

From Imperfect Nanowires to Intelligent Hardware: Co-Design of Materials, Devices, and Neuromorphic Systems

Tuesday, September 15, 2026

2:00 PM – 3:00 PM

Olin 125

Reception to follow

3:00 PM – 3:30 PM

Olin 204



Dr. Payman Zarkesh-Ha

V. Clayton Lafferty Endowed Chair and Professor, Electrical and Computer Engineering, Marquette University

ABSTRACT: The continued scaling of conventional CMOS technology faces increasing challenges in power consumption, device variability, and physical limits. At the same time, emerging AI applications demand computing architectures with dramatically improved energy efficiency. This talk presents a co-design approach in materials, devices, and systems to develop a new generation of energy-efficient neuromorphic hardware. The research combines floating-gate nanowire transistors, and monolithic 3D integration to create massively parallel and reconfigurable computing architectures. A key idea is to embrace device imperfections rather than treating them solely as limitations, using the inherent tolerance of neuromorphic systems to enable scalable and efficient hardware. The talk will discuss the underlying materials and device technologies, statistical device modeling, neuromorphic architectures, and opportunities for low-temperature, BEOL-compatible 3D integration. Together, these approaches point toward a new paradigm in which materials, devices, and computing architectures are designed together to overcome the limitations of conventional semiconductor technology.

BIOGRAPHY: Payman Zarkesh-Ha is the V. Clayton Lafferty Endowed Chair and Professor in the Department of Electrical and Computer Engineering at Marquette University. He received his Ph.D. in Electrical and Computer Engineering from Georgia Tech in 2001. Prior to joining Marquette, he spent 20 years at the University of New Mexico, where he served as Professor in the Department of Electrical and Computer Engineering and Director of the Center for High Technology Materials. He also worked in the semiconductor industry at LSI Logic, gaining experience in integrated circuit design and semiconductor technology. His research spans microelectronics, VLSI, semiconductor devices, integrated circuit design, RF circuits and systems, and emerging computing technologies, with an emphasis on innovative and energy-efficient semiconductor systems. He has published more than 130 papers and holds more than 20 issued U.S. patents.