Center for Environmental & Applied Fluid Mechanics

"Nature in Motion: The Power of Bioinspired Design in Unraveling Locomotion across Mediums and Scales"

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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 rely on reflexive and passive control. Nature often exploits distributed flexibility to simplify global actuation requirements. These approaches to locomotion and morphing rely on multifunctional and passively adaptive structures. This talk will introduce several examples of bioinspired multifunctional structures, such as feather-inspired flow control devices. Flow control devices on birds' wings will be introduced as a pathway toward revolutionizing small air vehicles' current design and flight control. Wind tunnel and flight-testing results show the aerodynamic benefits of these devices in delaying stall and improving flight performance. In addition to bioinspired engineering, I will highlight how engineering analysis and experiments can help answer critical questions related to elasticity in biological systems, such as the flying fish aerial-aquatic transition and click beetles' legless jumping. These research topics represent examples of how nature can inform robotic engineering design and highlight that engineering analysis can provide insights into the locomotion and adaptation strategies nature employs.

Spring 2024 CEAFM Seminar Series

April 26, 2024 ✖ 3:00 PM ✖ Gilman Hall 132