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IEEE BULLETIN

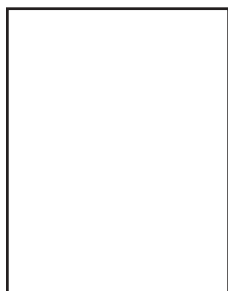
Networking
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February 2002

Volume 64

Number 2

Chairman's Corner

by: Ray Aker*Ray Aker*

The Month of February is Engineers' Month, and the last week in February is Engineers' Week. During these times, many and numerous professional meet-

ings and activities will take place. They all provide visibility to the designs and works of Engineers. These works thereby show the public the vital role that Engineers play in supporting and enhancing the social and technical structure upon which our way of life rests.

You are all encouraged to participate in these meetings and activities, including those of our brother engineering societies as well as those of the IEEE. Please review the Calendar section in this Bulletin, read the technical articles that follow them and decide to attend a meeting and activity from among these offerings. At these events, you can meet new people, learn new technology and plan to be prepared for future opportunities and challenges.

Of course, the first place to start your Engineers' Week adventures is to attend a meeting of your own Council, Section, Chapter or Affinity Group. They offer many chances for enhancing your acquaintances and knowledge. There, you will become aware of the many new frontiers of human endeavors and achievements.

Included in these endeavors are the changes now taking place within the Los Angeles Council, ECI and WESCON. All should learn and know of these changes, some of which have been reported in previous Bulletins. We will now have a new slate of Council Officers, and we are working to mold a new WESCON within the IEEE organizational structure to best fit the efficiency and effectiveness of our present operation.

We are now preparing to work with IEEE Headquarters to achieve the best fit so that we can proceed to produce the best ever WESCON Show and Convention. Everyone's patience and forbearance is needed to produce this fit. A Transition Committee is now being formed to work out the details of the new organization. You are all welcome to attend the next Los Angeles Council meeting to participate in organizing the new WESCON structure.

Again, I encourage everyone to participate in the activities of Engineers' Week. There are several events planned that should be of interest to all. Look at the Calendar Listings, Meeting Notices and Technical Articles to get acquainted with the various activities planned just for you!

Election Results

Los Angeles Council

New Officers are:

Chair — Ray Aker

Vice-Chair, Publications — Justin Biddle

Vice-Chair, Chapters — Art Sutton

Treasurer — Donald Mayer

LA Council Election Results

By: Kip Haggerty

The Tellers Committee for the IEEE Los Angeles Council 2001 Fall Election met on 27 December 2001 to count the ballots received and certify the election results. We would like to thank all candidates who participated in this years election. With their enthusiastic support we were able to run contested elections for all but one office bringing us close to full compliance with IEEE nominations procedures. Our failure was one of not finding a second willing candidate for Vice Chair - Chapters and we urge all members to consider running for a Council, Section, or Chapter office next fall. Furthermore, we expect the Council, Sections, and Chapters to consider for appointive office those enthusiastic volunteers who were not successful in their bid for elective office this year. The winner for each of the four Council Offices is identified by an asterisk (*).

Los Angeles Council 2001 Fall Election Results

Total Ballots Received: 103

Invalid Ballots: 3

Total Valid Ballots Received: 100

Candidates Votes For Chair

Ray Aker 74 *

Baruch Berman 25

Write In 0

Blank 1

Vice Chair - Publications

Justin M. Biddle 53 *

Sumner Matsunaga 46

Write In 0

Blank 1

Vice Chair - Chapters

Arthur W. Sutton 94 *

Write In 0

Blank 6

Treasurer

Donald Mayer 59 *

Jay Park 35

Write In 0

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Engineers Week Activities

National Engineers Week is coining up February 17-23, 2002. This year's celebration is co-sponsored by ASCE, DuPont and NSPE. The theme for this year's celebration is "Without Engineers the World Stops." Visit the NSPE website www.eweek.org for details of the National Celebration.

Here is a brief list of local events and the person(s) to contact for more information.

IAE Installation of Fellows and Awards:

February 16th, 2002

Social: 6 p.m.

Dinner: 7 p.m.

Cost: \$60 per person

The Reef Restaurant, 880 Harbor Scenic Drive, Long Beach

Contact: Gary Sumner, 562-491-5749

Menu not finalized at time of printing, but will allow the usual choices.

Reservations: 2/8/02

Inland Empire Council of Engineers and Scientists:

February 20th, 2002

Social: 6 p.m.

Dinner: 7 p.m.

Cost: \$25 engineers, \$20 spouses and/or guests, \$13 students

University of Redlands, Casa Loma Room

Speaker: Frank Demartino, P.E.,

President & CEO of Parsons Corporation.

Topic: "Military Preparedness, a Private Section Point of View"

Contact: Art Sutton, P.E., 909-869-2524

Menu: Roast Prime Rib of Beef, Chardonnay Dijon Chicken, or Baked Beefsteak Tomato.

Make reservations with John Herring at 909-686-4985 prior to 2/13/02

Engineers' Council (San Fernando Valley) Honors and Awards:

February 23th, 2002

Social: 5 p.m.

Dinner: 6 p.m.

Cost: \$65 per person

Sportsman Lodge, 4234 Coldwater Canyon Studio City.

Contact: Lloyd Higginbotham, 818-992-8292

Menu not finalized at time of printing, but will allow the usual choices.

"Note New start time of 5 p.m."

Orange County Engineering Council Annual Awards Banquet

February 24th, 2002

Social: 6 p.m.

Dinner: 7 p.m.

Cost: \$65 per person

Hyatt Regency, Corner of Harbor Blvd. and Chapman Ave. in Anaheim.

Contact: Stuart Leigh 714-227-4223

Menu not finalized at time of printing, but will allow the usual choices.

Reservations: 2/15/02

San Diego Engineering Council Annual Awards Banquet:

February 22th, 2002

Social: 6 p.m.

Dinner: 7 p.m.

Cost: \$35 per person (not conf.)

Double Tree Hotel in Mission Valley

Speaker: Frank Pace,

General Atomic AeroNautical Systems, Inc.

Topic: Predator Remotely Operated Aircraft System.

Contact: Tom Kanneman 714-227-4223

Menu: Chicken Aubergine, Baked "Native" Sea Bass, or Vegetarian Entree.

Reservations: 2/15/02

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Monthly Meetings On Homeland Security

By: Martin S. Roden

The IEEE Los Angeles Chapters for Communications, Signal Processing, and Vehicular Technology will hold a series of monthly meetings during 2002 with a theme of Homeland Security. Mr. Dennis Quine of The Aerospace Corporation will provide a kickoff presentation during a luncheon meeting on Wed, 20 Feb. 2001. He will provide an overview of the 200-year history of homeland defense challenges and a perspective on our national responses. This historical perspective provides the foundation for understanding the challenges of the new era of terrorism with weapons of mass destruction, and the new kinds of problems homeland defense must address in the 21st century.

Mr. Quine has a B.S. in Mathematics from Florida State University, an M.S. in Engineering Physics from Air Force Institute of Technology, and an M.S. in Systems Management from USC. He is a retired Air Force Lt. Col. He was with General Research Corporation from 1984 to 1988, and has been at the Aerospace Corporation since 1988. He conducts support studies and analysis for several classified national space programs, and is also conducting analysis of homeland defense/security issues under the Corporate Strategic Initiative.

Subsequent meetings in this series will deal with computer security and data processing for law enforcement applications, facial recognition technology, computer security and data fusion.

Martin Roden, Professor, Electrical Engineering co-chair IEEE Communications/Signal Processing/Vehicular Technology Chapters, California State University, Los Angeles 5151 State University Drive Los Angeles, CA 90032, (323) 343-4485, FAX: (323) 343-4547

IEEE LAC Meeting Calendar for February / March 2002

AEROSPACE & ELECTRONICS SYSTEMS/INSTRUMENTATION & MEASUREMENT/GEOSCIENCE & REMOTE SENSING/OCEANIC ENGINEERING, LAC CHAPTER

No meeting announcement for February

ANTENNAS AND PROPAGATION, LAC CHAPTER

No meeting announcement for February

ANTENNAS AND PROPAGATION/MICROWAVE THEORY AND TECHNIQUES, FOOTHILL CHAPTER

No meeting announcement for February

BUENAVENTURA SECTION

No meeting announcement for February

CALTECH/MIT ENTERPRISE FORUM

No meeting announcement for February

CENTRAL COAST SECTION

Who: TBA

What: TBA

When: Tuesday, February 5, 2002

Where: Cal Poly Engrg. Bldg. 20, Rm. 206

Details: Refreshments available around 6:30 pm

Parking: stop at kiosk on Grand Ave & say "IEEE meeting"

Contact Stephanie Allen at sallen@calpoly.edu for an e-mail of particulars

See Web for latest info: www.ieee.org/central_coast

John T. Armstrong, 1740 Portola St., San Luis Obispo, CA 93405-4716

805-541-5702, Fax 541-3457, Cell 704-9666

CHINA LAKE SECTION

No meeting announcement for February

CIRCUIT AND SYSTEMS/ELECTRONIC DEVICES, LAC CHAPTER

No meeting announcement for February

COASTAL LOS ANGELES SECTION

No meeting announcement for February

COMMUNICATION/SIGNAL PROCESSING/VEHICULAR TECHNOLOGY, LAC CHAPTER

Who: Jim Takach, Dir. Advcd. Pgrms CDMA Devpmnt Grp.

What: CDMA 2000

When: Wednesday, February 13, 2002

Where: Wyndham Gardens Hotel, 3350 Ave. of the Arts,

Costa Mesa, CA 714-751-5100

Dinner: IEEE members \$18.00 with advance reservations, \$23.00 at the door Non-IEEE members: \$23.00 & \$28.00 respectively Students with

IDs \$5.00 No charge for technical portion of the meeting only.

RSVP: e-mail to Martin Roden at m.roden@ieee.org or, 343-4485 FAX:

(323) 343-4547

Who: Dennis Quine of The Aerospace Corporation

What: Kickoff presentation on Homeland Security as part of monthly series.

When: Wednesday, February 20, 2002. NOON - 1:30 P.M.

Where: The Aerospace Corporation, El Segundo (See Important Note Below)

Cost: No charge for meeting. Suggested donation for lunch is \$5.00.

RSVP: Respond to m.roden@ieee.org.

NOTE: Location for this meeting is the Aerospace Corporation. However we may

have to move to a larger facility. RSVP is very important so we can keep you informed of any location changes.

COMPUTER SOCIETY, LAC CHAPTER ALONG WITH THE ACM (ASSOCIATION OF COMPUTING MACHINERY)

Who: Wayne Smith

What: Information Architecture on the Wild, Wild Web:

When: Tuesday, February 5, 2002

Time: 8:00 pm talk, 7:00 pm dinner (optional)

Where: Ramada Plaza, Lobby Level

A map for Ramada Plaza can be found at this website: "<http://www.calendarlive.com/E/V/LAXCA/0001/18/74/1.html>

RSVP: mail to: fkoo@ieee.org

ELECTROMAGNETIC COMPATIBILITY SOCIETY, LAC CHAPTER

No meeting announcement for February

ENGINEERING IN MEDICINE AND BIOLOGY, LAC CHAPTER

No meeting announcement for February

ENGINEERING MANAGEMENT/EDUCATION/PROFESSIONAL COMMUNICATION, LAC CHAPTER

No meeting announcement for February

FOOTHILL SECTION

Who: Mr. Frank Demartino, P. E., President and Chief Operating Officer of the Parsons Corporation

What: Military Preparedness, a Private Section Point of View

When: Wednesday, February 20, 2002

Where: Casa Loma Room at the University of Redlands. Social hour begins at 6 p.m. with dinner at 7 p.m. Cost of the dinner is \$ 25 for engineers, \$ 20 for spouses and guests, and \$ 13 for engineering students. From west, exit I-10 at University in Redlands. Go left on to University. From east, exit at Cypress, go left two blocks, and turn right onto University. From either direction follow University 0.8 mile (north) to Brocton (next stop sign after Colton). Turn right onto Brocton (east) and after one block turn right in either 3rd or 4th driveway to enter parking lot. (Ted Runner Stadium will be on opposite side of Brockton.) The Casa Loma Room is on the east side of the lot. Reservations by Wednesday,

February 13 to John Herring, 5443 Argyle Way, Riverside, CA 92506 (909) 686-4985. Make checks payable to IECEES. State choice of Roast Prime Rib of Beef, Chardonnay Dijon Chicken or Baked Beefsteak Tomato. For information call Art Sutton (909) 869-2524.

INDUSTRIAL APPLICATION SOCIETY, LAC CHAPTER

No meeting announcement for February

LASERS AND ELECTRO-OPTICS, LA METROPOLITAN CHAPTER

No meeting announcement for February

MAGNETICS, MAG 33 SOCIETY, LAC CHAPTER

No meeting announcement for February

METROPOLITAN LOS ANGELES/PES

No meeting announcement for February

MICROWAVE THEORY AND TECHNIQUES, LAC CHAPTER

No meeting announcement for February

**MICROWAVE THEORY AND TECHNIQUES,
SFV CHAPTER**

Who: Joe Ellison, Senior Vice President,
Morgan Stanley
What: "Keys to Successful Investing"
When: Thursday, February 21st, 7:30 PM
Where: Morgan Stanley, 335 N. Maple Dr.,
Suite 150, Beverly Hills, CA
Details: RSVP M&O 800-275-8765 or
mostaff@mo-rep.com, free parking, [http://
www.mo-rep.com/sfvmtt.htm](http://www.mo-rep.com/sfvmtt.htm),

**ORANGE COUNTY CHAPTERS OF THE
IEEE COMPUTER AND COMMUNICATION
SOCIETIES**

No meeting announcement for February

**POWER ELECTRONICS SOCIETY, LAC
CHAPTER**

**POWER ENGINEERING SOCIETY, LAC
CHAPTER**

No meeting announcement for February

REGION 6 SOUTHERN AREA

No meeting announcement for February

SAN FERNANDO VALLEY SECTION

No meeting announcement for January

**SOCIETY ON THE SOCIAL IMPLICATIONS
OF TECHNOLOGY, LAC CHAPTER**

No meeting announcement for February

**SOLID STATE CIRCUITS, JOINT LAC/OC
CHAPTER**

No meeting announcement for February

**WOMEN IN ENGINEERING AFFINITY
GROUP, COASTAL LOS ANGELES SECTION**

No meeting announcement for February

IEEE SOUTHERN CALIFORNIA CENTRE

No meeting announcement for February

Election Results

San Fernando Valley Section
new officers are:

Chair — Ramin Roosta

Vice-Chair — David Franklin

Secretary — Chris Maddox

Treasurer — Mehrdad Zomorodi

**Mini-Lasers And Silicon On Sapphire Technology Lead
To Speedier And Cost-effective
Interconnects Between Computer Chips**

*Replacing Wires With Optical Components for high-performance
Chip-to-chip Communication*

By using light beams in place of metal wires, engineers at The Johns Hopkins University have devised a cost-effective way to speed up the way microchips talk to each other. The method, created by a team in the Department of Electrical and Computer Engineering, takes advantage of unusual characteristics associated with silicon on sapphire technology, a new way to manufacture microchips.

"We've developed a very fast and cost-effective way of getting data on and off a chip without using wire," says Andreas G. Andreou, a professor in the department and director of the lab in which the work was done. "It really promises to revolutionize how computer systems for homes and businesses are put together."

Andreou's team relies on the same fiber optics technology that is used to carry phone conversations across great distances. These components are incorporated into a new type of microchip technology. The microchips inside most modern computers are assembled on thin slices of silicon, a material that is a semiconductor. The Johns Hopkins engineers use microchips in which silicon is layered onto thin slices of synthetic sapphire, a material that is an insulator and also allows light to pass through it.

In the microsystem devised by Andreou's team, a signal that originates in a wire is transformed into light and beamed through the transparent sapphire substrate via a laser that is only slightly larger than a human hair. Microlenses and other optical components, manufactured at the same time as the electronic circuits on the microchip, collect the light beam and guide it to another place on the microchip or, using an optical fiber, move it to another chip.

At its destination, the light enters a high-speed optical receiver circuit that transforms the stream of photons into a stream of electrons that continue their journey through electrical wiring connected to other computer components. By using optical signals, or simply an unhindered

laser beam, the Johns Hopkins researchers believe a signal could move 100 times faster than it does along a metal wire. Also, the optoelectric interface circuits require much less power because the sapphire substrate is an insulating material, not a semiconductor. This property of the substrate reduces the power dissipation that commonly occurs in modern microprocessors when signals travel through wires that have capacitances, which are parasitic components that not only degrade the signals but also increase the power consumption of the system.

The new design is expected to significantly speed the movement of data between electronic components (across a single chip and from one chip to another for a simple reason. "Without the parasitic capacitances, it's much faster to send signals at the speed of light," says Alyssa Apsel, a doctoral student in the Andreou's lab who helped develop the system.

Andreou and Apsel wrote about the breakthrough in an article published in the November 2001 issue of *IEEE Circuits & Systems Magazine*. Their co-authors were Zaven K. Kalayjian, a former Johns Hopkins doctoral student; Phillippe O. Pouliquen, a Johns Hopkins postdoctoral fellow, Ravi A. Athale, formerly of George Mason University and now at the Defense Advanced Research Projects Agency; George Simonis of the Army Research Laboratories, and Ron Reedy of the Peregrine Semiconductor Corp. Also, in the Sept. 13, 2001, issue of the journal *Electronics Letters*, Apsel and Andreou reported on this new design and described a high-speed, very-low-power optical receiver that uses this new technology.

The project was supported by grants from the Army Research Laboratories and the National Science Foundation.

Johns Hopkins University news releases can be found on the World Wide Web at http://www.jhu.edu/news_info/news/Information on automatic E-mail delivery of science and medical news releases is available at the same address

Calendar Articles

Information Architecture on the Wild, Wild Web: Improving the Structure, Presentation, Accessibility, and Semantics of Our Electronic Content

By: Wayne Smith, Director, Office of Information Technology, College of Business and Economics, California State University, Northridge, wayne.smith@csun.edu

(See Meeting in the IEEE Computer Reliability and CPMT Societies Chapter Section Calendar)

Deciphering the W3C alphabet soup (XML, CSS, SVG, DOM, SOAP, RDF, WAI, P3P, etc.) for publishing standards-based documents on the World Wide Web is rapidly becoming a full time job. Moreover, each of the “document” standards has subtle technological, architectural, design, and organizational touchpoints. Understanding the genesis, direction, and status of each of the W3C standards is increasingly critical in a highly interconnected world.

Probably the most ambitious initiative yet is the one to build the “Semantic Web”—that is, to embed clarity, consistency, and mutually reinforced semantic meaning on the Web. This presentation will summarize these activities and discuss what future “information architectures” IT professionals will be building for their organizations.

Biography of Presenter:

Mr. Smith has been involved with computers since 1975. He graduated with a Bachelor’s of Science degree in Management Information Systems from California State University, Northridge (CSUN) in 1984, and is currently a doctoral student in the School of Information Science at Claremont Graduate University. He has held various positions at CSUN including full-time lecturer in the Department of Accounting and MIS. Mr. Smith co-founded and taught in the desk-

top technology program of the CSUN Continuing Education program in 1986. He has been a network manager at a large UC campus and has also taught Financial and Managerial Accounting at a local community college. From 1991 to 1994, Mr. Smith supervised a team of programmers who designed and developed a major magazine imposition database and layout computer application for a Fortune 125 printing firm.

Mr. Smith is currently the Director of Technology in the College of Business Administration and Economics at CSUN where he helps manage the technology needs for 5,000 students, 150 faculty, and 35 staff. Mr. Smith has daily contact with students, most notably as the faculty advisor to the Management Information Systems Association student organization and as a frequent guest lecturer in the College. He has some enterprise-wide involvement as well, including network and server management, implementation of ERP (Peoplesoft) systems, developing custom DSS/OLAP solutions, classroom multimedia design, strategic planning and change management, and IT professional development.

In the past two years, Mr. Smith has been involved in doing pro bono work for other government agencies, including the Los Angeles Police Department, the Los Angeles County Office of Education, and Santa Monica College, in the area of hiring and selecting quality IT professionals and executives. Mr. Smith is a licensed amateur radio operator and is active in several religious and charitable organizations in the San Fernando Valley.

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Military Preparedness, a Private Sector Point of View

Frank Demartino President and Chief Operating Officer, Parsons Corporation

(See Meeting Foothill Chapter Section Calendar)

Immediately following the events of September 11, 2001, Parsons Corporation, like many of the other major engineering and construction companies was asked to respond to numerous requests for assistance for the federal government and public and private sectors. Mr. DeMartino will discuss several of the more interesting challenges being addressed by the engineering community in the post 9/11 environment.

For details see Calendar Section Wednesday Military Preparedness, a Private Sector Point of View Frank Demartino President and Chief Operating Officer, Parsons Corporation.

WESCON NEEDS YOUR HELP!

September 24-26, 2002
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Camera Ready

“Herbie Hydrant” Wins Best Consumer Electronics Product in the 2001 Hammacher Schlemmer Invention Contest

By: David Whitmoyer

Tragedy prompts veteran fireman to invent innovative child safety product

It's a product firefighter Mike Lucas wishes he didn't have to invent. But, a fire tragedy years ago led Lucas on a mission to create a product called Herbie Hydrant that would help in similar disasters all over the world.

While fighting a residential fire in Vail's Gate, New York, Lucas and his fellow firefighters sought desperately to find two small children lost in the burning home. When the children were finally found, they had died from smoke inhalation. Lucas says this haunting experience, one that is shared all too often by firefighters across the nation, led him to take action. With no previous invention or product development experience, Lucas set forth the arduous task of bringing Herbie Hydrant to life — soon to be followed by Holly Hydrant.

And Herbie Hydrant is already receiving rave reviews from some of the top product development experts nationwide as well. Out of more than 550 entries, the product was named Best Consumer Electronics Product in the prestigious Hammacher Schlemmer Invention Contest on November 12, 2001. <http://www.herbiehydrant.com>

Herbie Hydrant is a kid-friendly, multi-dimensional unit designed to be perched beside a child's bed. In the event of a fire or other emergency, children are taught to grab Herbie to help them find their way to safety. Once lifted from the mounted base, Herbie's flashlight shines, an alarm bellows and strobe lights flash. Additionally, the unit's digital timer begins, letting emergency personnel know how long the child may have been ex-

posed to the smoke. There is even a storage compartment where pertinent medical records of the child can be kept for quick reference by rescuers. If a child is not able to make it out of the fire, the lights and alarm aid the firefighters in locating the child.

The company is producing a long list of additional fire safety education accessories and Herbie will soon be available for fundraising efforts and fire education services for firestations, EMS departments and schools nationwide. <http://www.herbiehydrant.com/docs/fundraiser.htm>

Herbie will also be available in retail outlets nationwide in the months to come. In keeping with Lucas' original intention, portions of all proceeds from Herbie Hydrant will be donated to the Burn Centers of America.

Thinking Big On A Small Scale

USC Engineers Look For Ocean Pathogens With Swarms Of Tiny Robots

By: David Whitmoyer

The University of Southern California School of Engineering has received \$1.5 million research grant from the National Science Foundation to create swarms of microscopic robots to monitor potentially dangerous microorganisms in the ocean.

"With increasing urban runoff, sewage spills and blooms of harmful algae off heavily populated coastal areas, it is very important to be able to sense, and then identify, particular ocean microorganisms quickly," said Ari Requicha, a USC professor of computer science and the project's principal investigator.

"The quicker we learn that a pathogen is present in the water, the sooner we can warn people and begin action to correct the situation." The project spans the fields of nanotechnology, robotics, computer science and marine biology, but is centered on the development of the ultra-small robotic sensors and software systems to control them.

Requicha directs the USC School of Engineering's Laboratory for Molecular Robotics where his team has been experimenting with nanometer-scale structures for nearly seven years. One nanometer is one/one-billionth of a meter - roughly the length of a yardstick. A nanometer is to a meter what a small grape is to the entire Earth.

In the 1980s, scientists discovered that the sharp silicon tip of the newly invented scanning probe microscope not only produced images revealing individual atoms and molecules, but it sometimes moved them. The computer-controlled microscope scans microscopic samples, sensing their minute atomic forces and precisely mapping the surface at a molecular or even atomic level.

Working with colloidal gold and silver balls as small as two nanometers, and string-like organic molecules called dithiols that tether the balls to each other, Requicha's group has programmed their atomic force microscope - a particular

kind of scanning probe - microscope - to slide the "nanoscale" particles into precise positions on tiny slabs of mica or silicon. They can chemically link the particles to form crude assemblies, and they can make "nanowires" by depositing metals on strings of carefully positioned balls.

"We do this at room temperature and at normal air pressure, and we can also work in water and other liquids, which is crucial for biological applications," said Requicha.

The group has made a nanoscale single-electron transistor and an optical waveguide, which is a structure used to guide light. They are working on an actuator, or switch, and are starting to fabricate more complex 3D "nanostructures" by building up successive layers of nanoscale assemblies. Each layer is surrounded by a "sacrificial" material that holds it in place and that is removed when all the layers are complete to leave a tiny nanoelectromechanical device. Substances being investigated for use as the sacrificial material include charged polymers, zinc phosphonate films and organic compounds containing silicon known as silanes. Requicha said it will be possible to build nanoscale devices with electrical and mechanical components so that the devices could propel themselves, send electronic signals and even compute. While individual nanoscale devices would have far less computing power and capability than full-sized devices, the plan is to have vast numbers of them operating in concert.

It often takes Requicha's team weeks to assemble even a simple nanoscale object, but the procedure can be automated once the computer programming is perfected. Other labs are working on atomic force microscopes with more than one tip. Requicha said a single atomic force microscope could theoretically have an array containing thousands or even millions of tips, all controlled by the same computer program to manufacture large numbers of nanoscale devices.

David Caron, professor of biological sciences and a co-investigator on the project, said ocean robots needn't be terribly complicated or powerful to be useful. A single robot might sense only whether the water is fresh or saline and communicate by a faint radio signal only with other robots closest to it, which would then relay the information to other robots in the network linked to the Internet by still more robots.

In the next year, Caron hopes to attach an antibody to a microscope tip. He recently created an antibody that binds to *Aureococcus anophagefferens*, the toxic algae known as Brown Tide. With the same procedure widely used to test for HIV and other diseases, he can reliably test for the algae.

"That test takes a day in the lab, which is an improvement over current testing, but it's still not fast enough," said Caron. The microscope should detect the algae the instant a microorganism binds to the antibody on its tip.

Requicha estimates that it will be a decade before the researchers can build and deploy nanoscale robots in the ocean capable of the kind of instant and specific test like Caron's for Brown Tide. Along the way, he hopes the project will spin off technology in marine biology and other areas. "Suppose we put 15-nanometer particles on a grid with 100-nanometer spacing, which we can routinely do in our lab today. If we interpret the presence of a particle as a binary one and its absence as a zero, we have a scheme to store data," he said. "The bit density is 10 gigabytes per square centimeter, which means we have data storage that is 100 times better than today's compact disks. And it could be even greater with smaller particles and spacing."

The USC researchers will first build small robots that will move, sense and communicate while tethered in a tank of water in a laboratory. They will gradu-

(Continued on Page 9)

Thinking Big...

(Continued from Page 8)

ally progress to building and controlling increasingly larger numbers of increasingly smaller freely moving robots. The end goal of the project will be to create robots that are as small as the microorganisms that they seek to monitor.

"Today, we commonly do experiments with five or ten robots," said Gaurav Sukhatme, USC assistant professor of computer science and a co-investigator on the project. "But we'll need algorithms to coordinate a million or more robots. That is a daunting problem, and we must start laying out the foundations for large numbers of robots long before they are a reality."

Requicha said that nanotechnology today is at the same stage of development as the Internet was in the late 1960's. "The idea that we'll have swarms of nanorobots in the ocean is no more far-fetched than the idea of connecting millions of computers was then," he said. "I don't think these robots will be confined to the ocean. We will eventually make robots to hunt down pathogens or repaircells in the human body."

The grant is from the National Science Foundation's Information Technology Research program. Maja Mataric, associate professor of computer science and director of the USC School of Engineering's Robotics Research Laboratories, and Deborah Estrin, a computer networking specialist from UCLA, are also co-investigators on the project.

NANO BIOLOGY.BC-USC-JAN. 9, 2002

JOKE



One day, a fellow went for a ride through the park on his bicycle. The following day, a friend asked him if he would like to do it again. He replied, "No thanks, I'm not into recycling."

The Fourth IEEE BME/ BioTech Applications Contest will take place February 9, 2002

Eligibility: College students enrolled in six or more units whose campus is located in Los Angeles, Orange, Riverside, San Bernardino, Ventura, Santa Barbara, San Luis Obispo, or Kern counties.

Theme: To develop and present a concept using Electrical, Electronic, Bio-medical, and/or Electro-Optics techniques to assist a person's disability or to improve a person's ability to manage tasks that usually require assistance.

Requirements and Dates: Abstract of 50 to 500 words submitted for judging before February 1, 2002. An earlier letter of intention to participate is strongly encouraged and should be mailed at the beginning of January. All abstracts should be typed, using no smaller than size 10 font, and must not exceed four pages in length including any attached diagrams, schematic, and/or pictures. The concept submitted shall be that of the students, and shall note all references. The student shall present a brief overview of the basic concept, either a totally new idea or a conceptual modification to an existing item or system. The contest will be held on Saturday, February 9, 2002 at the CSULB Campus in Long Beach, Ca.

Awards: At the previous contests, the college students with the best concepts

and presentation received awards in the amounts up to \$1,000 (First Place) and proportionally lower were awarded for the second, third and fourth places. The amounts depended on the funding level.

Also, the winners were recognized at the awards banquet being held during National Engineers Week and received complimentary tickets. The previous contests were sponsored by IEEE Engineering in Medicine and Biology, and Circuits and Systems/Electron Devices Los Angeles Council Chapters and the Communications/Signal Processing Joint Chapter in addition to the IEEE LAC South Bay Section (support and sponsorship). Companies or individuals interested in the sponsorship of this event contact Dr. Chris Druzgalski at druz@csulb.edu.

For questions about this contest you may contact the Contest Panel members and/or judges (not more than one per participating institution) are: Dr. Willis Downing, CSUN; Dr. Bogdan Kuszta, Caltech; Mr. Jack Iverson, IEEE/EMBS; Dr. David Braun, Calpoly SLO; Dr. Richard Cockrum, CSUP; Dr. Ernesto Suaste, C-INVESTAV-IPN; Dr. Fleur Tehrani, CSUF; Dr. David Whitmoyer, IEEE; Mr. Frank Stankis, IEEE and contest coordinators: Larry Dalton, IEEE/LAC, Dr. Chris Druzgalski, IEEE/LAC/EMB, and Dr. Maryam Moussavi, IEEE/LAC/Student Activities.

(see www.csulb.edu/~druz/BMEBIOTECH)

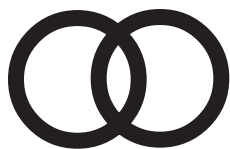
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Ask an Engineer

• **Question** — I am a chemical engineer working on my Masters. I would like to know to what extent is computer literacy needed to work in the chemical industry. I am familiar with languages like C. To be more specific, what are the well known packages for equipment design, process design and simulations used in the chemical industry. Can you tell me of a site where I can obtain more information.

Answer — Programming ability is not as important as familiarity with an ability to use spreadsheets, databases, and word processors, and other applications. Most organizations have programmers who take care of the programming issues. There are a number of design, modeling and simulation programs that are used, and the best vary depending upon the specific application.

• **Question** — I have just accepted a position with a manufacturing company requiring time and motion studies to determine cost of production and labor with the goal to reduce costs and determine more efficient methods to achieve the same quality product outcome. I am in need of information or web sites that can give me detailed information on conducting these studies; how to approach the overall task and how to break down the functions into manageable segments.

Answer — The first step is to list every task in the process to be analyzed. Each task can then be broken down into smaller tasks/motions. Each task has to be clearly defined - where it begins and where it ends. Variables that can occur within the task generally indicate that it should be broken down into separate tasks. For example, if 2 people are working on an assembly line to make toy trucks. The person at station A puts the wheels on. But there are actually 2 tasks in putting on the wheels - placing the

wheel on its support and tightening the bolts. There may be opportunity for improvement in each task, and if they are classified as one task, the opportunities for improvement may not be as obvious. There are a number of text books available about time and motion studies. They can be obtained at university book stores or through professional societies - try the mechanical engineers or industrial engineers societies. They each have web pages.

• **Question** — I'm interested in engineering, particularly in computers or computer programming. Please advise me on the institutions that can provide this kind of course.

Answer — A number of institutions throughout the country that have computer programming and computer engineering curriculums - way to many to mention here. And the selection of a school should involve much more than just the curriculum, but things such as religious affiliation, cost of tuition, the area of the country in which it's located and the size of the school. There are references - such as Barrons - that can be found at book stores and libraries that summarize this information and rank the schools based upon a number of factors including difficulty of curriculum and difficulty of admission, and provide information about admission requirements.

• **Question** — I am a mechanical engineering student who is looking for the ideal job. My goal is to find a company with a product that I am interested in, and then make that product better. What course of study should I follow?

Answer — I fairly generic mechanical engineering curriculum, with more emphasis on the mechanical aspects than the thermodynamic/heat transfer aspects would be recommended. To explore the perfect job, take advantage of under-

graduate research programs, summer internships, and/or co-op programs available. Talk to professors and people in the workplace to try and find out information about various companies. The internet is another good option for exploring companies. Also try and get involved in the student section of ASME and any projects/competitions that they are involved with, as these are often sponsored by corporations.

• **Question** — Can you tell me about embedded microprocessors?

Answer — Embedded microprocessors are ones used in systems where the software running on the processor is specific to the application. For example, a VCR has a microprocessor and its sole function is to run the VCR. The microprocessor reads input signals that tell it when the tape is put in the machine, which buttons are pushed, and whether or not the tracking must be adjusted. The code running the microprocessor makes decisions about what it has to do in response to the actions of the operator. The software written for the VCR is considered embedded.

• **Question** — Was the windshield wiper invented by a woman?

Answer — Mary Anderson is credited with the invention of the windshield wiper. She was a southern belle with no mechanical experience. When visiting NYC she felt sorry for streetcar drivers who had to hop out and clean their windshields periodically, so she designed a lever that would activate a swinging arm outside to mechanically clean the snow and ice. From "Feminine Ingenuity, How Women Inventors Changed America" by Anne L. Macdonald.

More questions and answers can be found at <http://www.expage/pagelaskanengineer6>

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