Civil Engineering
at JOHNS HOPKINS UNIVERSITY

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WHITING SCHOOL OF ENGINEERING

"A new approach to wind energy"

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Modern wind farms require significant land resources to separate each wind turbine from the adjacent turbine wakes. This aerodynamic constraint limits the amount of power that can be extracted from a given wind farm footprint. We investigated the use of counter-rotating vertical-axis wind turbines in order to achieve higher power output per unit land area than existing wind farms consisting of propeller-style turbines. Full-scale field tests of vertical-axis wind turbines in various counter-rotating configurations were conducted under natural wind conditions during summer 2010. Whereas wind farms consisting of propeller-style turbines produce 2 to 3 watts of power per square meter of land area, these field tests indicate that power densities an order of magnitude greater can be achieved by arranging vertical-axis wind turbines in layouts that enable them to extract energy from adjacent wakes and from above the wind farm. Moreover, this improved performance does not require higher individual wind turbine efficiency, only closer wind turbine spacing and a sufficient vertical flux of turbulence kinetic energy from the atmospheric surface layer. The results suggest an alternative approach to wind farming that has the potential to concurrently reduce the cost, size, and environmental impacts of wind farms.

Dr. John Dabiri is a Professor in the Graduate Aeronautical Laboratories and the Option of Bioengineering at Caltech. He graduated from Princeton University with a B.S.E. degree summa cum laude in Mechanical and Aerospace Engineering in June 2001. In September 2001, he came to Caltech as a National Defense Science and Engineering Graduate Fellow, Betty and Gordon Moore Fellow, and Y.C. Fung Fellow in Bioengineering. Under the supervision of Professor Morteza Gharib, he earned an M.S. degree in Aeronautics in June 2003, followed by a Ph.D. in Bioengineering with a minor in Aeronautics in April 2005. He joined the Caltech faculty in May 2005. In 2008, he was selected as an Office of Naval Research Young Investigator for research in bio-inspired propulsion, and Popular Science magazine named him one of its "Brilliant 10" scientists. He was selected for a Presidential Early Career Award for Scientists and Engineers (PECASE) in 2009. In 2010, he was awarded a MacArthur Fellowship.

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JHU Homewood Campus
Hodson 110
12:00 – 12:45 pm

Seminar is FREE. For parking please see link for visitors at www.jhu.edu and select information on Homewood Campus.

One Professional Development Hour (PDH) will be awarded to attendees.