technology (BEST) Center,

Wang has helped craft the highly impactful and world-class research program housed at the University.

In the past decade, his research has focused on the discovery and development of novel chemistry, materials and systems for electrochemical energy storage. Approaching his research as inherently interdisciplinary, Wang has worked with a broad range of students and faculty from colleges and units across Penn State to successfully pioneer new impacts in the field.

Recently, Wang and his team developed an innovative method that could enable the widespread use of silicon-based anodes in lithium ion batteries. In addition, he also detailed the creation of a solid-electrolyte interphase, a novel technique that could help achieve both high-energy density and long-cycling within the metal batteries. These research advancements are likely to enhance the performance of electric vehicles and smartphones.

His work has been influential beyond the University, demonstrated by his designation as a Web of Science Highly Cited Researcher by Clarivate Analytics.

“Advances in batteries have led to the rapid acceleration of the devices we all rely upon today. Future advances hinge on improved and advanced materials that can provide even better performance,” a nominator said. “Wang came to Penn State to establish a world-class research program in battery and energy storage technology in a field that falls at the intersection of engineering, chemistry and materials science and he has done just that.”