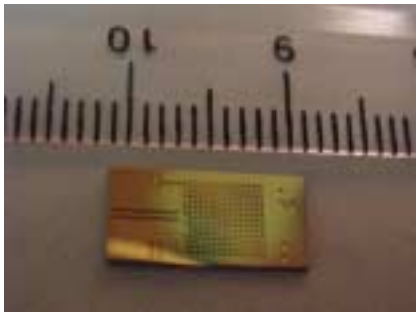
IEEE

Madison Section NEWSLETTER

Volume 5, Number 3 | *Serving IEEE Members of South Central Wisconsin* | March 2002

Nuclear Microbatteries for MEMS Use



Date/Time: Thursday, March 21, 2002, 11:45 AM - 1:00 PM

Speaker: Amit Lal, Assistant Professor, Electrical and Computer Engineering, UW-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 March 18th to Tom Yager via email (tyager@biocentricsolutions.com) or call 608.821.0821 ext. 342

Non-member guests are always welcome!

Nuclear microbatteries have been explored over the last century. This talk will describe some experiments and a new paradigm of using integrated microbatteries for powering MEMS devices. Experimental results on a self-reciprocating cantilever device will be described that guides the way to a highly integrated sensor, actuator, computation, and information transmission tool. Theoretical results and future of this technology with respect to military and civilian needs will also be discussed.

Prof. Lal is a member of the Departments of Electrical and Computer Engineering and Biomedical Engineering. He is affiliated with the Biomedical Engineering Center, MRSEC IRG #1 on Chemical Vapor Deposition, Materials Science Program and Wisconsin Center for Applied Microelectronics. He has interests in MEMS, ultrasonics, sensors and actuators, biomedical engineering, microfluidics and integrated circuit design. Prof. Lal has a PhD from the University of California, Berkeley.

coming in April… **Joint Meeting with UW-Madison IEEE Student Chapter**

coming in May… **Tour of Space Astronomy Lab (SAL)**

ABET'S EC2000: How're We Doin'?

by Donald Christiansen

When John Pierce arrived at Bell Labs in 1936 as a freshly minted Ph.D. from Cal Tech, he knew little about his new workplace. As he told Andrew Goldstein, an interviewer from the IEEE Center for the History of Electrical Engineering, “I wasn't very well oriented. I didn't know much about the real world of science and engineering… I sure was in a different world… Wandering into Bell Labs [was] just like wandering into hell.”

But he found his colleagues friendly and helpful in answering his questions, and he did what others suggested. It worked out well. His inauspicious beginning turned into an auspicious career at the Labs, culminating in his position as director of research

CONTENTS

Meeting Notices 1
ABET'S EC2000: How're We Doin'? 1

IEEE Networking the World™

IEEE MADISON SECTION NEWSLETTER

Printing and Mailing by: SprintPrint
2790 S. Fish Hatchery Rd.
Madison, WI 53711

Published 9 times per year (Jan. - May & Sep. - Dec.) by the Madison, Wisconsin Section of the Institute of Electrical and Electronic Engineers (IEEE), as a service to its members in south-central Wisconsin.

Mailed at Madison, Wisconsin as 3rd Class, Non-Profit postage. Permit No. 953.

Online at: **http://www.bugsoft.com/ieee/**

For address changes: notify IEEE headquarters, address-change@ieee.org and contact Craig Heilman, cheilman@ieee.org, 608.274.2003

For advertising information: contact John Hicks, jhicks@facstaff.wisc.edu, 608.233.4875

For editorial comment: contact Craig Heilman, cheilman@ieee.org, 608.274.2003

IEEE MADISON SECTION OFFICERS

Chair:	Sandy Rotter, 278.0377 rotter@ieee.org
Vice Chair:	Bob Sier, 877.7603 rsier@atcllc.com
Treasurer:	John Hicks, 233.4875 jhicks@facstaff.wisc.edu
Secretary:	Tom Yager, 821.0821 x342 tyager@biocentricsolutions.com
E-mail Coord.:	John Cortsvet, 831.2945 j.corstvet@ieee.org
Member at Large:	Les Schroeder, 260.1356 l.schroeder@ieee.org
Member at Large:	Dan Danbeck, 262.3748 danbeck@engr.wisc.edu
Member at Large:	Wayne Lenius, 664.1464 lenius@bigfoot.com
Past-Chair:	Craig Heilman, 274.2003 cheilman@ieee.org

for the communications sciences division and his recognition as "Father of the ECHO Satellite."

Today, though, the type of education that Pierce and others of his time received might not be good enough. As far back as the years just after World War II, industry and educators alike began looking for ways to change the electrical engineering curriculum — particularly at the undergraduate level — so that a new graduate could get into harness (like a Clydesdale rather than a trotter, one supposes) and immediately begin to pull his weight as a productive engineer.

The problem was seen to be that while new grads might be technically competent, they knew little about the process of engineering — how things were designed, refined, and put into production — and what the constraints of real-world engineering might be.

Some schools tried nobly to ameliorate this problem. Cornell University, for example, devised the five-year baccalaureate in electrical engineering (BEE), in which students would elect courses outside the engineering college to broaden their perspectives, perhaps making them less "nerdy," and enabling them to speak and write well. But this well-intentioned program did not last; the opportunity for students to earn an EE degree elsewhere in four years soon drew prospective candidates from the five-year program, and it was discontinued.

Most companies kept the dream of hiring the ideal graduate on their perennial wish list, while others assumed the responsibility for providing the necessary indoctrination and training, picking up where engineering schools left off. A widely respected example of this support is the General Electric "test program," in which new engineers were exposed to a series of jobs in different departments.

But many of the post-World-War-II graduates found themselves in the same situation that John Pierce had encountered a decade earlier — in unfamiliar, sink-or-swim environments. Most swam, with the aid of good mentors and helpful colleagues who had been through it all themselves.

Later, the solid-state revolution and the concomitant success of electronics companies spawned an era in which continuing education for engineers was encouraged and even sponsored by many of these prosperous companies. It helped that "employment for life" was then still an expectation. But with the onset of deregulation, mergers, global competition, and downsizing, companies were less likely to support educational programs for their engineers.

The drumbeat of discontent with the abilities of new graduates by their employers, never completely stilled, grew once again. Engineering school alumni, many of whom are now company executives, came back to their alma maters as advisory board members, urging faculty to devise new programs that would make their graduates productive more quickly.

In response, over the past several years, the Accreditation Board for Engineering and Technology (ABET) devised new Engineering Criteria (EC2000) that have been tested in pilot programs and with which all engineering schools must now comply. Some 100 schools have already been reviewed using the new criteria. The old criteria were heavily resource-based; that is, they measured the

quality and quantity of laboratory equipment, computers, number of faculty, and the like. The new criteria are output- or outcome-based. They focus on what graduates ought to be able to do: know where and when to apply appropriate math; conduct and interpret experiments; design things; work on multidisciplinary teams; be ethically responsible; communicate well; be always ready to learn something new; know what's hot in the profession and what the "contemporary issues" are; and have and use the right skills and tools to get a project done.

Professor John Orr, head of the Department of Electrical and Computer Engineering (ECE) at Worcester Polytechnic Institute (WPI) in the Massachusetts area, sees this as a transient period, when both reviewers and schools are coming to an understanding of what's involved. The "incredibly difficult" part, he said, is defining wanted outcomes so that they can be measured against the mission criteria. Defining outcomes is necessary to improve curricula and educational methodology continually, a requirement of ABET 2000. Despite its growing pains, Orr and others consider the ABET process to be faring well.

Design Is Making a Comeback

Many schools are placing a renewed emphasis on design. At one time, some engineering graduates would leave school never having designed anything. Not any more. Those who support the design emphasis say that all engineers are fundamentally designers. Research engineers design experiments; design engineers design products and systems; manufacturing engineers design processes and equipment; and at the least they must all be familiar with design aspects of the products and systems that result from the end-to-end process. Many schools elect to satisfy the design requirement through a senior design project. Some schools have led the way with senior or "capstone" projects, among them WPI, which implemented the project concept in the 1970s. WPI undergraduates today are required to do three projects and usually work in teams. Their junior-year project works with an interdisciplinary real-life problem, often outside the United States.

Some schools have introduced elements of design techniques during the freshman year. One might even imagine a complete college program based on a single design project (perhaps an actual design), during which the appropriate educational material is brought in at the point where it is useful for moving the project forward ("just-in-time" education). Engineering faculty might find the Harvard Business School's case study approach a valuable role model. If this is all beginning to sound like a graduate program, some faculty would agree. And can resurrected talk of a five-year baccalaureate be far behind?

Employers Want Soft Skills, Too

Employers are hoping that the new graduates will have better skills in communicating, openness and cooperation, and being sensitive to ethical issues. Faculty are hoping that such non-technical skills can be integrated into the curriculum or into individual course work without eroding the time available to teach the basic knowledge-based material, which itself is becoming more complex and demanding. One possibility for teaching these new skills may be to incorporate them into the design projects. The challenge to faculty will be to select projects that have believable aspects related to ethics, feasibility, and other real-world considerations, so students will be able to grapple with the tradeoffs and compromise inherent in engineering design.

While there is general satisfaction on the direction ABET 2000 is taking, problems remain and differences of opinion related to implementation persist. But the new criteria are intended to permit flexibility on how each school implements its program. Today's Engineer will carry discussions about ABET 2000 in future issues. In the meantime, input from students, faculty, or employers on ABET 2000 or on engineering education in general are welcome. Send your thoughts to todaysengineer@ieee.org. Please include your name, home city and state, and IEEE membership level (if applicable).

Donald Christiansen is the former editor and publisher of IEEE Spectrum and an independent publishing consultant.

All rights reserved. Copyright © 2002 IEEE.

Spring 2002

Telecommunications Short Courses

- **Using and Installing Fiber Optic Systems for Communications,** *March 5–7, 2002 in Madison, WI*
- **Fundamentals of Data Communications** *March 19–21, 2002 in Madison, WI*
- **Fundamentals of Cellular and PCS Wireless Communications,** *April 9–11, 2002 in Madison, WI*
- **DC Power System Design for Telecommunicatons** *April 23–25, 2002 in Madison, WI*
- **Siting Wireless Communications Antennas and Towers,** *May 6–8, 2002 in Madison, WI*
- **Engineering and Planning Telecommunications Local Loop Facilities,** *May 20–23, 2002 in Madison, WI*

For further information...

Web: http://epdweb.engr.wisc.edu or **E-mail:** danbeck@engr.wisc.edu

THE UNIVERSITY of WISCONSIN MADISON

College of Engineering Department of Engineering Professional Development

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.

Per issue ad rates:	1 Time	2 Times	5 Times	9 Times
Business Card	$ 50	$ 45	$ 42	$ 41
2-Business Card	83	76	71	70
1/4 Page	145	135	129	127
1/2 Page	215	203	195	193
Full Page	330	315	306	303

IEEE
Networking the World
2790 S. Fish Hatchery
Madison, WI 53711

NONPROFIT ORG.
U.S. POSTAGE
PAID
Madison, WI
Permit No. 953