

IEEE Robotics and Automation Society  
Central New England Chapter

Tuesday, September 14, 2004  
Informal Discussion: 6:00 PM  
Program: 6:30 PM

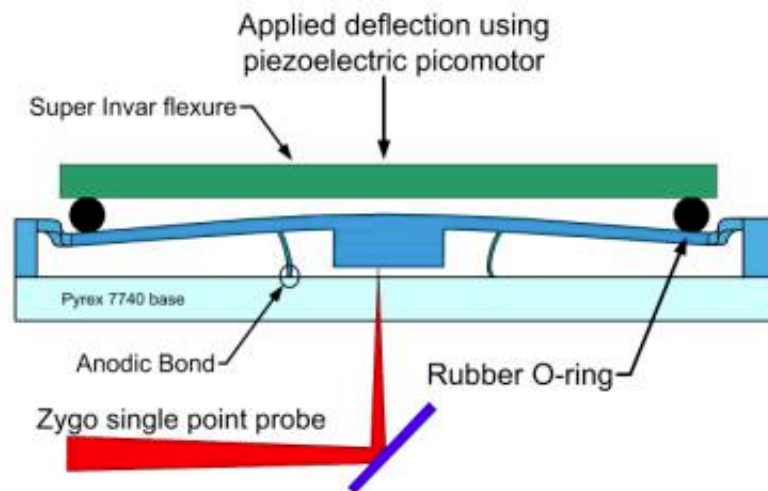
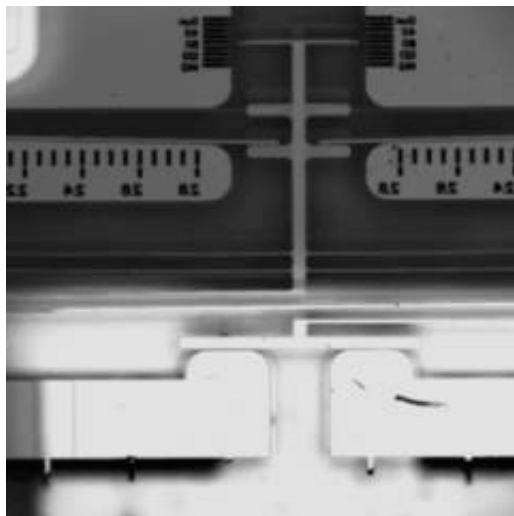
FUNDAMENTALS of Designing Machines & MEMS

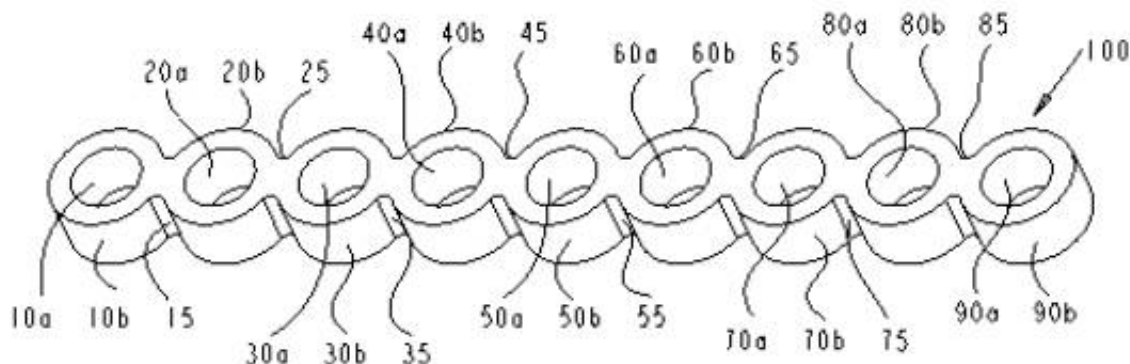
Presented by

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All of our worldly goods were created with machines, but how were the machines created and with what design tools? Are these same design tools useful for designing MEMS machines? From Occam to Saint-Venant to Abbe to Maxwell, examples of fundamental principles will be discussed with a focus on precision MEMS machines. For example, the fundamental basis for all macro-machine is the flat plane because it acts as the basic reference from which all other structures are built. In the world of MEMS and Nano, this is also true as shown by the *Nanogate* device created by Slocum's lab. The nanogate uses two flat plates separated by a circular fulcrum, which allows the center region to be pried open with Angstrom resolution. This simple plate-lever mechanism yields a proportional valve for nanofluidics, or a variable RF filter. Another application appears to be for the controlled growth of nanotubes in small confined spaces, which looks like it will lead to a *nanotube spinneret*. Other examples include bistable relays, thermal and electrostatic actuators, and the Nanogate for nanoscale fluid flow control.

And even with all the focus on MEMS and Nano, these same Fundamental principles can also be used to create new consumer products. Accordingly, using one of the most FUN of the FUNDAMENTAL principles, that of reciprocity, when we teach students how to design consumer products, they can quickly learn about the FUNDAMENTAL principles! Examples include MassagaSoap and NoodleNodes! Needless to say, an evening of fun and mental activities will permeate the evening!





## SPEAKER BIOGRAPHY

Prof. Alexander Slocum did his undergraduate and graduate work at MIT. He worked from 1983 to 1985 at the National Bureau of Standards, where he earned 12 superior service awards and a Department of Commerce Bronze Medal. He is a MacVicar Faculty Fellow and the 2001 Massachusetts Professor of the Year, has

been teaching design to graduate and undergraduate students at MIT since 1985. He is currently the instructor in-charge for the famous Introduction to Design course 2.007 (formally 2.70), and has written an internationally acclaimed reference book Precision Machine Design which he uses to teach graduate students how to design precision machines in course 2.75. In addition, he also teaches a 2 week 8 hour/day intensive design seminar for minority freshman in the 2nd Summer program, for which he received the Martin Luther King Jr. Leadership Award. Prof. Slocum has five dozen patents issued/pending and he designs manufacturing equipment for the automotive, aerospace, semiconductor, and entertainment industries. He has been involved in several manufacturing equipment company start-ups, and he has helped many different companies bring many different machines to the marketplace. In addition, he has also been involved with nine products that have been awarded R&D 100 awards, each for annually being one of one hundred most technologically significant new products. He is the recipient of the Society of Manufacturing Engineer's Frederick W. Taylor Research Medal. His current interests focus on the development of instruments, MEMS, and nanotechnology.

## MEETING INFORMATION

The IEEE Robotics and Automation Society will meet on Tuesday, September 14, 2004 at Wellesley High School at 6:00 PM for informal discussions and for the formal presentation between 6:30 and 7:30 PM. The group will have a no-host dinner afterwards at Bertucci's, where more conversations can take place with the guest speaker. The meetings are open to the general public, and all are welcome at the dinner afterwards.

For more information, contact Rich Maynard at 978-439-5511 x6221 or check the Chapter email address: [info@robotics-boston.org](mailto:info@robotics-boston.org)

## DIRECTIONS

From Route 128, take either Route 9 or Route 16 west. From the junction of Routes 9 and 16, follow Route 16 (Washington Street) west past the Wellesley Hills commuter rail station (within walking distance of the school, then turn left onto Rice Street. Wellesley High School is on the left. Parking is available in a lot just beyond the school.

For a web map showing the location of Wellesley High School, go to the Yahoo map site at <http://maps.yahoo.com/> and enter the following information in the indicated locations:

Address: 50 Rice St  
City, State or ZIP: Wellesley, MA

The star marker is misplaced slightly to the south. Imagine it about 1 cm toward the top of the map at Rice St.

For more information about our Section and Chapter, visit our web site at our new registered domain URL

<http://www.robotics-boston.org/>