

Research Review 2001 3

"A Blueprint for the Information Infrastructure": Executive Forum, Faculty State-of-Field talks featured at February 23 event.

Y. C. Fung 6

Professor Y. C. Fung awarded the President's National Medal of Science in Washington D.C. ceremony.



UC San Diego

WINTER 2001

Jacobs School of Engineering

**Wireless extension of
the Internet
throughout the physical world**

\$300M Institute for Telecommunications and Information Technology Established

THE CALIFORNIA INSTITUTE FOR TELECOMMUNICATIONS AND INFORMATION TECHNOLOGY [Cal-(IT)²], led by UC San Diego in partnership with UC Irvine, has been established as one of three new California Institutes for Science and Innovation. Creating a powerful research collaboration along southern California's High Tech Coast, Cal-(IT)² partners some 220 UCSD and UCI faculty with research professionals from 43 companies, including a large number working in telecommunications, information technology, and software.

The goal of the institute is to extend the anticipated all-optical core of the Internet with digital wireless links and sensor technology to enable a new capability to monitor, manage, and interact with our world. Institute applications researchers will create leading-edge testbeds to investigate how the new wireless Internet will advance markets important to California's economy and quality of life

as related to the environment and civil infrastructure; telemedicine, bioinformatics, and digitally enabled genomic medicine; intelligent transportation; and new media arts.

"Our institute's mission is simple: Extend the reach of the current information infrastructure throughout the physical world. But as simple as this statement is, the research required to bring the new Internet into being is formidable," said Larry Smarr, institute director and professor of computer science and engineering at the Jacobs School. "No single investigator could hope to study this emerging system in its entirety, nor does any single company have sufficient resources to dominate the market. That's why we need an interdisciplinary institute of such unusually broad scope."

"The Institutes won't just be portals to the new economy. They will be its pilots."

-CA Governor Gray Davis

Read more on page 4

Jacobs School of Engineering

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Dean's Column

Ensuring Innovation into the Future



THE ESTABLISHMENT OF the California Institute for Telecommunications and Information Technology - affectionately referred to by us techies as Cal-(IT)² - is wonderful news both for California and our region. This comprehensive research effort will take the information revolution to a new level, and will help alter the way people communicate no matter where they are around the world.

Cal-(IT)² will ensure California's continuing technological leadership and economic growth, and will result in thousands of new jobs for people in the State. The new institute also reinforces San Diego's position as the wireless capital of the world, and sends a clear signal that if you want to be involved in telecommunications and the Internet, then you must have a presence here on southern California's Technology Coast.

Cal-(IT)² represents a new model for research in our country in that a state, rather than the federal government, has taken the leadership in determining its research agenda and research priorities. Over the past decade, our country has enjoyed one of the longest periods of economic prosperity in history. And it is this prosperity that is allowing California and others to invest the level of resources necessary to drive innovation in a way that makes sense for regional economies.

Recently, the National Council on Competitiveness has begun to track regions of the country where successful technology clusters have emerged. Clearly, in regions such as San Diego, Silicon Valley, North Carolina's Research Triangle, and Boston, clusters have grown up around great research universities. State investment in research universities, tied to the priorities of the region, will also serve to advance the public-private partnership that has so productively led to innovation and high quality jobs.

Here in California, Governor Gray Davis allocated \$300 million, to be matched on a two-to-one basis by industry and other sources, towards the creation of three new centers of research excellence. Through a competitive proposal process, the UC campuses, together with California industry, looked years ahead to determine focus areas that would most benefit from concentrated basic science and engineering research. For southern California, the area of telecommunications and information technology, applied to key markets such as medicine and transportation, and clearly built on the strengths and potential of UCSD as lead campus and UC Irvine as the partner campus, was our choice.

As chair of the campus steering committee assigned to develop the proposal for our new institute, I became convinced that we are entering a new era of maturation on our cam-

pus. At just 40 years old, UCSD has been built by recruiting stellar faculty who are leaders in their fields and by encouraging a spirit of entrepreneurship in the way we teach and conduct research. We have also worked very hard, particularly over the past five to ten years, to build positive relationships and partnerships with our surrounding communities and industries, in a way consistent with the university's core values and missions.

The Cal-(IT)² proposal, one of the best research and management plans I have ever seen, proved that our preparation paid off. Our proposal was successful because of three key elements: an experienced and competent management team led by Professor Larry Smarr of our CSE department and Professor Ramesh Rao of our ECE department; a great technical vision; and the School's long-standing relationships with industry.

One of the most exciting aspects of the institute is the industry involvement. Cal-(IT)² teams 43 companies with UCSD and UCI in this research endeavor. And the number of companies interested in partnering grows daily. Representing unprecedented support for basic research by industry, our industrial partners committed more than \$140 million to our efforts. These resources are in the form of gifts for endowed chairs for faculty, scholarships and fellowships for students, and equipment, and in the form of sponsored research programs.

The majority of these companies are already engaged with the School and the University in a very meaningful way—some through the Jacobs School's Corporate Affiliates Program and Center for Wireless Communications, others through the corporate outreach programs at UCI. We could not have prevailed, given the Governor's call and request not only for matching funds but for the university to be in a meaningful partnership with industry, without the tremendous support our industry partners are providing.

We clearly have high hopes for our new California Institute for Telecommunications and Information Technology. I believe it will lead to advances in telecommunications and Internet and information technology that will surely result in an improvement in our quality of life. And it will serve as an international model for government-academic-industry partnership to advance new discovery and innovation. This in the end may be the Institute's greatest legacy, and having UCSD pushing all these frontiers is what makes the place so exciting.

Bob Conn, Dean

CONNECT Version 2.0: Broader Partnerships; Deeper Programs

UCSD CONNECT has become one of nation's best recognized programs for fostering the growth of high technology companies. More than 500 early stage companies have received direct entrepreneurial assistance from CONNECT.

Now CONNECT is launching 2.0, a set of initiatives to facilitate interconnections between the university and the business community to drive technology commercialization. CONNECT 2.0 represents an increased focus on extending program reach and depth through partnerships in the biotechnology, telecommunications, and software/Internet areas.

A cornerstone of CONNECT 2.0 is creating closer ties to the world class technology emanating from UCSD. In the first university partnership being announced, CONNECT and the Jacobs School will join forces to foster the growth of technology commercialization. CONNECT plans to open a satellite office inside the School to provide resources, support and business mentoring for faculty and students desiring to evaluate the potential commercial value of their research. Complementing the services of UCSD's technology transfer office, CONNECT will be available to provide advice and assistance in forming a new business, identifying appropriate management talent as well as sources of seed capital. CONNECT will also partner with the Jacobs School in offering training and education in entrepreneurship for engineering students, researchers, and faculty.

CONNECT is also forming new partnerships with industry groups. For example, CONNECT has just announced a partner relationship with the San Diego Telecom Council with features such as a dedicated, telecom-focused Springboard Program for companies in the start-up to first round funding phase to help with business plan assessment, technology evaluation and funding strategy development.

Yet another component of CONNECT 2.0 is partnership with UCSD Extension Continuing Education to offer executive entrepreneurship courses. The emphasis will be on team teaching by industry executives and nationally recognized entrepreneurial management educators.



"CONNECT 2.0 programs are all about going full throttle to accelerate the creation and quality growth of high technology companies in the region."

Fred Cutler
Director,
UCSD CONNECT

UCSD Preuss School Helps Prepare Students for Higher Education



Preuss School students prepare for their first annual Winter Concert.

DOORS OPENED TO UCSD's Preuss School in October. The public charter school was made possible through gifts from Peter and Peggy Preuss, as well as many other community supporters. The mission is to prepare educationally under served students for university admission and graduation.

The majority of the school's 416 sixth through ninth graders come from the San Diego Unified School District, but there also are representatives from Poway, Mira Mesa, San Ysidro and Linda Vista. The public charter school has extended class periods and school days as well as a longer school year than traditional schools. Classes range from 20 to 25 students. Twenty-two teachers are assisted by UCSD faculty members and students who serve as tutors, interns, and mentors. By the year 2003, the school should accommodate 700 sixth through 12th graders. Visit <http://preuss.ucsd.edu>.

A Blueprint for the
Information Infrastructure

Research Review 2001
Friday, February 23

Executive Forum

- Dr. Paul Horn, IBM Corporation
- Dr. Paul E. Jacobs, QUALCOMM Inc.
- Dr. Greg Papadopoulos, Sun Microsystems
- Åke Persson, Ericsson Wireless Communications
- David M. Rickey, AMCC

Faculty State-of-the-Field Talks

Graduate Research Posters

Industry Technical Exhibits

Register on-line:

www.soe.ucsd.edu/events/rr01_reg.html

University of California, San Diego Irwin and Joan
Jacobs School of Engineering

Contents



CENTER SECTION

Annual Highlights feature new faculty and plans for growth.

Students 7

ECE graduate student wins national inventor's award.

Corporate Partnership 8

Bioengineering program welcomes industry partners.

Private Support 9

MaryAnn F. Stewart named executive director of external relations.

Alumni 10

Richard Kornfeld '82 is a pioneer in the wireless industry.

Job Opportunities Back Cover

ON THE COVER

California Institute for Telecommunications and Information Technology [Cal-(IT)² established.

Research 4

The Cal-(IT)² research plan.

Innovation 5

Project for glucose monitoring and control.

Faculty 6

Ronald Graham, chair of computer science and engineering, looks to the future of the department.

Cal-(IT)² Integrated Research Approach

The California Institute for Telecommunications and Information Technology [Cal-(IT)²] takes a systems engineering approach to extend the reach and capability of the "new Internet."

As Institute Director Larry Smarr puts it: "We envisioned what the new Internet will look like ten years from now, then determined what research has to be carried out today to make it a reality in the future."

Smarr predicts that the number of wireless connections to the Internet will come to exceed the world's population and that the all-optical Internet backbone will carry information through highly parallel wavelengths of light. The new Internet will enable revolutionary changes, such as medical sensors that can monitor the vital signs of home-based patients and signal health care providers in the case of medical emergencies; processors remotely stationed in the high Sierras to monitor snowpack for its implications with respect to the future quantity of water resources for California; and smart transportation systems that communicate among vehicles and, in aggregate, serve as a "smart supercomputer" to monitor and manage traffic flows and emergency situations.

Development of this new Internet will be fueled by basic research through Cal-(IT)². For example, monitoring the environment and civil infrastructure continuously and efficiently requires research on materials, devices, circuits, and systems-on-chip to create a new generation of low-cost, low-maintenance, low-power nodes that can sense, store, process, and communicate data. Research on devices, circuits, and communication systems is needed to develop a common communication fabric

that "sees" untethered devices. Organizing the large-scale sensor networks demands software research on self-organization, scalability, and security.

The Cal-(IT)² research program is organized into five separate, but interwoven research layers:

Materials and Devices

Molecular materials; optical, wireless, and storage components; and micro-electro-mechanical-system devices.

Networked Infrastructure

Digital wireless, broadband, network architecture; protocols and management; photonics; sensors; and storage.

Interfaces and Software Systems

Secure and scalable distributed system software, mobile agents, knowledge management and data mining, human-computer interfaces.

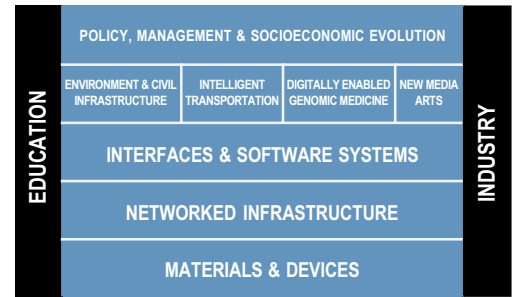
Strategic Applications

Environment and civil infrastructure, intelligent transportation; telemedicine, bioinformatics, and digitally enabled medicine; new media arts.

Policy, Management and Socioeconomic Evolution

Spectrum allocation, privacy, intellectual property, and networked enterprises.

The research teams will integrate the technologies developed and create "living laboratories" where scientists will be able to test new products and concepts.



For example, in partnership with the institute, UCSD's new Sixth College, scheduled to open in 2002, will be "born wireless." At UCI, a "smart house" will be constructed to demonstrate how computer-controlled appliances, entertainment suites, and security systems can be operated remotely via wireless Internet links.

UCI and UCSD students will work with academic and industrial researchers in a powerful, dynamic environment, and, upon graduation, become the leaders of the next generation of research and development in academia, industry, and government.

The institute involves scientists from a broad range of research centers and nearly every academic unit at UCSD and UCI. The management team includes Smarr; UCI Division Director Peter Rentzepis, a UC Presidential Chair and UCI professor of chemistry and electrical and computer engineering; UCSD Division Director Ramesh Rao, UCSD professor of electrical and computer engineering and director of the UCSD Center for Wireless Communications; and Institute Chief Scientist Ronald Graham, chair and UCSD Irwin and Joan Jacobs professor of computer science and engineering.

New Paradigm for Innovation

CALIFORNIA GOVERNOR GRAY DAVIS proposed the creation of the California Institutes for Science and Innovation in January 2000 to ensure California's premier standing in high-tech and biosciences industries and provide the technological underpinnings for economic growth. The institutes are funded by a four-year \$300-million state allocation, matched two-to-one by non-state dollars, bringing the base total funding to at least \$900 million.

The institutes are basic research centers concentrating on complex challenges that demand multidisciplinary strategies and state-of-the-art facilities. Partnerships with industry will move prototypes into the R&D pipeline for more rapid delivery to the marketplace.

Governor Davis used a competitive, peer-review proposal assessment process. Six UC proposals were submitted, and, on December 7, 2000, Davis announced the three winning institutes: Cal-(IT)²; Bioengineering, Biotechnology and Quantitative Biomedicine led by UC San Francisco; and the California Nanosystems Institute led by UCLA, as well as a fourth center led by UC Berkeley which funding will be requested for in this legislative session.



Cal-(IT)² Industry Partners

Akamai Technologies, Inc.
AMCC

The Boeing Company
Broadcom Corporation
CAIMIS, Inc.

Compaq
Conexant Systems, Inc.

Connexion by Boeing
Copper Mountain Networks, Inc.
Emulex Corporation Network Systems
Enterprise Partners Venture Capital

Entropia, Inc.
Ericsson Wireless Communications, Inc.
Global Photon Systems, Inc.
IBM

IdeaEdge Ventures
Intersil Corporation
The Irvine Company
Irvine Sensors Corporation
Leap Wireless International
Litton Industries, Inc.

Merck
MedExpert International, Inc.
Microsoft Corporation
Mission Ventures
NCR
Newport Corporation
Orincon Industries
Panoram Technologies
Printronic

Qualcomm Incorporated
The R.W. Johnson Pharmaceutical
Research Institute

SAIC
SolFrame, Inc.
Silicon Wave
Sony
STMicroelectronics, Inc.
Sun Microsystems
TeraBurst Networks
Texas Instruments
The Unwired Fund
UCSD Health Care
WebEx

Cal-(IT)² at a glance

State Funds: \$100 million
Matching Funds: \$200 million+
Faculty Involved: 220+
Industry Partners: 43
To be Constructed:
215,000 ft² building - UCSD
119,000 ft² building - UCI
Web Site: www.calit2.net

Glucose Project Focuses on Creating a Better Life for Diabetics

CONTROLLING DIABETES requires careful, frequent monitoring of blood sugar levels and accurate delivery of insulin. For many diabetics today, this means a lot of finger pricking to collect blood samples, a constant juggling of meals and activity schedules, and a drawer full of insulin syringes.

Now, a group of doctors and engineers at UCSD are trying to make life simpler for people with diabetes. They have teamed up to form a collaboration known as the "Project on Glucose Monitoring and Control" to explore new ways to monitor blood glucose and deliver insulin. The project is privately funded.

"We are considering a variety of glucose sensors and insulin replacement strategies," says David Gough, project director and chair of bioengineering at the Jacobs School. "These range from improvements in finger-pricking devices and fully implantable glucose sensors, which we'll be focusing on at UCSD, to shining

light through the skin and using the light's reflection at particular frequency to gauge insulin levels."

In addition to developing new sensors, researchers will determine how to use information from sensors to better control blood glucose levels. The sensors would provide feedback for improved insulin replacement, either by optimization of conventional injection schedules or by activating new insulin pumps under development elsewhere.

The sensors will be placed near the surface of the skin, but the exact location is still being determined. A plausible spot is on the upper chest.

The glucose monitoring group will also address other approaches to treating diabetes. Much of what scientists learn from sensors and control algorithms also applies to the optimization of certain proposed biological therapies, such as implants based on encapsulated beta cells and islets harvested from the pan-

creas. Islets are cell groups that synthesize insulin. Learning how to control them could lead to an effective artificial pancreas.

"I think there is a potential to substantially improve the quality of life for people with diabetes," says Gough. "The Project on Glucose Monitoring and Control may provide the means."

The group will sponsor a Conference on Glucose Monitoring and Control at the Radisson Hotel in La Jolla on February 15-17. The conference is expected to draw over 100 scientists and engineers, government officials, industry representatives and members of the public, and may become an annual event. One of the key objectives is to define performance goals for glucose regulation systems so that progress can be evaluated. The Project team will strive to interact with industry as much as possible.

Visit: www-bioeng.ucsd.edu/dept/events/glucose_conf/index.html for conference information.

UCSD Tests Components for Bay Bridge

UCSD STRUCTURAL ENGINEERS have begun a year-long series of proof tests on components for the new San Francisco-Oakland Bay Bridge East Bay Span. A single-tower, self-anchored suspension bridge and skyway is planned to replace the existing East Bay Spans, which were built after part of the deck collapsed in the 1989 Loma Prieta Earthquake. The modern design for the new bridge should allow the structure to withstand a major earthquake on both the Hayward and San Andreas faults. With an estimated cost of \$1.5 billion, the new bridge will be the most expensive project in Caltrans history.

In December, UCSD began tests of several bridge components, including evaluation of a quarter-scale model of the supporting piers. Based on designs and previous testing by Frieder Seible, chair of structural engineering, the piers demonstrate a new design concept in which a hollow concrete pier has four confined corners made up of solid concrete reinforced with steel.



Patents and Licenses

Biophotonics for Cell Selection

GenOptix has signed a letter of intent for four inventions by **Sadik Esener** (ECE) and **Sangeeta Bhatia** (Bioengineering), which use light energy to rapidly select and control the positioning of cells. This portfolio includes field-assisted fluidic assembly of small devices and molecules, microfluidic switching technologies, and novel design and use of optical tweezers. Such cell manipulation techniques could be useful for drug development and for

diagnosis of cancer and genetic disease. One patent has been filed, and three more are anticipated. Contact Tina Nova, (858) 523-5000, www.genoptix.com.

Potential Treatment for Shock

Aethlon Medical, Inc. of San Diego has executed a letter of intent for two inventions by **Geert W. Schmid-Schönbein** (Bioengineering) regarding ischemic shock. The discoveries are directed towards identifying cell activation factors

responsible for ischemic shock, and using pancreatic enzyme inhibitors as a potential therapy to prevent or treat shock following traumas or surgeries. Two patents have been filed to cover this work.

Contact Richard Tullis, (858) 793-8730, www.aethlon.com.

Internet Data Analysis

Spinning out of UCSD's **San Diego Supercomputer Center** are Caimis, Inc. and Caimis Geo, Inc. Caimis focuses on

Internet monitoring and network management tools, while Caimis Geo is based on geographic location tools, all originally developed at SDSC's Cooperative Association for Internet Data Analysis (CAIDA) and exclusively licensed from the University. Contact Daniel Westrick, westrick@caimis.com, www.caimis.com.

This column is provided by UCSD's Technology Transfer and Intellectual Property Services (TTIPS) office: <http://invent.ucsd.edu>

Web Watch

DNA Sequencing

Pavel Pevzner, Ronald R. Taylor Professor of Computer Science, is developing a new DNA sequencing technique that will allow scientists to piece together DNA fragments in order to assemble very large genomes. His research will play a significant role in completing the much-publicized national effort to sequence the human genome. In contrast to previous approaches, Pevzner's EULER program resolves the notorious "repetitive DNA" problem and produces error-free assemblies while the existing programs assemble up to 20% of fragments with errors. "The classical computational approach to DNA sequencing is not unlike assembling a puzzle from millions of small pieces, and existing algorithms for such fragment assembly face formidable computational difficulties," explains Pevzner. As a result, these algorithms make assembly errors and are often unable to resolve repeats even in relatively small bacterial genomes. "Our new approach emulates the fragment assembly as an analysis of DNA chips, another hot genomic technology."

Visit: www-cse.ucsd.edu/users/ppevzner/research.html.

Chemical Engineering Program

The Jacobs School's Chemical Engineering program recently unveiled its new and improved web site, complete with revolving images that refresh automatically to provide a pleasant visual tour. Founded in the late 1970s, the program provides undergraduate and graduate curricula designed to foster chemical engineering as a multi-disciplinary field, interfacing engineering and the life sciences (physics, chemistry, and biology), and facilitating California's critical biotech and high-tech based economy. In terms of content, the well-organized site provides valuable program information, including a thorough program description, a summary of undergraduate and graduate studies, faculty and staff information, and a list of various research projects. Additionally, users can access links to important news and events, as well as student resources and advising material.

Visit www-mae.ucsd.edu/wwwcheme/.



Y.C. Fung Receives National Medal of Science

YUAN-CHENG FUNG, PROFESSOR EMERITUS of bioengineering, recently received the President's National Medal of Science, the nation's highest scientific honor. Fung is the first bioengineer to receive the prestigious medal since it was established in 1959. He is also the only engineer among the year 2000's 12 honorees.

Fung joined UCSD in 1966 to initiate a B.S., M.S., and Ph.D. program in bioengineering. He helped shape and continues to bolster a bioengineering department that was ranked third best in the nation in the 2000 U.S. News & World Report survey of graduate programs.

Prior to joining UCSD, Fung was a faculty member at CalTech, where he received his Ph.D. in 1948. His early research focused on the dynamics of airplanes in turbulent weather, and on aircraft and spaceship safety, performance and design. His pioneering work welded the classical fields of aerodynamics and structures into a unified discipline of aeroelasticity.

Beginning in the late 1950's, Fung became interested in the mechanics of the eye because his mother was suffering from glaucoma. In the mid 1960's, he published the pioneering "tunnel" theory of the capillary blood vessels, and the "stress-free design" theory of the red blood cells, which are still widely accepted. He grew convinced that understanding of the human body can be improved by paying attention to stress and strain in the body.

At UCSD, Fung developed equations representing the strain energy function of soft tissues as an exponential function of a quadratic sum of the strain components. He devised many ways to determine the elastic constants of soft tissues and introduced the concept of pseudo elasticity and quasi-linear viscoelasticity.

Fung, with Sid Sobin, Michael Yen, and their students, developed a "sheet-flow" theory of the lung. It explains and predicts many clinical observations on pulmonary blood flow, edema and other problems. Fung and his associates have also developed fundamental knowledge about the coronary blood vessels, pulmonary vascular tree, and intestines.

He and his students clarified the zero-stress state of blood vessels and other organs. When a tissue remodels, the zero-stress state changes. This change is the simplest and best measure of tissue remodeling. Such concepts of tissue remodeling form a take off point for tissue engineering.

Fondly known as the father of biomechanics, Fung adds the National Medal of Science to a long list of awards and honors. He is one of the few individuals to be elected a member of all three branches of the National Academy.

Q & A with Ron Graham

Chair, Department of Computer Science and Engineering



Q: What are the department's key research areas?

A: There are five critical areas of research that we must focus on to take the department to the next level: Internet systems (security, networking, and mobile computing), bioinformatics, Web-based information systems (how to find and organize information on the Web), software systems, and distributed systems.

Q: What are CSE's goals with regards to student recruitment?

A: Our projected student enrollment for the future is huge! We are really just at the beginning of the information age and there is still so much to learn and do. The number of yearly applicants continues to climb. We now have over 1100 undergraduates and more than 230 graduate students. Within the next few years we'd like to add 100 new graduate students and put a greater emphasis on the Ph.D. program.

Q: You mention increasing graduate enrollment. How will you do this?

A: First and foremost, to attract more graduate students, we must offer more first year fellowships. The Jacobs School's new matching fellowship program and the California Institute for Telecommunications and Information Technology [Cal-(IT)²] will allow us to offer very gen-

erous initial packages to graduate students. Also, cultivating world-class research areas and recruiting outstanding faculty helps in developing a reputation of excellence. CSE has made a dynamic effort to recruit strong faculty and last year was our biggest recruiting year ever. We hired Pavel Pevzner (bioinformatics), Stefan Savage (wide-area networking and distributed systems), Andrew Kahng (VLSI physical design and CAD), and Larry Smarr (computational science and information technology). We must maintain this aggressive approach to accommodate our expected growth over the next five years.

Q: Finally, how does CSE differ from ECE? They both have a focus on computer engineering.

A: That's a good question. I think that there is very little difference right now between the two. ECE may focus a little more on hardware and CSE a little more on software, but the distinction between the two is rather tenuous. In fact, CSE students take courses in both departments and professors teach in both areas. There is obviously some duplication, and we need to take a closer look at this in order to be as effective and efficient as possible.

Faculty Honors

Sarah Gille (MAE), received the Zeldovich Award from the Committee on Space Research (COSPAR) and the Russian Academy of Sciences for excellence and achievement by a young scientist.

Sergei Krasheninnikov (MAE) has been nominated Fellow of the American Physical Society. Krasheninnikov will be profiled in the centennial edition of *Who's Who in America*.

Miroslav Krstic (MAE) has been appointed to the Board of Governors of the IEEE Control Systems Society. Krstic is the organizer of the 2001 Combustion Control Workshop co-sponsored by the Office of Naval Research and UCSD on February 15 and 16 at Sea Lodge, La Jolla. Call (858) 822-1374 for information.

Larry Milstein (ECE) has been selected for the Armstrong Achievement Award of the IEEE Communications Society.

Marlene Rosenberg (ECE Research Scientist) has been elected a Fellow of the American Physical Society for her pioneering contributions to the theory of dusty plasmas related to strong coupling effects and the role of instabilities.

1999-2000 Best Teacher Awards were recently presented to **Michael Bailey** (CSE), **Pao Chau** (ChemE), **Juan Lasheras** (ME), **Larry Milstein** (ECE), **Keiko Nomura** (AE), **Geert Schmid-Schönbein** (BE), **Dave Tribolet** (lecturer, MAE) and **Chia-Ming Uang** (SE).

Jacobs School Student Inventor Receives National Award for Microlens Fabrication Technique



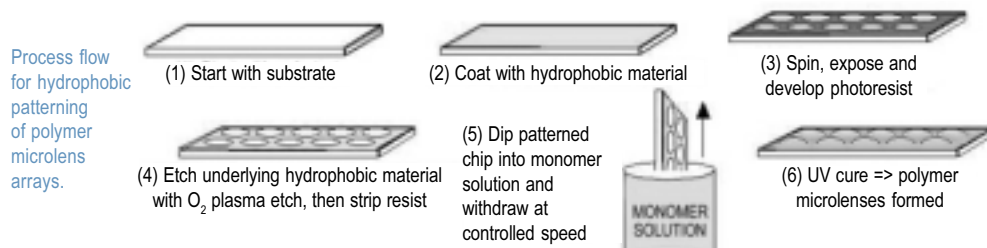
DANIEL HARTMANN, AN ELECTRICAL AND COMPUTER ENGINEERING graduate student has invented a new line of high performance, low cost polymer microlenses. These tiny optical components may be used as building blocks inside next generation computers and flat screen televisions. Hartmann was one of six first place winners at the 2000 Collegiate Inventors Competition, sponsored by the National Inventors Hall of Fame (www.invent.org).

Microlenses, which direct and focus light beams, are currently used in optical switches for routing signals in optical communication systems.

But in part, because costs can range as high as \$20,000 for a single array of lenses, microlenses have found limited use in consumer products. As more and more applications emerge, there is an increasing need for cost-effective microlens technology. Under the direction of Professor Sadik Esener and researcher Osman Kibar, Hartmann has created an elegantly simple fabrication technique that could bring the costs of microlenses down to earth.

"Our process for creating an array of microlenses requires very little machinery, and no heat," says Hartmann. "Using a principle called the hydrophobic effect, we simply coat a piece of glass or silicon with RainX, a compound that makes the glass resistant to liquid. Then we etch out our pattern for the lens array. After that, we dip the glass into a polymer solution. The solution sticks to the areas that have been etched out and naturally forms small caps of liquid that become lenses."

Hartmann expects manufacturers to use low-cost microlenses to develop ultra-fast computers. Such lenses can be used to make optical-interconnects, which could replace traditional electrical interconnects between chips and other components. Microlenses could also be used to redirect light beams through optical fibers, or even through midair, bridging the gap between a transmitter and a receiver. UCSD has a patent pending on the technique.



THE NEWEST EFFORT in the Jacobs School's outreach is KEYs (Keys to Empowering Youth), a program focused on girls in middle school.

Sangeeta Bhatia, assistant professor of bioengineering, has been the primary force behind establishing the initiative: "KEYs brings girls age 11 to 13 together with college students and faculty to participate in workshops that foster empowerment, awareness, problem-solving skills, and demonstrate that science and engineering can be fun." Bhatia says the program was started at MIT in 1993, after research showed that girls in this age range experienced diminished self-esteem, had few role models in science and engineering, and exhibited declining test scores in math and science.

The first workshop at UCSD, organized by the Society of Women Engineers (SWE)-UCSD Chapter and the Girl Scouts of San Diego, was held September 30th for 30 girls from Horace Mann Middle School and National City Middle School. The day's activities included role-playing, career planning, and laboratory tours.



KEYs Program Provides Role Models for Girls

Quick Study

Graduate Student Honored for Cell Patterning Research

Mihrimah Ozkan (ECE) won the "Graduate Student Silver Award" (1999) at the Materials Science Conference in Boston for her paper *A New Electrochemical System for Pick and Place of Devices and Biological Cells on Silicon Substrate*. She recently added to her accolades by receiving the Biomedical Engineering Society Year 2000 Graduate Student Award, and spoke at the BMES annual meeting in Seattle, Washington. Ozkan's talk was titled *Electrokinetic Patterning of Cells and Beads in Microfabricated Arrays*. She authored the work along with Jacobs School Professors Sadik Esener and Sangeeta Bhatia.

Registrations Open for Engineering Job Fair

Companies may still register to participate in the Student-run DECaF (Disciplines of Engineering Career Fair) scheduled for February 13 in the UCSD Price Center. Participating companies also receive a book of undergraduate and graduate student resumé. The registration fee is \$500 and all proceeds benefit engineering student professional organizations at the Jacobs School. For more information or to register, please call (858) 534-6277, or contact Kate Twogood at ktwogood@ucsd.edu.

World-class Education at a Great Price

UCSD has been ranked 10th among the "100 Best Buys" in U.S. public colleges and universities by Kiplinger's Personal Finance. The list is based on graduation rates, student-faculty ratios, and expenditures on instruction and library resources. Further criteria were quality of education, cost of education, and financial aid.

The University of California recently announced that it has not raised student fees for six consecutive years. Fees for resident undergraduates were *reduced* by 10% during the 1998-1999 and 1999-2000 years, and fees for resident graduate students went down 5% in 1999-2000. In contrast, a survey by the College Board reveals that college fees and tuition increased by an average of 4.4% at public four-year institutions nationally this year, with students paying \$148 more annually in academic 2000-2001 than they had the previous year.

CAP CORNER

Corporate Affiliates Program

> Welcome to the following companies who joined CAP in the last four months: **IdeaEdge, Silicon Wave, The Boeing Company** and **WJ Communications, XSILOGY**. This brings our total Cap membership to 55 companies! If you would like information about CAP, contact Kelly Briggs at (858) 534-2329.

> Thank you to Dave Esbeck (**Solar Turbines**) for hosting the 5th annual "Spirit of Solar" Cruise. CAP Executive Board members and prospective new members were treated to a lovely San Diego Bay cruise to kick off the academic year.

> **BAE Systems** is offering a limited number of "tuition reimbursement gifts" to qualified seniors. E-mail jill.hagerman@baesystems.com for qualifications and information.

> The Annual Resumé Service, which includes resúmes of honors undergraduate and graduate students, was recently released. For more information regarding this service, contact Kelly Briggs, (858) 534-2329, kbriggs@ucsd.edu.

> Marina Hayden (Engineering Student Services) is available to help CAP members plan for summer internships and to assist companies with tailored searches based on individual needs. Call (858) 822-3780 for an appointment.

> 2000-2001 goals for CAP were established at the Fall 2000 board meeting. These goals include:

- Increase membership by 30%
- Expand scholarship/fellowships
- Establish subcommittees for the ABET accreditation process.

> Dave Grooms (**Kyocera**) has retired. Alan Chow (**NCR**) will be assuming Dave's duties as CAP Vice Chair for the balance of 2000-2001.

> **Mark your calendars!**

Important CAP dates to remember:

February 23

Annual Research Review

March 1

Student Internship Program (SIP) solicitations

May 4

Annual Recognition Banquet

Microsoft has created a philanthropic tradition of providing invaluable support to the Jacobs School.

BY PARTNERING WITH UNIVERSITIES around the world, Microsoft Research encourages faculty, students, researchers and staff to integrate Microsoft technologies into computer science research. For the Jacobs School's Computer Science and Engineering (CSE) Department, the Microsoft Research University Relations program has made a substantial contribution to the department's ability to achieve its educational mission and research goals.

CSE student Daniel Choe, a Microsoft student consultant, acts as a liaison between UCSD and Microsoft Research.

"Our goal is to expose students to the latest innovations in software, such as Microsoft Visual Studio, a Windows-based suite of development programs and tools, in order to help prepare students for life after college."

Visit www.research.microsoft.com/programs to learn more about the University Relations program.

MICROSOFT CONTRIBUTIONS TO THE JACOBS SCHOOL

- \$700,000 Microsoft Research grant
- \$200,000 computer hardware grant
- Product training and support
- Compaq Ipaq wireless Pocket PC devices for Active Web group research
- 650 copies of Visual J++
- Over 200 copies of Visual Studio
- Nearly 100 copies of Windows 2000 for independent student development
- 60+ MS Press Books
- Prizes for programming contests
- Pizza for various classes

Conexant Supports Students

Conexant recently provided \$21,600 for student scholarships and program support. According to Glynda Davis, Director of Engineering Student Services for the Jacobs School, "I'm absolutely delighted and thrilled that Conexant has chosen to acknowledge, in such a significant way, the importance of the student activities in the overall development of well-rounded engineers. These resources will allow us to move more quickly in expanding support for student activities that promote interest in engineering, facilitate retention in the engineering majors, and develop a deeper understanding of real-world problem solving."

The Conexant gift is earmarked for scholarships (\$12,000), student organizations (\$2,000), student design projects (\$4,000), and outreach (\$3,600) through the

MESA program, which serves disadvantaged and under represented students in engineering programs at the undergraduate level.

Conexant is the world's largest independent company focused exclusively on semiconductor products and systems solutions for communications electronics.



Conexant's gift supports student design projects such as the Human Powered Submarine

Bioengineering Program Welcomes Industry Partners

A major goal of the Whitaker Institute of Biomedical Engineering (WIBE) is to enhance industry-academic collaboration and interaction. The WIBE's Industrial Affiliates Program was created to build these critical relationships. Benefits of the program include access to WIBE faculty and researchers, invitation to research symposia and seminars, direct access to students and the Industrial Internship Program, subscription to the WIBE Newsletter, and representation on the Industrial Advisory Board. For more information on becoming a member of the Industrial Affiliates Program contact Tatyana Matusov (tmatusov@bioeng.ucsd.edu) at (858) 822-2290.



Professor William and Margaret Chang

Fellowship Campaign Tops \$700,000

With the graduate student fall admissions cycle running at full throttle, the Jacobs School now has an additional \$705,000 in fellowship support to aid its recruitment efforts. Last year's Graduate Fellowship Campaign, in which UCSD matched each dollar contributed by individuals, was a huge success. The initiative was particularly critical for the Jacobs School. The School has grown from a graduate enrollment of 500 in 1995 to 720 today, and graduate enrollment will increase to 1,500 over the next 10 years. Graduate fellowships provide funds for student expenses such as tuition, living expenses, and education supplies.

Many thanks to the following individuals who contributed to the Campaign:

- Walter J. Zable Foundation
- Robert Akins/Cymer
- David and Jennifer Brown
- Brian and Kathleen Kenner
- Arnost and Kitty Fronck
- R.R. "Buzz" Woolley, Jr.
- Dev Purkayastha
(Purkayastha Family Foundation)
- Professor William and Margaret Chang
- ECE faculty and friends

Jacobs School Faculty Honor Professor William Chang through Endowed Fellowship

Professor William S.C. Chang joined UCSD in 1979 to establish a microelectronics program. Through his tireless leadership, the Electronics Devices and Materials group is enjoying a worldwide reputation in compound semiconductor electronics and optoelectronics.

Not long ago, Professor Chang and his wife Margaret worked closely with the University in setting up an endowed graduate fellowship fund for the Department of Electrical and Computer Engineering (ECE) within their estate plan. When the ECE Department learned of the Chang's future gift, they decided to initiate a fundraising drive in order to establish the fellowship fund during Chang's lifetime.

The ECE faculty efforts coincided with the recent Graduate Fellowship Campaign. In less than three months, more than 20 donors, including Chang's friends, colleagues, and former students, contributed a total of \$16,300. Chang and his family matched this amount, and UCSD matched the sum for a combined total of more than \$65,000. The ECE Department will receive one third of the fund each year for the next three years.

Endowed Gifts: A Tax-Savvy Opportunity

The Changs chose to establish an endowed fund in their estate plan as they desire the ECE Department to have a permanent source of funds to provide fellowships. An endowment distributes a specific percentage (at most universities, it is typically 4%) of the fund balance on an annual basis to be spent for the designated purpose of the fund. In this way, as the principal grows, so does the distribution – and the fund continues in perpetuity.

With the advice of their estate planner, the Changs designated a certain portion of their retirement plan assets to eventually fund the endowed fellowship fund. By doing so, they have not only provided a very generous and meaningful gift, but they also did it efficiently and at the lowest possible cost to their family. In other words, retirement plan

assets are one of the most heavily taxed assets within an estate. Retirement plans are not only subject to estate tax once the value of the estate exceeds \$675,000, but are also subject to income taxes when the plan participant dies. This is because income tax was never paid on the contributions or the investment earnings. The law does not allow one to escape this tax – even at death. By designating a charitable beneficiary, such as UCSD in the retirement plan documents as the recipient of retirement plan assets at the participant's death, both estate tax and income tax can be avoided.

For more information on planned giving, contact MaryAnn F. Stewart, mfstewart@ucsd.edu.

Planned Giving Expert Joins Jacobs School



MaryAnn F. Stewart was recently named executive director of external relations for the Jacobs School of Engineering. With more than 12 years experience in fundraising, she plans to

apply her knowledge and expertise to expand the Jacobs School's horizons in the area of philanthropic support.

"I'm absolutely delighted to join the senior management team of this premier engineering school," said Stewart. "The Jacobs School plays such an important role in education and technology development for the state of California and the nation. The next 10 years will be critical as the School doubles in size to accommodate the needs of the State."

Stewart will manage and expand the School's comprehensive external relations program. She succeeds Joe Bear, who will continue to work with the Jacobs School on a reduced schedule as he pursues additional outside interests.

Stewart served as director of the UCSD Office of Planned Giving for the past six years. During her tenure, planned gifts grew from \$3 million per year to \$19.5 million in fiscal year 99/00. She was previously director of planned giving at Santa Clara University, and maintained a private financial planning practice in the San Francisco Bay Area. To contact Stewart, call (858) 534-4575 or e-mail mfstewart@ucsd.edu.

RICK KORNFELD FELL INTO THE FIELD OF WIRELESS COMMUNICATIONS almost by accident. But he found the technology and the start-up industry so exciting that he's made a full 20-year career out of it.

Kornfeld is currently general manager of Texas Instruments' new San Diego Wireless Center, a position he's held since his own San Diego-grown company, Dot Wireless was acquired by TI in a \$475 million deal last September. Dot Wireless developed complete chipsets for CDMA including chip, software, analog and RF technologies. Kornfeld is now overseeing TI's rapidly growing third generation (3G) cellular chipset business while spearheading the company's fast-paced expansion in San Diego.

He says the new position was a perfect move for him: "TI is a large company that thinks like a start-up. People understand that achieving long-term goals in a highly dynamic market requires minute-by-minute decision making. They know how what they accomplish each day impacts the company. For me, TI holds the thrill of a start-up."

Kornfeld's wireless career began in the early 80s, when he was an undergraduate electrical engineering student at UCSD. Based on a referral from one of his professors, Kornfeld received a phone call one day from M/A-Com Linkabit with an offer of a summer internship.

In many ways Linkabit was the company that founded the commercial wireless industry in San Diego. Kornfeld is among several key individuals who later left Linkabit to start-up a family of companies that form the backbone of San Diego's telecommunications industry.

After five years with Linkabit, Kornfeld continued his career as vice president of engineering at Qualcomm, where he helped lead the then 20-person start-up through its first crucial business and technological successes. He later managed the Consumer Products division of NextWave Telecom before co-founding Dot Wireless.

Kornfeld displays an impressive array of 16 patents on his office wall, symbolizing his many innovations in RF engineering for the field of wireless voice and data communications, particularly in the area of CDMA phone design.

"The innovations I am most proud of are the ones where I was

overseeing the overall design," says Kornfeld. "I am a proponent of hiring the best people, and then getting out of their way so they can get the job done."

Although he loves the detailed process of developing new technology, it is the actual application of the technology that is most fascinating for him, and which he says will keep him in the wireless industry for quite some time.

And that is what Kornfeld appreciates most about his education at UCSD. He was able to concentrate on the theory that has allowed him to understand different technologies and move from one application to the next.

"Even today, my education gives me an understanding of how things work behind the scenes on a theoretical basis. It has given me the ability to move in different directions."

When asked what will be the frontier for the industry, Kornfeld responds: "Into the future, there will be a convergence of many industries, with wireless being at the center of it. The kind of computing applications that we have today will be different when they are wireless. The same thing goes for multimedia and gaming. So when you think about putting things like voice capability of phones and multimedia capability of video cameras together, you can envision a new product and a new market."

Kornfeld says he is confident that San Diego will remain a hotspot for wireless innovation, so long as the industry keeps its eye on what he calls "market discontinuities" such as the importance that optics will play in future advances.

"There is a tremendous amount of momentum still building here, and that's why big companies such as TI are coming," says Kornfeld. "The university is very strong in wireless, there is an existing cluster of wireless companies, and that creates a pool of engineering and management talent that everyone benefits from."

As a way to keep in the lead on new innovation directions, Kornfeld says TI is strategically partnering with UCSD in programs such as the Center for Wireless Communications and the newly formed California Institute for Telecommunications and Information Technology, led by UCSD with UC Irvine.



Rick Kornfeld

A dynamic technology pioneer and entrepreneur, Kornfeld's achievements include strategic business development, and the long-term growth and profitability of companies.

Nominations Requested for Alumnus of the Year

Each year the Jacobs School of Engineering presents the Outstanding Alumnus Award to recognize individuals who have distinguished themselves as leaders in technology development or engineering education. The awards are presented at the School's Annual Recognition Banquet to be held this year on May 4. If you would like to nominate someone for this honor, please contact Kelly Briggs: kbriggs@ucsd.edu; (858) 534-2329.

Annual Fund Drive is Your Opportunity to Give Back

The engineering alumni telephone fund drive is coming up this April. This annual fundraising effort supports priority programs and education and research initiatives at the Jacobs School.

As always, alumni can make their gift using the online giving form found at https://soeadm.ucsd.edu/dev_events/giving.html.

Many alumni also find using their employers' matching gift program is a great way to leverage their contribution. To find

out if your company has such a policy, please check with your human resources representative. Then simply attach your company's matching gift form with your gift, and we'll do the rest.

Gifts to the Jacobs School of Engineering are tax deductible and may be made to the Dean's Discretionary Fund for general operating support, or may be designated for current special use or in support of a specific department in the School.

Alumni Updates

1975 Tricia Oberndorf, M.S., CSE. Oberndorf is currently a senior member of the technical staff at the Software Engineering Institute, Carnegie Mellon University. Her research focus is on the use of commercial off-the-shelf products for large systems.
E-mail: po@sei.cmu.edu

1985 Douglas A. Doi, B.S., Applied Mechanics. Doi is a program manager with Wingcast, a Ford/Qualcomm telematics joint venture. He and his family are moving back to San Diego from Michigan.
E-mail: zekemusubi@aol.com

1987 Nabil Abu-Ghazaleh, M.S., Applied Mechanics. Abu-Ghazaleh has been appointed dean of student learn-

ing for arts, communications and disabled student programs at Moorpark College (Ventura, CA). He taught at Pasadena City College and was dean of engineering and technology there from 1999 to 2000.
E-mail: nabil@vcccd.net

1990 Mark M. Shih, B.S., ECE. Shih received his M.D. from the University of Minnesota. He is currently practicing pediatric rehabilitation in Portland, Oregon.

1992 Elizabeth Mickaily-Huber, Ph.D. AMES, Chemical Engineering. Mickaily-Huber is teaching at U.S.F. and S.F. State University in her hometown of San Francisco.
E-mail: liz@huber1.com

1993 William M. Bruin, P.E., B.S., Structural Engineering. Bruin currently practices civil/structural engineering in the Oakland, CA headquarters of EQE International Inc. He and his wife Moiré are proud to announce the birth of their second child, Russel Edward "Teddy" Bruin on August 4, 2000.

1998 Rochelle Lakey, B.S., Computer Science. Lakey has relocated to the San Francisco Bay area and is currently a senior quality assurance engineer at Connex, Inc. Connex is a producer of storage servers and software for NAS and SAN technology. She hopes to return to academia soon to continue her education.
E-mail: rochellelakey@connex.com

*Please take a few moments to update us on your recent activities and/or new address.
E-mail to: dhagen@ucsd.edu -or- Updates on the Web: www.soe.ucsd.edu/alumni/class_notes.html*

Name _____	Class of _____		
Degree _____	Major _____		
What's New With You? _____			

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Send to: Alumni News, Jacobs School of Engineering 9500 Gilman Dr. • La Jolla, CA 92093-0403			

JOB OPPORTUNITIES - continued from back cover

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One Rancho Carmel
San Diego, CA 92128
e-mail: resumes@rc.trw.com; fax: (858) 592-3108
Software, communications systems, digital circuit design, RF circuit design, mechanical design, manufacturing and hardware/

software test engineers. Desired degrees - EE, CE, CS, Math, Applied Physics, ME.

ViaSat, Inc.

www.viasat.com
e-mail: resumes@viasat.com; fax: (760) 929-3920
ViaSat, Inc. is currently looking for FPGA design engineers and embedded software engineers to work on new state-of-the-art wireless broadband projects.

Xsily, Inc.

www.xsily.com
6170 Cornerstone Court East, Ste. 100
San Diego, CA 92121
e-mail: jobs@xsily.com
Xsily provides wireless sensor monitoring systems and Internet-based remote monitoring for a wide range of commercial and industrial applications. Entry, intermediate and advanced engineering positions available.

Companies listed are members of the School's Corporate Affiliates Program. Visit the Corporate Jobs page at www.soe.ucsd.edu for direct links to detailed employment opportunities.

AMCC

www.amcc.com
e-mail: jobs@amcc.com; fax: (858) 535-6500
AMCC is a leader in high-bandwidth silicon connectivity solutions for the world's optical networks.

Conexant Systems, Inc.

www.conexant.com
e-mail: jd@conexant.com; fax: (858) 713-4422
9868 Scranton Road, San Diego, CA 92121
Software engineers, systems engineers, analog/mixed signal design engineers, RFIC design engineers, RF systems engineers, product managers, product engineers, test engineers, and product applications engineers.

Cymer, Inc.

www.cymer.com/JobOpps
e-mail: resumes@cymer.com; fax: (800) 268-9317
At Cymer we share a common goal - to pioneer the development of excimer lasers. Seeking software, electrical and manufacturing engineers.

ENCAD, Inc.

www.encad.com/jobs
e-mail: jobs1@encad.com
6059 Cornerstone Ct. West, San Diego, CA 92121
ENCAD delivers high quality digital imaging solutions to a worldwide market. Entry-level and experienced software, firmware and electrical engineering positions are available in San Diego.

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EyeVelocity, Inc.

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e-mail: recruiting@eyevelocity.com; fax: (858) 636-4493
9665 Chesapeake Drive, Ste. 300, San Diego, CA 92123
EyeVelocity is a leading B2B provider of eCommerce visualization solutions with applications for a variety of vertical markets including automotive, boating and retail. Numerous opportunities in web development and project management at all experience levels are available.

Hughes Network Systems

www.hns.com/careers/careers.htm
Please visit our Website for current career opportunities.

IBM Corporation

www.ibm.com/whywork
At the forefront of technological advancement, IBM spans the world of Information Technology. Visit our Website to view employment opportunities.

Information Systems Laboratories (ISL)

www.islinc.com
e-mail: rhmill@islinc.com; fax: (858) 535-9848
6370 Nancy Ridge Dr., Ste. 101 San Diego, CA 92121
Engineers; signal processing, embedded software C/C++, RF engineering, control systems. Designers; high-speed analog and digital hardware design, RF system design.

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e-mail: cmallozz@intersil.com; fax: (321) 729-4140
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PacketVideo provides software-based encoding, transmission management, and decoding products that enable content providers and wireless carriers to deliver rich media content, not just data, to mobile devices anytime, anywhere.

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RRC provides time-critical DSP solutions in the fields of communication, telemetry, radar and location determination. Positions available in Tucson, AZ.

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e-mail: jobs@sdge.com
Everyone talks about a powerful career. We deliver careers with power. Career opportunities for engineers at all levels are available.

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e-mail: jobs@saic.com; fax: (858) 826-7702
SAIC, a diversified high technology research and engineering company, offers a broad range of expertise in technology development and analysis, computer system development and integration, and technical support services. Entry-level and program management engineering and software positions are available.

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Sony Technology Center-San Diego has openings for an associate hardware development engineer and associate software development engineer.

STMicroelectronics

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e-mail: recruitment-rancho-bernardo@st.com; fax: (858) 592-2702
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www.ZoneInOnSun.com
e-mail: college-jobs@sun.com
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See JOB OPPORTUNITIES - page 11

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