

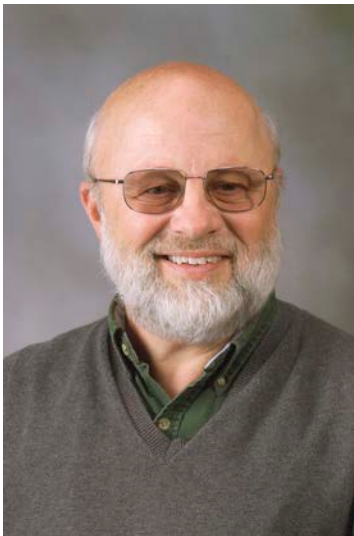
2015 Rayleigh Lecture

Good Vibrations: Low Power Energy Harvesting

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The goal of harvesting energy from ambient vibrations to drive low power electronics has caused a spike in academic research and the creation of a number of products. This talk traces the history, successes and failures of vibration based energy harvesting for powering low power electronics using piezoelectric and electromagnetic transduction. This talk presents the fundamentals of vibration based energy harvesting followed by examples of applications ranging from powering pacemakers to gust alleviation control systems for small, unmanned aircraft. Much of the research and many of the applications have focused on powering structural health monitoring systems. Piezoelectric based energy harvesting is very inefficient but works on the principle that in most circumstances it is capturing waste energy with little effect on the source. However in some circumstances, harvesting also acts as a noticeable source of damping providing additional utility. Electromagnetic harvesting is more efficient but requires larger amplitude vibrations and increased volumes. These constraints are also presented.



Daniel J. Inman received his Ph.D. from Michigan State University in Mechanical Engineering in 1980 and is currently Chair of the Department of Aerospace Engineering at the University of Michigan, as well as the C. L. "Kelly" Johnson Collegiate Professor. Since 1980, he has published eight books (on vibration, energy harvesting, control, statics, and dynamics), eight software manuals, 20 book chapters, over 300 journal papers and 540 proceedings papers, given 62 keynote or plenary lectures, graduated 61 Ph.D. students and supervised more than 75 MS degrees. He works in the area of applying smart structures to solve aerospace engineering problems including energy harvesting, structural health monitoring, vibration suppression and morphing. He is a Fellow of ASME, AIAA, IIAV and AAM.