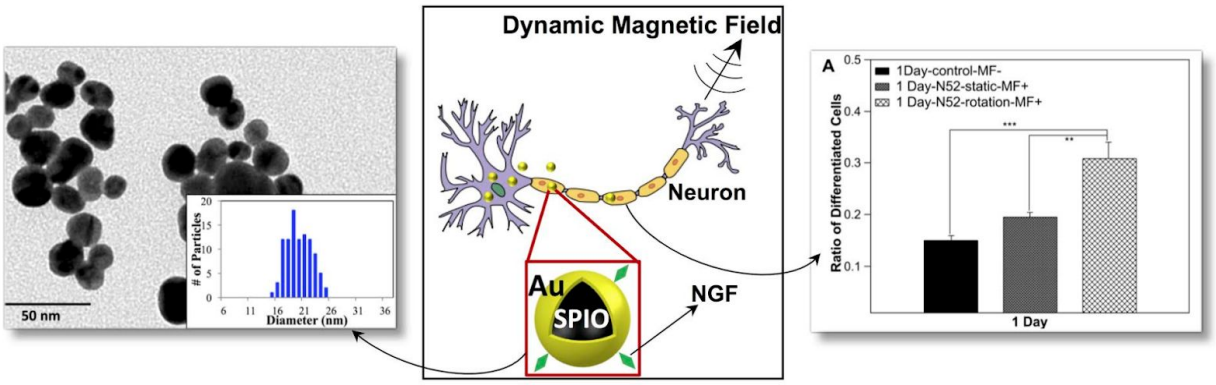
NSF CAREER Award for Ya Wang
Funding supports neurodegenerative disease research

The prestigious CAREER Award from the National Science Foundation (NSF) has been bestowed upon mechanical engineering Assistant Professor Ya Wang for her project, ***Understanding Dynamics of Ultra-small Magnetic Nanoparticles in the Brain for Neuron Regeneration Therapies***. The award exclusively supports the research of junior faculty with a federal grant through the NSF's Faculty Early Career Development Program (CAREER).

A remarkable transformation of non-invasive neuron regeneration is enabled by applying magnetic fields on biodegradable ultra-small (~20 nm) magnetic nanoparticles (NPs). To date, neuroscientists have largely focused on the associated biological phenomena, with little attention to microvascular dynamics of NP transport, thus limiting the translation to clinical practice. Professor Wang proposes that the $500k CAREER grant will generate new knowledge for bridging this gap, and will potentially lead to a new era of precision medicine and tissue engineering over the next five years. The research objective of Professor Wang's CAREER project is to analyze biological phenomena to predict the neuron regeneration mechanisms. The established microvascular dynamic model, capable of quantifying the neuron regeneration process, is essential for moving closer to clinical success in treating fast-spreading neurodegenerative diseases.



"Professor Wang is the 9th recipient of NSF CAREER award in the history of our department. Her work on modeling the dynamic behavior of magnetic nanoparticles within the brain microenvironment would lay the foundation for quantifying the neuron regeneration process. This opens up the exciting new possibility for the development of a new microchip for brain research," said Jeff Ge, chair and professor of mechanical engineering.

Professor Wang intends for this project to lead to groundbreaking discoveries, while also creating awareness of nanotechnology and biomedicine. "I strive for this project to increase the participation in STEM programs from minority groups, including women and first-generation

college students on Long Island. It will also expose students, high school teachers, clinicians, and the public to STEM-related research, with the intent to support, teach, and inspire."

As the director of the Nanomaterial Energy Harvesting and Sensing (NES) lab, Professor Wang's research focuses on studying dynamic features of smart materials, structures, and intelligent systems. Her work has been sponsored by NSF, DOE ARPA-E, DOD ONR, DOT UTRC, and local industrials. She was awarded the 2015 Special Congressional Recognition and the 2015 DOE Wave Energy Prize. She is also an advisor to four semi-finalists of Intel/Regeneron Science Talent Search and to several semi-finalists of the Siemens competition. She has authored one book chapter, 28 journal papers, and 30 conference proceeding papers, as well as filed a U.S. utility patent and five provisional patents. She is a member of ASME, SPIE, AIAA, IEEE, and is the conference symposium chair of the 2018 ASME SMASIS, and a technical committee member of ASME SMASIS, and SPIE NDE/smart structures.

Professor Wang also works extensively with the Stony Brook Simons summer research program, the URECA program, and the WISE program to mentor high school and undergraduate students, in particular women, and students from other underrepresented minority groups. As a woman in engineering, Professor Wang's personal experiences in the U.S. have given her a deep understanding and appreciation of difficulties faced by these students and she strives to help them succeed in the engineering field.