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At the Frontiers of Physics

Two UC Santa Barbara physics professors — Cristina Marchetti and Leon Balents — are among the newest members of the National Academy of Sciences (NAS). They join 98 others so honored, and 25 foreign associates, recognized for their "distinguished and continuing achievements in original research."

Marchetti and Balents bring to 42 the number of UCSB faculty elected to NAS, 16 of whom come from the Department of Physics.

"What a tremendous honor it is for our campus to congratulate two of our leading physicists, Professor Leon Balents and Professor Cristina Marchetti, on their election to the National Academy of Sciences," said UC Santa Barbara Chancellor Henry T. Yang. "This prestigious peer recognition acknowledges the depth and breadth of the pioneering research and distinguished contributions through which each is pushing the boundaries of science, and we join with the academy and our global society in being inspired by their brilliance."

Both Marchetti and Balents work in relatively new and burgeoning areas of physics — Marchetti in the field of active matter and Balents in the realm of quantum materials. Both quantum and active matter systems are characterized by the collective behaviors of their many individual components, but these systems exist at different scales and possess different properties.

"I am incredibly pleased and honored to have been elected to the National Academy of Sciences," said Balents, a permanent member of the campus's Kavli Institute for

Theoretical Physics (KITP). “I’ve spent most of my career at UC Santa Barbara, and owe much of my scientific success to the great environment here, especially the Kavli Institute for Theoretical Physics and the physics and materials departments.”

Balents, who holds KITP’s Yzurdiaga Chair in Theoretical Physics, is particularly interested in the quantum aspects of materials. Think behaviors of electrons and atoms at the subatomic and molecular scales that to our eyes would be strange, such as forming particles that are also waves, carrying signals that mysteriously connect far-separated regions, and being in more than one configuration at the same time. According to Balents, these odd quantum-scale properties do not only underlie all materials — if harnessed, they can be used to generate sophisticated materials that perform highly advanced functions, such as converting waste heat into energy or transmitting power with ultra-low loss. They can also serve as the basis for future quantum computers.

Recently appointed to co-lead the Canada-based CIFAR research institution’s quantum materials program, Balents received his bachelor’s degrees in physics and in mathematics from MIT in 1989. He went on to receive his Ph.D. from Harvard in 1994. First coming to UC Santa Barbara as a postdoctoral fellow in 1994, he returned in 1999 as a professor in the Department of Physics and became a permanent member of KITP in 2008.

Farther up the size- and length scales, Marchetti’s specialization, active matter, is a field she is credited with helping to define and create.

“It is wonderful to receive such a recognition from the community for one’s contribution to science,” Marchetti said of her election to NAS. “I am grateful to UC Santa Barbara for welcoming me in their faculty less than a year ago and to Syracuse University for the support I have received there for the past thirty years. Any success I may have had in research would not have been possible without the inspiring collaborations I’ve had with students, postdocs and colleagues.”

For the past 15 years, Marchetti has been studying active matter — systems made up of a large number of interacting units that consume energy to generate forces and motion. These can range from the cells in our bodies to bacterial colonies to flocks of birds and schools of fish, all of which spontaneously organize in complex patterns and structures on scales much larger than those of the individuals.

Recently, her work in the general area of nonequilibrium statistical mechanics earned her the inaugural Leo P. Kadanoff Prize from the American Physical Society.

Marchetti joined the UC Santa Barbara faculty in 2018, after three decades as a professor of physics at Syracuse University. Prior to that, she was an assistant professor of physics at the University of Illinois in Chicago. She also has been a visiting professor at Harvard University and a member and chair of the Advisory Board of UC Santa Barbara's KITP. She received her Ph.D. in physics from the University of Florida and her Laurea (equivalent to a masters degree) cum laude from the University of Pavia in Italy.

NAS is a private, nonprofit institution established under a congressional charter signed by President Abraham Lincoln in 1863. It recognizes achievement in science by election to membership and — with the National Academy of Engineering and the National Academy of Medicine — provides science, engineering and health policy advice to the federal government and other organizations.

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.