COLLEGE OF ENGINEERING
MECHANICAL ENGINEERING
UNIVERSITY OF MICHIGAN

ME Department Seminar

Coupling Insights into Emerging Markets with Engineering Science to Create High-Performance, Low-Cost, Global Technologies

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Tuesday, October 2, 2018
3-4 p.m.
2153 GGB

Abstract

The MIT Global Engineering and Research (GEAR) Lab characterizes the unique technical and socioeconomic constraints of emerging markets, then combines these insights with engineering science and product design to create high-performance, low-cost, globally-relevant technologies. This approach has catalyzed three primary technological and research contributions, which will be the focus of this talk: a method for tuning the constitutive behavior of low-cost, passive prosthetic legs to induce near able-bodied biomechanics; characterizing the coupled solid and fluid mechanics of drip irrigation systems to design devices that require one-half the pumping power as conventional technology and lower the capital cost of off-grid systems by up to 40%; and co-optimization of electrodialysis (ED) desalination and photovoltaic (PV) power systems that are 40% less expensive than current technology, and ED stack designs which cut capital cost or production time by more than 50% through active voltage control. In addition to advancing the science and design knowledge in these areas, all three projects have manifested in new engineering hardware and field tests around the world with target stakeholders. Furthermore, by providing high-value, low-cost solutions, each project has become a "reverse innovation", with variants of the technology now transferring to wealthier, global markets. This talk will demonstrate how rigorous engineering theory combined with insights on emerging market constraints can yield high-value solutions relevant to poor and rich countries alike.

Bio

Amos Winter is the Ratan N. Tata Career Development Associate Professor of Mechanical Engineering at MIT. His research focuses on machine and product design for developing and emerging markets. Prof. Winter earned a BS from Tufts University (2003) and an MS (2005) and PhD (2011) from MIT, all in mechanical engineering. He received the 2010 Tufts University Young Alumni Distinguished Achievement Award, the 2012 ASME/Pi Tau Sigma Gold Medal, was named one of the MIT Technology Review's 35 Innovators Under 35 (TR35) for 2013, and received the MIT Edgerton Faculty Achievement Award and an NSF CAREER award in 2017. In 2018 he joined the first cohort of the National Academies New Voices in Sciences, Engineering and Medicine program. Prof. Winter is also the principal inventor of the Leveraged Freedom Chair (LFC) developing world wheelchair, which was a winner of a 2010 R&D 100 award, was named one of the Wall Street Journal's top innovations in 2011, received a Patents for Humanity award from the U.S. Patent and Trademark Office in 2015, and was the subject of "Engineering Reverse Innovations", winner of the 2015 McKinsey Award for the best article of the year in Harvard Business Review.