# Madison Section NEWSLETTER

Volume 5, Number 9 | Serving IEEE Members of South Central Wisconsin | December 2002


## The Future of Diesel Engines in Automobiles

**Date/Time:** Thursday, December 19, 2002, 11:45 AM - 1:00 PM

**Speaker:** Kevin Hoag, Associate Director of the Engine Research Center, University of Wisconsin - Madison

**Location:** Rocky Rococo's Pizza, 7952 Tree Lane (Madison Beltline Hwy. at Mineral Pt. Rd.), 608.829.1444

**Menu:** Pizza buffet, salad and soft drinks (cost $10.00, free for student members)

**RSVP:** by December 16th to Tom Yager via email (tyager@ieee.org) or call 608.821.0821 ext. 342

*Non-member guests are always welcome!*

In Europe almost fifty percent of new automobile registrations are diesel, and the percentage is steadily growing. In the U.S. only Volkswagen still offers a diesel engine. What are the reasons for such very different trends? What does the future hold, for diesels and other alternative engines? This talk will address these questions from political, economic, and technological perspectives.

Kevin Hoag is the Associate Director of the Engine Research Center at the University of Wisconsin, and a Program Director with the university's department of Engineering Professional Development. He has over 25 years experience in a variety of engineering roles in the internal combustion engine industry. He is widely published in the fields of engine development and adult education, and is currently completing a book on vehicular engine design.

## Photon-based Lithography: From DRAM to DNA chips, and beyond

**Date/Time:** Thursday, January 16, 2003, 11:45 AM - 1:00 PM

**Speaker:** Franco Cerrina, Professor of Electrical and Computer Engineering, University of Wisconsin - Madison

**Location:** Rocky Rococo's Pizza, 7952 Tree Lane (Madison Beltline Hwy. at Mineral Pt. Rd.), 608.829.1444

**Menu:** Pizza buffet, salad and soft drinks (cost $10.00, free for student members)

**RSVP:** by January 13th to Tom Yager via email (tyager@ieee.org) or call 608.821.0821 ext. 342

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Lithography is the art of patterning a substrate, and has been developed mostly for application to semiconductors where it represents the work-horse of today's manufacturing process. Several types of lithographic techniques have been introduced, spanning the range from the near ultraviolet to the X-rays. The main benefit of photon-based patterning techniques is in their intrinsic parallelism, so that millions of pixels can be transferred in a single flash. This allows the unsurpassed throughput of tens of wafer per hours that is required by the modern industry. Lithographic-based techniques have been developed in many other areas, from attempts to direct material modification by preferential epitaxial growth to the synthesis of 3-dimensional structures as in stereolithography; MEMS structures as well require somewhat different tools than the more advanced semiconductor production tools. These

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"exotic"; approaches have met with variable success. While the semiconductor oriented lithography continues to develop, more recently other applications have emerged in the biological area. One of the most developed is the fabrication of the so-called DNA microarrays that are currently used for gene expression analysis, and other research and diagnostic application. This concept, pioneered by Affymetrix using a straight extension of contact lithography, has recently evolved to include direct maskless synthesis of DNA microarrays at NimbleGen Systems, probably the first commercially successful example of a photon-based maskless lithography. The requirements of biological lithography are considerably different from those of semiconductor techniques; for instance, the resolution needed is at most a few microns, but the contrast must exceed 1000-1500 in order to complete complex oligomers (n=40-100). Biological lithography can be used to build complex three-dimensional structures, either directly by synthesizing in-situ DNA and other molecules, or by building scaffolds for the attachment of selected molecules.

In this talk we will address the broad picture of optical lithography development, comparing trends in the development of optical-based lithographic tools with emphasis on the applications beyond semiconductor lithography.

Franco Cerrina is a Professor of Electrical and Computer Engineering at the University of Wisconsin-Madison. He is an IEEE and OSA Fellow, recipient of the SRC Aristotle award, and the director of the Center for Nano Technology. He earned his doctorate in Physics from the University of Rome in 1974 and joined the ECE Department in 1984. Since then, 23 students have graduated from his group.

His research interests are in the area of semiconductor processing and device fabrication, in particular lithography, and X-ray optics and technology. This research has a strong applied content and is currently focused on manufacturing technologies for the sub-100 mm ULSI electron devices, such as post-optical lithographies. More specifically, he is researching the application of X-rays to lithography for semiconductor manufacturing and to microscopy for materials and biological science. His activities include not only work with synchrotron X-rays, but also metrology, electron beam and extreme UV lithography (EUVL), and atomic force microscopy. Another focus of activity is in the computer modeling of optical systems (X-ray optics) and of semiconductor lithography, where his group has developed codes that are now worldwide standards.

Recently he has become interested in the application of microfabrication techniques to biological problems, and has developed a novel method for the rapid synthesis of DNA microarray chips. This technique is being commercialized.

He has published over 200 papers and holds several patents.

Research Interests:

- Advanced Lithography and Nanopatterning
- Biological Micro Fabrication
- Semiconductor Processing and Devices
- Process Simulation and Optical Modeling
- X-ray Applications: Optics, Lithography, and Microscopy

## IEEE Madison Section Elections

At the December 2002 monthly meeting, the IEEE Madison Section will conduct its annual officer elections prior to the technical presentation. Nominations may be made by telephone or via e-mail to the Chair (278-0377, rotter@ieee.org).

Additional candidate nominations are welcome and encouraged for all positions. The nominations to date include:

| | |
|---|---|
| Chair: | Sandy Rotter |
| Vice-Chair: | Bob Sier |
| Secretary: | Tom Yager |
| Treasurer: | John Hicks |
| Mem. at Large: | Les Schroeder |
| Mem. at Large: | Wayne Lenius |

## 'Voices Of Innovation' Launches Radio Spots, Enhanced Web Site

"Voices of Innovation," a new public radio program about real engineers and their stories from the American Association of Engineering Societies (AAES) and its constituent societies, including the IEEE, has launched a revamped Web site. Now visitors can listen to today's story, download a transcript and submit story ideas -- all from the comfort of their desk.

Go to: http://www.voicesofinnovation.org.

## Madison IEEE Entrepreneurs' Network

A new Madison IEEE Entrepreneurs' Network Chapter is being formed. For more information contact:

Dennis E. Bahr, P.E.
<http://www.bahr.com/index.html>
Email: <bahr@inxpress.net>
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Embedded programming focusing on Z-world

Sandy Rotter
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Analog/RF Product Development


## National Engineers Week Slated 16-22 February 2003

Start planning your celebration now for next year's National Engineers Week, which runs 16-22 February 2003. Next year's co-chairs, the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) and Lockheed Martin, are launching "The New Faces of Engineering," a program that will spotlight the outstanding contributions of America's youngest engineering professionals.

For more information, visit http://www.eweek.org

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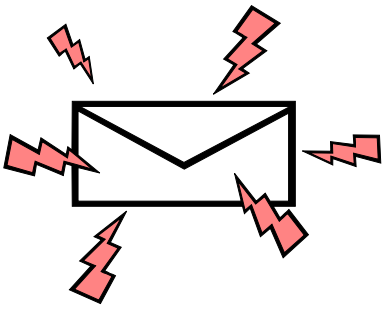

Some of you may not realize that the IEEE Madison Section has a email mailing list (madison-section). This list is very low volume and is only used for meeting announcements and general announcements that may be important to the membership. Only the list moderator is allowed to post messages so you won't receive any advertising or spam. Instructions on how to subscribe may be found on the IEEE Madison Section web site located at <http://www.bugsoft.com/ieee>. Just look under "Madison Section Mailing List". Basically you just send an email to <majordomo@majordomo.ieee.org> with `subscribe madison-section` in the body of the email (the subject is ignored). The list moderator will receive your request, verify your membership, then add you to the list. You will then receive notification that you have been subscribed to the list. This process may take a few days, so be patient.


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