

## Seminar Info

### 25 Years of Micro-Fabricated Motors and Generators

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Thursday March 29, 2012  
Larsen 234  
10:40 am – 11:40 pm

#### Abstract

This seminar will review the accomplishments of, and the lessons learned from, twenty five years of research on the development of micro-fabricated motors and generators. The earliest micro-fabricated machines, which appeared around 1987, were surface micro-machined electric variable-capacitance motors that converted perhaps 100 nW, most of which was consumed in bearing loss. Modern micro-fabricated generators, for example, are bulk micro-fabricated permanent-magnet synchronous machines riding on air bearings that produce near 10 W of useful electric power. There have been many other machines in between. From the beginning to now, fabrication constraints, bearings, parasitics, and power electronics have all posed problems that to a large extent have been overcome. As a result, the micro-fabricated machines of today exhibit power densities comparable to the best large scale electromagnetic machines. This is actually not a surprising result if one considers simple scaling laws.

#### Bio

Jeffrey H. Lang received his SB (1975), SM (1977) and PhD (1980) degrees from the Department of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology. He joined the faculty of MIT in 1980 where he is now a professor of Electrical Engineering and Computer Science. He served as the Associate Director of the MIT Laboratory for Electromagnetic and Electronic Systems between 1991 and 2003, and as an Associate Editor of Sensors and Actuators between 1991 and 1994. Professor Lang's research and teaching interests focus on the analysis, design and control of electromechanical systems with an emphasis on: rotating machinery; micro-scale (MEMS) sensors, actuators and energy converters; flexible structures; and the dual use of electromechanical actuators as motion and force sensors. He has written over 220 papers and holds 12 patents in the areas of electromechanics, MEMS, power electronics and applied control, and has been awarded 4 best-paper prizes from IEEE societies. He has also received two teaching awards from MIT. Finally, he is a coauthor of Foundations of Analog and Digital Electronic Circuits published by Morgan Kaufman, and the editor of, and a contributor to, Multi-Wafer Rotating MEMS Machines: Turbines Generators and Engines published by Springer. Professor Lang is a Fellow of the IEEE, and a former Hertz Foundation Fellow.