Madison Section NEWSLETTER

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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

Non-member guests are always welcome!

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 "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 Depart-

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ment 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

Entrepreneurs Network Chapter

Date/Time: Thursday, February 20, 2003, 5:30 PM meet & register, 6:00 PM dinner

Speaker: Gary L. Blank, Ph.D., Vice President, IEEE-USA

Location: Quiveys Grove, 6261 Nesbitt Road (map at <http://www.quiveysgrove.com/> under "Contact Us"), 608.273.4900

Menu: menu & cost to be determined

RSVP: by February 17th to Tom Yager via email (tyager@ieee.org) or call 608.821.0821 ext. 342

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You are a consultant or considering becoming a consultant of engineering services - in simpler terms, a private practitioner. You are an IEEE member and you would like to be associated with other Consultants. Where do you go?

An IEEE Consultants' Network is an invaluable resource for consulting information. You will meet experienced practitioners as well as others new to consulting. Speakers discuss such topics as taxes, self-marketing, entrepreneurship, finances, fee setting, software and liability insurance. The network is also a source of potential clients.

There are active IEEE Consultants' Networks in thirty areas of the United States and others are in the formative stages.

Organizing a network can be exciting and rewarding. This talk describes how to start a Consultants' Network, and the benefits to the members and the Section.

Gary Blank received his B.S. from Illinois Institute of Technology, his M.S. from the University of Idaho, and his Ph.D. from the University of Wisconsin at the age of 24. All degrees are in electrical engineering. Since then his career has advanced along parallel paths in industry and in academia.

For many years he was a full-time consultant in industry while concurrently teaching part-time at the University of Florida and at UCLA.

He also held full-time faculty positions at Marquette University, Northern Illinois University, and Illinois Institute of Technology, while concurrently consulting part-time in industry.

Dr. Blank is the author of numerous published articles and papers. He is a Vice-President of IEEE-USA. He is a Senior Member of the IEEE. He is the founding chairman of the IEEE Consultants' Network of Chicago/Rockford. He was the National Chairman of the IEEE-USA AICN (Alliance of IEEE Consultants' Networks) from 1998 to 2001, coordinating the activities of 30 Consultants' Networks, and starting several new Networks. He was the Chairman of the IEEE Region 4 Student Activities Committee and the Chairman of the IEEE Region 4 Major Conferences Committee. He was a member of the Midcon Board of Directors and was the Convention Director for Midcon 1991. He was a member of the IEEE Educational Activities Board's Committee on the Engineering Skills Assessment Program. He is a member of the IEEE Individual Benefits and Services Committee. He is a national S-PAC speaker.

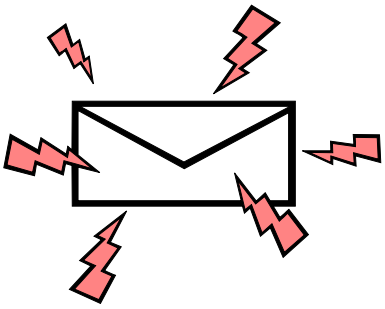
He is currently consulting full-time in industry in the areas of Control Systems, Digital Signal Processing, and Electronics. He teaches engineering courses live, and on home-study videos for review for both the PE Exam in Electrical and Computer Engineering and for the Fundamentals of Engineering (General Engineering) Exam. He also conducts seminars and workshops internationally on how to start and expand a successful consulting practice.

IEEE Madison Section Elections

The annual officer elections for the IEEE Madison Section were held at the December 19th, 2002 monthly meeting. The slate of candidates was elected unanimously. Congratulations to the new officers for 2003:

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

Madison Section Mailing List



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.

Reach over 700 IEEE members in South-Central Wisconsin with information on *your products and services* every month with an ad in this newsletter.

Our members have professional interests in computers, power engineering, signal processing, communications, industry applications and a number of other technical fields.

For more information, contact John Hicks at (608) 233-4875 or jhicks@facstaff.wisc.edu.

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