Three NSF CAREER awards help advance research in quantum science

The three awardees came to UCI's Department of Physics & Astronomy in just the last three years

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Condensed matter physicists Javier Sanchez-Yamagishi, Judit Romhanyi and Luis Jauregui won NSF CAREER awards.

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UCI Physical Sciences

Each year, the National Science Foundation gives out 500 Faculty Early Career Development program, or CAREER, awards in all scientific fields. The awards go to early-career scientists who show the promise to become the next leaders in their respective fields, and in 2021 three professors in the UCI School of Physical Sciences' Department of Physics & Astronomy were awarded. Notably, all three of the awardees do their research in condensed matter physics, and they were all hired in the last three years. They are also members of the recently-founded Eddleman Quantum institute (EQI).

"NSF CAREER grants are hard to come by as they aim to support only the highest-potential young scientists in their fields," said Professor James Bullock, who is the

dean of Physical Sciences. “That all three of our most recent hires in condensed matter physics have won this prestigious award points towards a brilliant future ahead. More generally, this kind of recognition is indicative of the excellent faculty that surround us on this campus — what a privilege it is to work alongside folks like this."

Assistant Professor Judit Romhanyi is a theoretical condensed matter physicist and the newest member of the condensed matter physics group. Her winning CAREER proposal will give her $687,867 to strike out and, perhaps, discover new properties of quantum magnets — magnets, whose properties are unquestionably quantum. The work has the promise to discover new, untrodden paths to the quantum computer designs that are protected from failures and to an efficient way of reading information that is encoded in their novel quantum memory elements, and also to help develop new technologies that consume less energy. Additionally, the funds will also support diversity, equity and inclusion efforts in the school by launching what Romhanyi calls a summer physics “bootcamp” that will draw local students from underrepresented minorities to UCI so they can get a feel for higher education and how it could be a path for them.

Another awardee is Assistant Professor Luis Jauregui, who joined UCI in 2019. He is a quantum physicist and also director of the Irvine Quantum Materials Center. Jauregui won a CAREER award totaling $670,844, which he said will be used to study “atomically thin materials under the influence of acoustical waves.” The work, he added, could have broad-ranging applications in the development of new electronics. “Even more,” Jauregui said, “the sound waves can be used to trap and manipulate electrons and explore their interactions to discover new physics and create new devices, simulators, and computers.” Like Romhanyi, Jauregui plans to use his part of the funding to augment efforts in the DEI realm through efforts he’s already involved with, including an NSF-funded program, Cal-Bridge, that provides a summer undergraduate research stay for Cal States physics students and a summer camp for high-school students called COSMOS, which sees students come to UCI to get first-hand experience in a range of STEM disciplines, from cancer biology to astronomy. Also, the efforts to include quantum science experiments in the undergraduate labs through the construction of a nitrogen-vacancy spin qubit. “Thanks to NSF and the Eddleman Quantum Institute, we will include quantum science experiments in programs that involve high school and undergraduate students such as COSMOS, Cal-Bridge, and the UCI Advanced Labs,” Jauregui said.

The third CAREER winner is Assistant Professor Javier Sanchez-Yamagishi. Sanchez-Yamagishi joined UCI in 2018, and his research deals with what he describes as the smallest Rubik's Cubes on the planet. The cubes are atom-sized, and Sanchez-Yamagishi uses them to study the ways in which electricity can flow through such structures. With the help of his $660,190 CAREER grant, he and his lab will be using a dial that can change the structure of the cubes so they can gauge how different configurations affect the flow of electricity. You can read about Sanchez-Yamagishi's award in this Physical Sciences Communications coverage from 2021.

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