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PWEB 175

Nature in Motion: The power of bioinspired design in unraveling locomotion across mediums and scales

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Abstract: Organisms have evolved various locomotion (self-propulsion) and shape adaptation (morphing) strategies to survive and thrive in diverse and uncertain environments. Unlike engineered systems, which rely heavily on active control, natural systems often exploit distributed flexibility to simplify global actuation and control requirements. This talk will introduce several examples of bioinspired multifunctional structures, such as feather-inspired flow control devices and fish- and insect-inspired robotic model organisms. These devices and systems offer a pathway toward revolutionizing mechanical systems across scales and in different media. The work presented in this talk also highlights how engineering analysis and experiments can help answer critical questions related to elasticity in biological systems, such as the click beetles' legless jumping. These research topics showcase that biology and engineering form an interdisciplinary two-way street. On one side, natural solutions can inform and inspire mechanical systems' design. This is referred to as bioinspiration or bioinspired design. The other side is referred to as engineering-enabled biology. On this side, controlled engineering experimental, numerical, and analytical tools are used and developed to answer key biological questions that would be difficult or even impossible to answer directly using the natural system.

Biographical Sketch: Prof. Aimy Wissa joined the Mechanical and Aerospace Engineering Department at Princeton University as an Assistant Professor in January 2022. She is the director of the Bio-inspired Adaptive Morphology (BAM) Lab. Wissa was a post-doctoral fellow at Stanford University, and she earned her doctoral degree in Aerospace Engineering from the University of Maryland in 2014. Wissa's work focuses on the modeling and experimental evaluation of dynamic and adaptive bioinspired structures and systems, such as avian-inspired and insect-inspired wings and robotic systems with multiple modes of locomotion. Wissa is a McNair Scholar. She has received numerous awards, including the Air Force Office of Scientific Research Young Investigator and NSF's CAREER awards.

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