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## NSF Graduate Research Fellowship Awarded to Physics Major

April 22, 2015

BLOOMINGTON, Ill.— The National Science Foundation (NSF) has awarded Illinois Wesleyan University physics major Margaret McCarter '15 (Arlington Heights, Illinois) a three-year Graduate Research Fellowship.

The competitive program awarded 2,000 fellowships this year from among 16,500 applicants spread across natural and social sciences, technology, engineering and mathematics, making it among the most competitive graduate fellowships nationwide, according to Professor of Physics Narendra Jaggi. NSF Graduate Research Fellows receive an annual stipend of \$34,000 for three years, and an honorarium of \$12,000 toward tuition and fees at the student's graduate institution. Since the 1950s, NSF has provided fellowships to individuals selected early in their graduate careers based on their demonstrated potential for significant achievements in science and engineering. Former NSF Fellows include numerous Nobel Prize winners, Google co-founder Sergey Brin and former U.S. Secretary of Energy Steven Chu.

"I would have to go back years to name another IWU physics major whose combination of ability, achievement in the classroom, work ethic, achievement in research labs both during summers and during the academic year, is comparable to that of Margaret," said Jaggi, who served as McCarter's advisor. "This fellowship, and her admission to the Ph.D. program at the University of California-Berkeley, are launching her on a very promising trajectory."

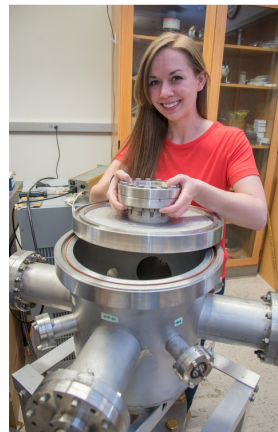
McCarter credits her Illinois Wesleyan experiences with her successful fellowship application. "It's a very exciting time for me, but I think this award also says a lot about the quality of the physics department here," said McCarter. "I doubt I could have gotten where I am now without the help of all my professors, classmates and friends. The supportive environment here at IWU has really made all the difference."

As a student McCarter worked summers in labs at Yale University and at the University of Illinois. At Yale she looked at using ferroelectric materials, which have an intrinsic electric field, making them good candidates for use in electronics and memory devices. In the Yale lab, she used a ferroelectric material to create a transistor, an electronic component found by the billions in cell phones and computers.

"At the interface between two different materials, there are a lot of new properties that can arise that are different than the individual properties of the two materials separately," said McCarter. "I was totally fascinated by this idea, and I'm hoping to study similar phenomena in graduate school."

At the University of Illinois lab, McCarter learned the techniques to study iron-based superconductors, a newer class of materials not well understood. Understanding the mechanisms of superconductivity and how the electrons behave are important for the future of superconductors, where they could be used to help meet society's growing energy needs, she explained. The fact that superconductors do not lose power, as ordinary conductors do, makes them ideal for energy applications.

"The biggest roadblock is that superconductors need to be kept very cold in order to work," McCarter explained. "The hope is that by studying and understanding these materials, we can find better superconductors that can operate at practical temperatures for widespread applications."



Margaret McCarter works with the vacuum chamber containing an electron energy analyzer in an IWU physics lab.



Margaret McCarter credits her Illinois Wesleyan experiences with her successful fellowship application.

McCarter was also named as a Goldwater Scholar, recognizing outstanding academic achievement in mathematics, the natural sciences and engineering. She served as co-president of the Illinois Wesleyan Society of Physics Students, and was a founding member of the IWU student chapter of SPIE, an international society advancing an interdisciplinary approach to the science and application of light. She is a member of the American Physical Society and the National Society of Leadership and Success. At IWU McCarter also worked in the lab of Assistant Professor of Physics Bruno deHarak on his NSF-funded research on electron scattering processes.

Ultimately McCarter would like to work as a researcher at a national lab or in private industry. She'll have an opportunity to test the atmosphere in a lab this summer, when she works at Argonne National Laboratory. This fall McCarter will enter the Ph.D. program in physics at the University of California, Berkeley. At Cal she expects to be part of Professor Ramamoorthy Ramesh's lab.