Prof. Jean Anne Incorvia, assistant professor in the Department of Electrical and Computer Engineering at The University of Texas at Austin's Cockrell School of Engineering, has been selected to receive a Faculty Early Career Development (CAREER) Award from the National Science Foundation. The award is the most prestigious offered by NSF's CAREER Program, providing up to five years of funding to junior faculty members who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of their organizations’ missions.

Prof. Incorvia received the award for her research on "Capturing Biological Behavior in Three-Terminal Magnetic Tunnel Junction Synapses and Neurons for Fully Spintronic Neuromorphic Computing." Brain-inspired computing is a revolution in computing that is already seeing applications in a myriad of areas, from image recognition to developing learning rules that allow computers to intelligently process big data sets. The goal of this CAREER proposal is to model, build, and measure three-terminal magnetic tunnel junction (3T-MTJ) devices that can, as closely as possible, capture the biological behavior of the brain. Like the brain, compared to traditional computers, magnetic materials have relatively slow switching but with low voltage, nonvolatility, and with digital, analog, stochastic, and oscillatory behavior. Little research has moved beyond simple multi-weight synapses and stochastic neurons to capture more robust biology that allows the brain to perform data-intensive tasks with low power consumption and in real time. The proposed research method to address this problem is to understand the biological behavior by working with neuroscientists; map the biological behavior onto magnetic properties; develop and simulate the device; fabricate and test the device; and then measure the switching energy and probability in comparison to biology and other artificial neurons and synapses (e.g. silicon and other resistive memories).

Dr. Incorvia received her Ph.D. in physics from Harvard University in 2015, cross-registered at MIT, where she was a Department of Energy Graduate Student Fellow. From 2015-2017, she completed a postdoc at Stanford University in the department of
electrical engineering, working in nanoelectronics. She received her bachelor’s in physics from UC Berkeley in 2008.

Dr. Incorvia is focused on developing practical nano devices for the future of computing using emerging physics and materials. This has included research in fabricating spintronic logic devices and circuits, new types of magnetic memory using spin orbit torque effects, the intersection of 2D materials and spintronics, and using low-dimensional materials for interconnects and transistors.

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