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"The Role of Flow in the Morphodynamics of Embryonic Heart"

Friday, December 8, 2017
11:00 am – 12:00 pm
UPC, Denney Research Center (DRB), Room 145

Nature has shown us that some hearts do not require valves to achieve unidirectional flow. In its earliest stages, the vertebrate heart consists of a primitive tube that drives blood through a simple vascular network nourishing tissues and other developing organ systems. We have shown that in the case of the embryonic zebrafish heart, an elastic wave resonance mechanism based on impedance mismatches at the boundaries of the heart tube is the likely mechanism responsible for the valveless pumping behavior. When functioning normally, mature heart valves prevent intracardiac retrograde blood flow; before valves develop there is considerable regurgitation, resulting in oscillatory flow between the atrium and ventricle. We show that reversing flows are particularly strong stimuli to endothelial cells and that heart valves form as a developmental response to oscillatory blood flow through the maturing heart.

Mory Gharib is the Hans W. Liepmann Professor of Aeronautics and Bio-Inspired Engineering, the Director of the Graduate Aerospace Laboratories at the California Institute of Technology (GALCIT), and the Director of the Center for Autonomous Systems and Technologies. Dr. Gharib is recognized for his accomplishments as an entrepreneur and founder of several successful imaging technology companies. He owns over 100 U.S. patents in biomedical applications and imaging technology. Professor Gharib's current research interests in conventional fluid dynamics include vortex dynamics, active and passive flow control, micro fluid dynamics, bio-inspired wind and hydro energy harvesting, as well as advanced flow-imaging diagnostics. His bio-mechanics and medical engineering research include cardiovascular fluid dynamics, aquatic-breathing/propulsion, and development of medical devices such as heart valves, cardiovascular health monitoring, and drug delivery systems.

Hosted By: Megan McCain