

EASTERN NEW YORK ASM/ HUDSON-MOHAWK TMS NEWSLETTER

May 2004

2004 ASM/TMS Spring Symposium



Smart & Functional Materials

May 24th & 25th, 2004

GE Global Research Center, Niskayuna, NY



Symposium Reception, Dinner and Lecture

May 24th at the Glen Sanders Mansion

1 Glen Avenue, Scotia, NY

6:00 pm Social Hour; 7:00 pm Dinner; 8:00 pm Presentation

Dr. Steve Jefferts, NIST on

Atomic Clocks - Past, Present, and Future

Atomic Clocks have become ubiquitous in modern electronic systems. Modern navigation systems, such as the global positioning system (GPS), and wide-bandwidth communication systems are examples of two systems that cannot exist without the long-term frequency-stability offered by atomic clocks. Commercially available atomic clocks range from Rubidium based oscillators, which cost around \$1000 with thousands of units per year produced, to Hydrogen masers costing \$250,000 with a yearly production of a handful. Finally laboratory based atomic clocks using sophisticated laser-cooling techniques have been built in a few laboratories around the world. These premier atomic clocks offer fractional frequency accuracy at the 10^{-15} level, equivalent to one second in 31 million years.

Laser-cooled atomic clocks are also being developed for flight aboard the International Space Station where they promise to deliver frequency accuracy of $\delta f/f=5 \times 10^{-17}$. Even more exotic atomic clocks are being developed in laboratories with potential accuracies at the 10^{-18} level. The underlying physical principles that govern all of these clocks will be illustrated. The basic structure of many of these atomic oscillators will be presented along with some discussion of the trade-offs inherent in all of these designs.

Finally, the current state of the art of new standards based on optical transitions will be presented. These optical standards based on transitions with frequencies on the order of 10^{15} Hz as opposed to the 10^{10} Hz hyperfine transition frequencies typical of existing atomic clocks, are being actively developed in many standards laboratories around the world. They are quickly approaching the accuracy of the very best hyperfine transition atomic clocks and the future promise of the optical clocks is bright.

For dinner reservations:

Sign up online at <http://www.research.ge.com/surveys/asmtms04.htm>

Or contact Laurent Cretegny at (518) 387-5730 before May 20.

Dinner and lecture: \$20 (Retiree: \$15, Student: \$10)

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GE Global Research Center, Niskayuna, NY

Monday, May 24th 2004

7:30-8:30 *Check-in/registration and coffee*

8:40-8:45 Opening Remarks

Session I **Materials Selection for Sensors**

(Chairs: Luana Iorio and Seth Taylor, GE Global Research)

8:45-9:30 Prof. S. Akbar (Ohio State U.) – *From Bulk and Thick-film Sensors to Ceramic Nanostructures*

9:30-10:15 Prof. C. Grimes (Pennsylvania State U.)– *Hydrogen Sensing and Photochemical Properties of Titania Nanotube Arrays Made by Anodization*

10:15-10:30 *Break*

10:30-11:15 Prof. O. Gregory (U. of Rhode Island) – *Development of a Ceramic Strain Gage for High Temperature Applications*

11:15-12:00 Dr. G. Hunter (NASA) – *Development of Chemical Sensor Arrays for Intelligent Aerospace System Applications*

12:00-1:00 *Lunch*

Session II **Materials-specific Applications of Sensors**

(Chairs: Evan Dolley and Ed Richey, Lockheed Martin KAPL, Inc.)

1:15-2:00 Dr. V. Agarwala (Naval Air Warfare Center) – *Sensors for Corrosion and Damage Detection (an Overview)*

2:00-2:45 Prof. C. Grimes (Pennsylvania State U.)– *Remote Query Magnetoelastic Environmental Sensors*

2:45-3:00 *Break*

3:00-3:45 Mr. B. Yildiz & Prof. M. Golay (MIT) – *A Bayesian Belief Network for System Monitoring and Advice*

3:45-4:30 Prof. R. Bucinell (Union College) – *The Use of the Speckle Image Photogrammetry Full Field Strain Measuring Technique for the Calculation of the J-Integral*

4:45-5:30 Tour of GE Global Research

Monday evening, May 24th 2004

6:00-7:00 Hors d'oeuvres and Cash Bar Reception (Glen Sanders Mansion)

7:00-8:00 Symposium Dinner

8:00-9:00 Dr. S. Jefferts (NIST) - *Atomic Clocks - Past, Present, and Future*

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Tuesday, May 25th 2004

7:30-8:25 *Check-in and coffee*

Session III **Materials for Actuation**

(Chairs: Liang Jiang & Bernard Bewlay, GE Global Research)

8:30-9:10 Prof. D. Grummon (Michigan State U.) - *Sputtered NiTi Thin films for Actuators at the Nano, Micro and Macro Scales*

9:10-9:50 Mr. J. Snodgrass (ETREMA Products, Inc.) – *Magnetostrictive Smart Materials: Past, Present, and Future*

9:50-10:00 *Break*

10:00-10:40 Prof. R. O’Handley (MIT) – *Magnetic shape memory alloys and other active materials*

10:40-11:20 Dr. C. Seeley (GE Global Research) – *High Authority Piezoelectric Actuation*

11:20-12:00 Prof. S. Priya (Pennsylvania State U.) – *Piezoelectric Actuators 2004*

12:00-1:30 *Lunch*

Session IV **Smart Structures**

(Chairs: Dan Lewis and Canan Hardwicke, GE Global Research)

1:30-2:15 Prof. R. Miles (SUNY Binghamton) – *Acoustic Sensing Inspired by Hearing In Insects*

2:15-3:00 Prof. D. Inman (Virginia Tech) – *Smart Materials for Structural Health Monitoring and Damage Prognosis*

3:00-3:15 *Break*

3:15-4:00 Prof. Y. Zhang (Lehigh U.) – *Piezoelectric Paint – Making Intelligent Coating Sensors for Non Destructive Structural Condition Assessment*

4:00-4:45 Prof. W. Sadik (SUNY Binghamton) – *Design of Advanced Materials for Sensing & Remediation*

4:45-5:00 Dr. K. Raj (Ferrotec) – *The Science and Technology of Ferrofluids*

5:00-5:15 *General Discussion and Concluding Remarks*

Symposium Pricing and Registration Information

Professionals: \$250 (2 days); \$150 (1 day); \$100 (½ day)

Students/Retirees: \$50 (2 days); \$25 (1 or ½ day)

Dinner and lecture: \$20 (Retiree: \$15, Student: \$10)

Pre-register online at <http://www.research.ge.com/surveys/asmtms04.htm>

Questions: Laurent Creteigny (518) 387-5730 or symposium2004@asm-easternny.org

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Zeiss Mat Mobile - On The Road Again.

The Zeiss Mat Mobile will go on tour around U.S.A. from April through June. Mat Mobile is a mobile microscope lab equipped with the latest products. Everything from Stereo to Laser Scanning Confocal Microscopy is onboard.

The Zeiss Mat Mobile will be in the Capital District on June 14 and 15, 2004

**SUNY Albany, Parking lot University Drive East
1400 Washington Ave. Albany (NY, 12222)**

Open to the public. More information available at <http://www.zeiss.com/matmobile>

This newsletter and other chapter information can be found on the

ASM Chapter website:

<http://www.asm-easternny.org/>

Please send any newsletter announcements and suggestions to Luana Iorio at iorio@crd.ge.com.