UC SANTA BARBARA

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Risk Yields Reward

UC Santa Barbara chemical engineering professor Michelle O'Malley has been named the recipient of the American Institute of Chemical Engineers (AIChE) 2021 Allan P. Colburn Award. The award, named for a legendary professor who founded the University of Delaware chemical engineering department, recognizes significant contributions to chemical engineering through publications by younger members of the institute. Nominees must have earned their highest academic degree within 12 calendar years of the year in which the award is presented. O'Malley received her Ph.D. in chemical engineering from the University of Delaware in 2010.

"I'm honored to be recognized with the Allan P. Colburn Award from AIChE," O'Malley said. "This honor inspires me to reflect on all of the wonderful publications that originated from my laboratory — many of which came from very risky research projects that took many years to bring to fruition. I attribute the Colburn Award to the hard work and dedication of current and past trainees in my laboratory, as well as several key collaborators who conducted the research and worked with me to publish these studies."

In 2020 alone, O'Malley received an AIChE Food, Pharmaceutical, and Bioengineering Division Early Career Award, as well as an American Society of Microbiology Award for Early Career Applied and Biotech Research, and was named a fellow of the American Institute of Medical and Biological Engineering. She has received a Camille Dreyfus Teacher-Scholar Award and a Rising Star Award from the American Chemical Society's Women Chemist Committee, among many other honors and distinctions.

“We at the College of Engineering are tremendously proud of Professor Michelle O’Malley,” said Rod Alferness, dean of engineering. “Her innovative research, published regularly in high-profile journals, has earned her broad respect and recognition, as well as numerous professional awards, the latest of which is the prestigious Allan P. Colburn Award. Her work reflects the spirit of multidisciplinary collaboration that characterizes the College of Engineering and enables so many important discoveries to emerge. I offer her our deepest and most sincere congratulations.”

“On behalf of the chemical engineering department, we congratulate Professor O’Malley on this well-deserved recognition,” said Rachel Segalman, department chair. “The Colburn Award is the most prestigious award for early-career chemical engineers given by our national disciplinary society, AIChE, and is a reflection of Michelle’s innovation and insightful contributions to the field. We’re thrilled for her and to have her as part of our community.”

O’Malley received a U.S. Department of Energy Early Career Award in 2013, a TechConnect Innovation Award in 2014 and a National Science Foundation Early Career Award in 2015. She earned a Presidential Early Career Award for Scientists and Engineers (PECASE) from President Obama in 2016, the highest distinction bestowed on young scientists by the federal government. She has been named one of the Top 35 Innovators Under 35 by the MIT Technology Review, and was included in the 2019 Science News list of Ten Scientists to Watch.

O’Malley is perhaps best known for establishing a new research field by engineering anaerobes, which evolved to decompose and recycle carbon biomass throughout the Earth — from our guts to landfills and compost piles. She is the world leader in engineering anaerobic fungi and associated microbiomes and has published papers on various aspects of the subject in many leading journals, including Science, Nature Microbiology, Nature Genetics, and Nature Chemistry.

Her long-term vision is to achieve a fundamental understanding of the genetic pathways that will lead us to understand and control biomass breakdown in anaerobic microbiomes, which has applications in carbon cycling, bioremediation and the production of high-value chemicals.

O’Malley’s group has provided breakthrough insights into enzymes that already outperform the current industrial standards, and also multiplied the amount of

sequencing data available for anaerobic fungi. They developed the first standard laboratory practices to work with these fragile organisms, and made discoveries about biomass-degrading enzymes that had eluded the community for several decades. Her innovative approaches and results are generating substantial attention not only from the scientific community, funding agencies and industry, but also from the popular press, including BBC News, Newsweek, CNBC News and Forbes.

By leveraging breakthroughs made in her lab — such as isolating anaerobes from the guts and fecal materials of herbivores and identifying a very large extracellular non-catalytic scaffolding protein in fungi that mediates enzyme tethering and biomass hydrolysis — she established a set of design rules (a “parts list”) to make synthetic enzyme complexes having new properties and functions.

O’Malley’s ongoing work focuses on the fact that biomass digestion is generally performed by consortia of microbes; she is now developing systems-level tools to evaluate and direct microbial interactions. She and her students have recently pioneered new approaches to isolate not only fungi, but also their dependent bacteria and methanogens, to create a simplified system to model their interactions. Her group’s research set the foundation for engineering microbial interactions in anaerobes to accelerate biomass breakdown, and serves as a unique spring board to study and engineer how microbes “partner” in nature and in bioreactors.

Her most recent publication describes how anaerobic fungi contain the genetic building blocks for putative antibiotics, opening the possibility — depending on what further characterization research shows — for the development of new medicines from gut microbes.

About UC Santa Barbara

The University of California, Santa Barbara is a leading research institution that also provides a comprehensive liberal arts learning experience. Our academic community of faculty, students, and staff is characterized by a culture of interdisciplinary collaboration that is responsive to the needs of our multicultural and global society. All of this takes place within a living and learning environment like no other, as we draw inspiration from the beauty and resources of our extraordinary location at the edge of the Pacific Ocean.