USC Engineer

A Journal for Alumni & Friends

ENGINEERED FOR SUCCESS

Daniel J. Epstein, BSISE '62 Names ISE Department

PULSE OF THE FUTURE

USC Leads Research into Ultra-wideband Wireless Technology

ISI@30

Still the Pioneer in Advanced Computer Science and Engineering

LILLIPUTIANS OF TROY

A Nanorobot Swarm

Spring/Summer 2002

Welcome to the premiere edition of *USC Engineer*, a journal for the USC School of Engineering's alumni and friends.

Welcome to *USC Engineer!* This publication has been created for you, the thousands of alumni and friends of the USC School of Engineering worldwide. It is with great pride that I introduce this premiere issue, which chronicles the School's accomplishments, as well as individual success stories, all in our ongoing pursuit of excellence.

As the new dean of the School of Engineering, one of my top priorities is to reconnect with our alumni and friends in many different ways. Communication with you on a regular basis is an important way for all of us to share in the growth and successes of the School. In *USC Engineer* you will read of the School's achievements, research topics and trends, faculty and student honors, current and upcoming events, and, of course, news about yourself, your classmates, and colleagues. I hope this communication will be two-way. Equally as important to me, are your opinions and reactions about what you read on these pages.

Much of the magazine will be dedicated to highlighting the successes of our alumni. In this issue, our cover story features Daniel J. Epstein (BSISE '62), who has made the largest gift by an individual to name an academic department in USC history, and the largest gift to name a department of industrial and systems engineering in the nation. As Daniel Epstein exemplifies, the quality of our alumni is without match. The alumni profiles of Jay L. Kear (BSME '60) and Alice P. Gast (BSCHE '80) clearly illustrate this as well. Just as extraordinary are the dozens of success stories revealed by our alumni from all over the country and the world.

This publication will also point out the strengths of our programs and research centers. The Information Sciences Institute, celebrating its 30th year, is aggressively expanding the boundaries of information technology. To say that ISI has few peers is an understatement. It is leading the pack.

> As we look ahead, we have tremendous opportunity for continued growth and future achievement. The various engineering disciplines are helping to shape the way society functions on a daily basis.

You will also read about an unprecedented seven junior faculty members who have recently won prestigious National Science Foundation Career Awards. The highly competitive awards signify that these individuals will undoubtedly be future leaders in their disciplines.

Our senior faculty is also contributing to the prestige and influence of the school. The article on Ultra-Wideband Wireless technology, featuring UWB pioneer, Dr. Robert Scholtz, who recently received the 2001 Military Communications Conference Award for Technical Excellence, demonstrates how our professors and research centers, in extraordinary collaboration with other top universities, are developing leading edge and relevant technology.

And, there is so much more currently happening at the USC School of Engineering to be excited about. As we look ahead, we have tremendous opportunity for continued growth and future achievement. The various engineering disciplines are helping to shape the way society functions on a daily basis. Recently, we have all witnessed how quickly our world can change, presenting new, never-before-asked questions. The researchers, faculty, students and alumni of the USC School of Engineering are poised to face the challenges of an ever-changing world. I hope you will join me in celebrating their stories, sharing your own, and looking toward a bright future.

C.L. MAX NIKIAS
DEAN
SCHOOL OF ENGINEERING

Photo by John Livzy

Investing in Excellence

The USC School of Engineering thanks the following corporations, foundations and organizations for their recent gifts. Their generosity is crucial to the success of our students and faculty as they pursue scientific and academic excellence.

3Com Corporation
ADC Telecommunication, Inc.
Advanced Bionics Corporation
The Aerospace Corporation
Agere Systems Inc.
Agilent Technologies
Airborne 1 Corporation
Akamai Technologies, Inc.
The American Electroplaters and
    Surface Finishers Society, Inc.
Alfred Mann Foundation
American Chemical Society
Amgen Inc.
ARCS Foundation, Inc.
Autodesk, Inc.
Avery Dennison Corporation
Beckman Coulter, Inc.
The Boeing Company
Brandow and Johnston Associates
Brush Engineered Materials Inc.
Cadence Design Systems, Inc.
Charles Lee Powell Foundation
ChevronTexaco Corp.
Cisco Systems, Inc.
Colachis Family Foundation
Compression Science Corporation
Computer Sciences Corporation
Conexant Systems, Inc.
Cost Xpert Group, Inc.
Cypress Semiconductor Corporation
Cytec
DaimlerChrysler
D-Link Systems, Inc.
The Charles Stark Draper
    Laboratory, Inc.
DRS Technologies, Inc.
E2O Communications, Inc.
Eastman Kodak Company
Edison International
Electronic Data Systems
Electric Power Research Institute
Electronics and
    Telecommunications Research
    Institute
Equilon Pipeline Company LLC
ERC, Incorporated
Ernst & Young Foundation
eXcelon Corporation
ExxonMobil Foundation
Eyematic Interfaces, Inc.
Fastrack Information Inc.
Fidelity Brokerage Services LLC
Ford Motor Company
Freshwater Software

Fulton Foundation
FX Palo Alto Laboratory
Galorath Incorporated
GC Environmental, Inc.
Geometrix, Inc.
Gerondelis Foundation, Inc.
Group Systems.com
Hewlett-Packard Company
Hitachi America, Ltd.
HKC Research
Honeywell International Inc.
House Ear Institute
HRL Laboratories LLC
Hughes Electronics Corporation
Hughes Network Systems, Inc.
Human Frontier Science Program
IBM Corporation
Industrial Technology Research
    Institute
Infonet Services Corporation
Intel Corporation
Interactive Video Technologies, Inc.
InterVideo, Inc.
Ipitek
Japan Science & Technology
    Corporation
JATO International Group
The John and Dorothy Shea
    Foundation
Jet Propulsion Laboratory
Kluwer Academic Publishers
The Kresge Foundation
The Lemelson Foundation
Lightchip, Inc.
Lockheed Martin Corporation
Lord Corporation
Los Angeles Orthopaedic Hospital
    Foundation
Los Angeles Times
Lucent Technologies/Bell Labs
MAG InnoVision
Marotz, Inc.
Marsh & McLennan, Inc.
Maven Technology
MBC Software Solutions Ltd.
McAloney Enterprises, Inc.
M.C. Gill Corporation
McDermott Technologies, Inc.
Meade Instruments Corporation
Memorial Park Engineering and
    Construction Company
Merrill Lynch & Company, Inc.
Metromedia Fiber Network, Inc.
Microsoft Corporation

MicroTest Laboratories, Inc.
Medtronic MiniMed
Mitsubishi Digital Electronics
    America, Inc.
Motion TV, Inc.
Motorola, Inc.
MP3.com, Inc.
NAV CANADA
Navigation Technologies
NCR Corporation
NetQuest
nLight Photonics
Nortel Networks Limited
Northrop Grumman Corporation
Northstar Consulting Group, Inc.
Nowcom Corporation
NTT DoCoMo
Nuevo Energy Company
Occidental Petroleum Corporation
Panoram Technologies, Inc.
Pearson Plc
Phaethon Communications, Inc.
Phillips Multimedia Center
Prentice Hall PTR
PRICE Systems, LLC
Primavera Systems, Inc.
QUALCOMM Incorporated
Quest Software Inc.
R & S Processing Company, Inc.
Rational Software Corporation
Raytheon Company
Reuters Consulting
The Richards Family Foundation
The Ryland Group, Inc.
Society of Automotive Engineers
    International
Samsung Electronics Co., Ltd.
Scandinavian Airlines
    System
Science Applications International
    Corporation

The Seattle Foundation
Sega of America
Semiconductor Research
    Corporation
Sempra Energy
Semtech Corporation
Sierra Monolithics, Inc.
Silicon Graphics, Inc.
Southern California Edison
Southern California Gas Company
STMicroelectronics, Inc.
SulphurX Incorporated
Sun Microsystems, Inc.
TACAN Corporation
TCL Integrated Marketing, Inc.
Tekelec
Telcordia Technologies, Inc.
Teledyne Technologies Incorporated
Teradyne Inc.
Texas Instruments Incorporated
TMH Corporation
The Toyota Foundation
Toyota Motor Corporation
TRC Environmental Solutions
TRW Inc.
Universal Studios
Verizon Communications
VProtect System, Inc.
Vulcan Ventures Inc.
The Walt Disney Company
Watson Pharmaceuticals, Inc.
The WB Television Network
The Whitaker Foundation
The William and Flora Hewlett
    Foundation
Xerox Corporation
Xian-Janssen Pharmaceutical Ltd.
Xircom, Inc.

Photo by Jeff Corwin

For more information on how your firm can help to shape the engineers of tomorrow, please contact:

Anna Norville
Director of Corporate Relations
School of Engineering
213/740-2502   e-mail: norville@usc.edu

features

P14

P19

departments

P24

P26
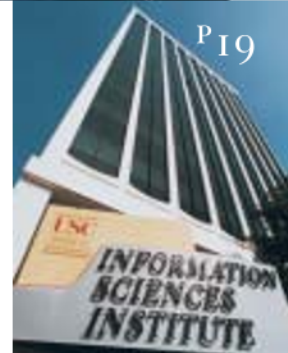
Assistant Professor Elaine Chew believes music is an ideal domain in which to study communication, creativity, human perception, and cognition. By building computer models that can probe more deeply into the structure of music and by relating this structure to performance decisions, she hopes to gain a deeper understanding of human creativity and communication.

P7

One of the most distinctive and enduring characteristics of USC, the thing that in many ways sets it apart from other great universities, is the notion and reality of the Trojan Family. It is a concept experienced not only by the communication and wholehearted interaction between alumni, but also through the participation and enthusiasm of adopted Trojans. At the School of Engineering, we are reconnecting with you, our branch of the family tree, and continuing a great USC tradition.

Dean C.L. Max Nikias' mission for the school centers on expanding and focusing in several key areas. One of the most important and ultimately enduring of these areas is Alumni Relations. The School has established a new Alumni Relations program with unprecedented support and investment. The program's mission statement is simple: To join together the School and our thousands of alumni and friends in mutually beneficial ways.

Through this kind of printed communication, on-campus and regional events, volunteer opportunities, stewardship, and a new alumni website, we will keep you informed, involved and most importantly, full of pride about your relationship with the School of Engineering. The creation of this publication was mandated by the need to "get the word out" about the incredible legacy of our alumni, and the excellence of the School's academic departments, programs, research centers, faculty and students.

In this premiere issue or *USC Engineer,* our cover feature, "Engineered For Success", highlights the generosity of accomplished alumnus, Daniel J. Epstein, who credits the USC School of Engineering with laying the foundation for his many achievements, and whose desire for continued involvement with the School is not only a testament to the strength of our individual departments, but once again speaks to the fortitude of the Trojan Family.

We will produce this publication biannually. Its different sections will highlight not only our alumni and their stories of success, but also distinguished faculty members who have received high honors, cutting-edge research occurring at the School, and impressive work coming out of our research centers and institutes.

We hope we will hear from you about what you see and read on these pages. Your feedback and communication are integral to the quality of our programs. Just as most families do, we look internally to our alumni and friends for their inspiration, challenges, analysis, collaboration and support. Our goal in establishing a new Alumni Relations program is to provide a place for you to seek the same things from us. We hope you will do so, because, ultimately, our success is measured by your success. We look forward to continuing the partnership.

ANNETTE BLAIN
DIRECTOR, ALUMNI RELATIONS

Photo by John Livzy

Teaching Agents A WEEK-LONG PROGRAM ON APPROACHES
TO CREATING INTELLIGENT COMPUTER AGENTS

W. Lewis Johnson is pictured with computer agent trainer "Steve," seen on the screens behind him and "Adele" on the laptop in the foreground

There are secret agents, real estate agents, travel agents, and talent agents, to name just a few. But the professionals who attended a special week-long instructional program at the USC School of Engineering in early January were interested in a different kind of agentry: intelligent computer agents.

"This is rapidly becoming a key area of computer science," says Milind Tambe, an associate professor in the Department of Computer Science and a project leader at the Information Sciences Institute (ISI). "It is an area where we have been the leader and that is the reason we organized this 'Agents School.'"

"Agents," Tambe explains, "are artificial entities. They're computer programs, or robots, that exhibit autonomy, purposefulness, behavioral flexibility, and even social capability. Researchers in the field vary on the specific characteristics of agents, but there's general agreement that such software has the ability to respond to complex situations in flexible, 'intelligent' ways."

The USC instructional program, the first of its

kind, attracted an overflow enrollment. Sixty-two graduate students came from as far away as Japan and Slovenia to listen to presentations by top scientists in the field, many of whom were from USC Engineering's Computer Science Department, the Institute for Creative Technology (ICT), and ISI. Faculty from Carnegie-Mellon, the University of Michigan, and other research centers also attended the program.

Since the first autonomous agents congress took place at ISI in 1997, Tambe believed it was logical to conduct the first agents school at USC as well. He described the event as a service to the field, offering students a broad sampling of a wide range of approaches in creating computer agents.

W. Lewis Johnson, director of the Center for Advanced Research in Technology for Education at ISI, brought two pedagogical agents to the school, Steve, a trainer who appears in virtual environments either individually or as a team, and Adele, who is a web-based teacher for distance learning applications.

Dr. Randall W. Hill, Jr., ICT deputy director of technology, chaired arrangements for the program. He noted that the field is relatively new, with useful applications only beginning to appear in the early 1990s. "USC is well-positioned to capitalize on this emerging field," he says. "We had a lot of expertise already in place, we went out and recruited more talent and now we've become a leader."

Hill also lauded the collaboration of the Computer Science Department, ISI, and ICT "in pitching in and working together" to conduct the instructional program.

MARK STEVENS
The Midas Touch

In its February 18 issue, *Forbes* magazine listed USC alumnus Mark Stevens (BSEE '81, BAECON '81, MSCENG '84) as tenth on its annual Midas List of "Tech's Top Venture Investors." Stevens, a member of the USC Board of Trustees and the School of Engineering's Board of Councilors, was 86th on the same list a year ago. The Midas List identifies managers who have built businesses that are valuable, efficient, attract loyal customers, and have earnings.

Stevens is a general partner with Sequoia Capital, a large Silicon Valley venture capital firm. He focuses on software and semiconductor-related investments for the firm, which gained notoriety for backing such icons as Apple Computer, Yahoo!, and Cisco Systems. *Forbes* credited Stevens with helping to create Pixelworks, QuickLogic, Terayon, and Nvidia.

The upbeat *Forbes* story "It's Morning Again in Silicon Valley", noted that "the engine of innovation still hums" despite the tech sector's problems, and added that venture capital firms raised $40 billion in 2001.

Stevens earned his MBA from Harvard University. He resides in Northern California with his wife Mary and three children.

Whitaker Foundation Grant Boosts Biomedical Engineering

The Whitaker Foundation has given a $1 million, three-year grant to USC's Biomedical Engineering Department. The foundation realizes that a steady supply of well-educated professionals, thoroughly grounded in both biomedicine and engineering, is essential to the ongoing progress of the biotechnology industry. The grant is accompanied by matching funds from the School and additional support from the Alfred E. Mann Institute for Biomedical Engineering.

"Biotech firms are constantly on the look-out for people whose education has included the fundamental principles underlying biomedical devices and diagnostics, as well as familiarity with the process of technology development," says Dr. David D'Argenio, professor and chair of the Biomedical Engineering Department.

Biomedical Engineering graduates meet these recruiting requirements as a result of the instruction, laboratory courses, projects, and internships they have while at USC.

"The Whitaker grant," D'Argenio explains, "will enable USC Engineering to deepen and strengthen this educational process and thus continue to provide this high-tech segment of the economy with engineers capable of visualizing, designing, building, and testing the next generations of medical devices and instrumentation." Biomedical Engineering will use the Whitaker grant, as well as other funding, to expand both graduate and undergraduate degree programs, and to add three new full-time faculty positions.

Biomedical Engineering chair David D'Argenio

"We plan to add a specialty track in biomedical device and diagnostic technologies at the graduate level," D'Argenio says, "and we will offer fellowship support for students who pursue it."

The department also has plans to establish an undergraduate internship program with certain biomedical device companies and the Mann Institute. When recruiting three new faculty members, D'Argenio will seek those with research and educational interests in areas key to the next generation of implantable devices, sensors, and diagnostic technologies.

MILITARY SALUTE

Electrical Engineering Systems professor, Robert Scholtz, received the 2001 Military Communications Conference Award for Technical Excellence for his sustained contributions to military wireless research into spread spectrum communications and ultra-wideband radio technology. Scholtz is only the fourth person to earn the award in the conference's 20-year history. *(For more on ultra-wideband radio technology see page 24)*

The chairman of the award committee, Professor Laurence Milstein of the University of California at San Diego, describes Scholtz as "one of the foremost contributors in moving the military communications field ahead. He is one of the most important investigators nationally in the new field of ultra-wideband radio."

Scholtz established the Ultra-wideband Radio Laboratory, or UltRa Lab, in the School's Integrated Media Systems Center in 1996. It was the first academic program to perform fundamental research on ultra-wideband radio.

The award is sponsored by The Institute of Electrical and Electronics Engineers Communications Society and the Armed Forces Communications and Electronics Association.

U.S. News & World Report
Top Ten Schools of Engineering

April 5, 2002–USC's graduate school ranks 8th in the nation

1	Massachusetts Institute of Technology
2	Stanford University
	University of California, Berkeley
4	Georgia Institute of Technology
5	University of Illinois, Urbana- Champaign
6	University of Michigan, Ann Arbor
7	California Institute of Technology
8	**University of Southern California**
	Cornell University
10	Carnegie Mellon University
	University of Texas, Austin

Composed Research
Faculty profile: Elaine Chew

As her fingers flew back and forth across the keys of a grand piano interpreting the intricate bi-tonal composition "Doubles" during a December concert in Los Angeles, Elaine Chew was also getting in a little practice for her day job.

"My technical training is in operations research, the science of decision making," explains the assistant professor of the Daniel J. Epstein Department of Industrial and Systems Engineering. "A concert performance is the result of a series of decisions, conscious or unconscious. A musician plots a course through a complex network of choices using his or her experience, analysis, and instinct."

Chew is also a senior investigator at the Integrated Media Systems Center (IMSC), a teacher, an accomplished international concert pianist, and an avid proponent of new music.

Crossing Cultures & Disciplines

Born in Buffalo, New York, she spent most of her childhood in Singapore before returning to America to study music, mathematics, and engineering. She majored in music and computational mathematics as an undergraduate at Stanford, and received her master's and PhD in operations research from MIT.

In her PhD dissertation, Chew began to explore tonality in music by using mathematical models. She has since created computer models that mimic human capabilities in finding keys. "Most people have the ability to determine the key of a musical passage intuitively, though they may not realize it,"

she says. "When you hear the music, you can pick out the most stable pitch, which is 'doh,' and you have found the key."

Chew believes music is an ideal domain in which to study communication, creativity, human perception, and cognition. By building computer models that can probe more deeply into the structure of music, and by relating this structure to performance decisions, she hopes to gain a deeper understanding of human creativity and communication.

"Music, mathematics, and engineering are all human attempts to describe and understand the logic and patterns in the world in which we live," she explains. "Using the language of one to describe the other, and understanding the commonalties among seemingly disparate fields, reveals as much about ourselves as it does the world around us."

Research Through Composition

Peter Child, an MIT professor of music, composed Chew's concert piece, "Doubles." It stemmed from several Chinese and Malay melodies and folk songs from her childhood. The MIT professor reworked the melodies into a series of complex pieces for piano. "I am not a composer," she says, "but I do like to work closely with composers on their creations."

In Child's bi-tonal composition, the pianist's left and right hands each play in different keys and often in widely varying rhythms. It can be a challenge for pianists and audiences alike. Yet "Doubles" was easily the most melodic part of the evening's program, and many of the images from the words of the original folk songs were apparent to the mind's eye. This was surprising because Chew gave Child the melodies to the folk songs, but not the lyrics.

Chew says that as a child, she and her siblings competed to see who could sing "Spring Song" the fastest. The song is about an old man lamenting over his spent youth

symbolized by birds flying away. Child presents that melody in a rush of fleeting notes, the fastest tempo heard in "Doubles." The "Cockatoo" is characterized by a series of playful and staccato notes that sound like a bird hopping. Two other Malay melody-based pieces, "Riversong" and "Sampan Variations," culminate in a burst of ragtime, an American musical genre from the Mississippi Delta. The music has made cross-cultural connections about rivers and water.

In a discussion that preceded the concert, Child said that composers who put poems to music must carefully match the rhythm and tone of their music so that it reflects what the poet's words convey. Why then, did Child's "Doubles" capture so many of the images and feelings expressed in lyrics he had not seen?

> **"Music, mathematics and engineering are all human attempts to describe and understand the logic and patterns in the world in which we live…"**

"It must have something to do with the piece's original composition," Child says, and Chew adds that "folk songs are some of the oldest music in existence." Many of the songs Chew sent to Child were songs that children have been singing for countless generations, perhaps for thousands of years. The words and the music have combined on a very fundamental level.

"I'm not surprised," Chew says, "that a New England composer can evoke the same emotions from audiences that I felt as a child in Singapore, because music transcends cultures."

Some artists maintain that it is not possible to explain a concept such as melody. Chew clearly disagrees. She uses modern engineering tools to investigate music. "Understand music and you begin to understand how the human mind works."

The Frame Game

For the nearly 40 million people whose vision is considerably less than 20/20, buying a pair of eyeglasses poses a problem: when the customer tries on new frames, prescription lenses are not in place. The customer often cannot clearly see the details of his or her own face in the optician's mirror, let alone the finer points of the frames. Buying glasses becomes heavily dependent on guesswork and the opinions of others. Considering the impact the right, or wrong, frame can have on a person's appearance, it's little wonder the $16 billion eyewear industry considers this issue a major barrier to increasing sales.

With help from an innovative face-modeling technology developed at the School of Engineering's Integrated Media Systems Center (IMSC), a National Science Foundation Engineering Research Center at USC, some of the guesswork in buying eyeglasses has been eliminated. IMSC's technology has been incorporated into a new product called 3D iView, which was developed by Geometrix of San Jose and its partner, Visonix of Israel. Hoya Corporation of Japan, the world's second largest manufacturer of eyeglass lenses, is introducing its own branded version of the 3D iView system in its home-market retail stores.

"This is a great example of how IMSC technology moves from the laboratory to a commercial product," according to Dr. Isaac Maya, IMSC's director of Industry and Technology Transfer Programs.

The in-store application of 3D iView is simple and quick. At a Hoya store, a customer takes off his glasses and poses before an array of six cameras, which simultaneously photograph his face at different angles. After only 90 seconds of digital mapping, the six photos are stitched into a 3D virtual representation of the customer's face, which then appears on a computer screen along with a wide selection of virtual frames. Placing different frames and lenses on the virtual face requires only a few clicks of a computer mouse. A customer can "try on" many frames in rapid

"This is a great example of how IMSC technology moves from the laboratory to a commercial product."

succession while still seeing clearly, because the customer never has to remove his or her current prescription glasses. As with many "object" movies now on the Internet, the customer's virtual face and eyeglasses can be moved by mouse and cursor into a wide range of views. Once the customer has chosen frames and lenses, the system automatically performs all the measurements previously taken by an optician, and transmits that data to a lens-processing lab for production.

Another potential use, although not currently offered by Hoya, is that once a facial model is created at the store, the customer can shop from home, using the system through the store's web site.

Dr. Gérard Medioni, professor and chair of the Computer Science Department, developed the IMSC face-modeling software, which is licensed by IMSC corporate partner Geometrix. Dr. George Chen, a former IMSC student, assisted Dr. Medioni. Dr. Chen received his PhD in December of 1999, and now works for ST Microelectronics, another IMSC partner.

FACULTY ACHIEVEMENT

Achieving the goals set out for the School by Dean C.L. Max Nikias will require successful recruiting of the best engineering minds. Recent awards garnered by junior faculty are evidence that the School of Engineering is on course. Seven junior faculty have won Early Career Development awards from the National Science Foundation.

The highly competitive awards provide upwards of $300,000 each for research, teaching, and outreach activities during the next five years. The purpose of Early Career awards is to help promising young professors establish academic careers.

Four of the recipients, Mathieu Desbrun, Ashish Goel, Christos Papadopoulos, and Gaurav Sukhatme are assistant professors of computer science. Two more, Ahmed Helmy and Won Namgoong are assistant professors of electrical engineering/systems. The final recipient, Chongwu Zhou, is an assistant professor of electrical engineering/electrophysics. Desbrun, Papadopoulos, and Sukhatme are also key investigators at USC's Integrated Media Systems Center.

Mathieu Desbrun is developing new mathematical and computational tools for digital geometry that will advance the field of computer graphics. His research is focused on how computers can improve the way they represent and process curved surfaces, and more generally, any irregular, non-uniform sampled data. He said the tools he is developing can accelerate the use of 3D graphics in medical imaging, biology, electronic commerce, video games, and haptics. "I am working on initiatives to incorporate advances in my project into both the graduate and undergraduate curriculum," said Desbrun.

Photo by Jeff Corwin

Oil Man — THE PASSION OF A MAN WITH

A LIFETIME OF DISCOVERIES WORLDWIDE

His sea-shell pink Hancock Park home could just as easily be the set for a film about a storied 19th century adventurer. It's brimming over with diplomatic medals, university degrees, ceremonial swords, 300-year-old Russian iconography, and museum-quality rugs and tapestries presented by the late Shah of Iran and Arab princes. Photos taken with kings, presidents, prime ministers, and some of the developing world's more colorful rulers of the past 50 years cover nearly every square inch of wall space. The common element in this life story is the world's primary energy source: light sweet crude.

In the past year, Dr. George V. Chilingar (BSPE '49, MSPE '50, PhD GEOL '56), professor of petroleum and environmental engineering at USC, has added two more awards to the hundreds already crowding his home.

Last September, King Fahd of Saudi Arabia acknowledged Dr. Chilingar's contributions to the success of Saudi Aramco, Saudi Arabia's national oil company. King Fahd also noted that some of the discovery and extraction of oil reserves around the world were due to Chilingar's successful blending of

petroleum engineering and geology, both of which he studied at USC. The Saudi Consul General in Los Angeles, Ambassador Mohammed A. Al-Salloum, presented the award, a globe signifying the worldwide reach and importance of the petroleum industry and Saudi Aramco. Among those attending the award luncheon were Dean C.L. Max Nikias and Dr. Carter Wellford, chair of the Civil Engineering Department.

A Russian Knight

Like many exiles of Stalinist Russia, Chilingar grew up across the Caspian Sea in Iran, where his father served as the Shah's

George Chilingar photo by Max S. Gerber

Students (left to right) Kim Vu, Jonathan Mapel, Johanna Wonsowicz, Melissa Patterson working on an issue of Illumin

ILLUMIN

What do a father in Argentina, a high school student in Texas, a businessman in Korea, and a Master Sergeant stationed in Japan have in common? They've all found answers to their technical questions at *Illumin*, an online magazine written, edited, and published by undergraduate students at USC's School of Engineering.

The School of Engineering started *Illumin* (illumin.usc.edu) three years ago as a response to students' need to improve their writing and communication skills. The magazine's specific mission is to explain the role of engineering in everyday life. By writing articles that link classroom theory to real-world applications, students learn how to communicate with and influence the world around them. Simply put, they make engineering accessible to non-engineers.

Six undergraduates and one graduate student make up *Illumin's* editorial team. They meet once a week to plan upcoming issues, discuss technical and layout possibilities, and consider ways to increase readership. Articles come from the required undergraduate advanced writing course, so every student gets a chance to submit an article for publication. The student editors review and rate close to 350 articles per year to create four issues with ten articles each.

Because the articles are on the Internet, multimedia features (from short lectures by USC faculty to Flash presentations) add a visual component unavailable in a traditional published medium. The site also features a glossary of terms used in the articles and an archive of past issues.

The student editors are constantly thinking of new applications and audiences. One of their next projects is to use the magazine to attract more women and minority students to engineering. An essay contest for high school students is also in the works. As college students, the editors know that clearly informing young women and men about engineering is a vital step in their professional development.

As part of the School of Engineering's approach to innovative teaching, *Illumin* will continue to challenge students to communicate how engineering influences our world.

–Stephen Bucher

student works

Bright Additions

Dean C.L. Max Nikias has made it a vital priority to discover new faculty members who are leading relevant and exciting research. As part of the new dean's plan, the results of this research will build strong ties to industry, elevate the School of Engineering in the national rankings, and deliver the best possible education to our undergraduate and graduate engineering students.

In 2001 and early 2002, the School recruited an exceptional group of brilliant researchers in a range of engineering disciplines, whose work will undoubtedly enrich the School's offerings.

ELAINE CHEW, Assistant Professor, Daniel J. Epstein Department of Industrial and Systems Engineering, earned her PhD at MIT in 2000. Dr. Chew's expertise is in the computer modeling of music perception and cognition, the representation and visualization of musical information, and optimization and algorithm design. She also has a research appointment at the Integrated Media Systems Center. *(See article on page 7)*

LEANA GOLUBCHIK, Associate Professor, Computer Science, earned her PhD at UCLA in 1995. She comes to USC from the University of Maryland, where she was an associate professor. Dr. Golubchik's research areas include Internet-based computing, multimedia systems, computer systems modeling and performance evaluation.

NORBERTO GRZYWACZ, Professor, Biomedical Engineering, joined the School from the Smith-Kettlewell Eye Research Institute, where he was a senior scientist. The research Professor Grzywacz performs uses a combination of experimental techniques with computational models to investigate neural processing in the retina and visual perception. He also studies retinal optimization in order to perform computations underlying early vision.

TZUNG HSIAI, Assistant Professor, Biomedical Engineering, received his PhD from UCLA in 2001, and his MD from the University of Chicago in 1993. Dr. Hsiai's research focuses on the use of Bio-MEMS (Micro-Electro-Mechanical Systems) and microfluidics to investigate mechanisms by which hemodynamics regulate coronary artery disease and acute coronary syndrome, or heart attack.

CAULIGI RAGHAVENDRA, Professor, Electrical Engineering/Systems, was a senior engineering specialist at the Aerospace Corporation from 1997 to 1999. Prior to that, he was the Boeing Centennial Chair Professor in Computer Engineering at Washington State University. His research interests include parallel and distributed systems, routing and multicasting networks, reliability and fault tolerance in networks, and power aware protocols for wireless networks.

MILIND TAMBE, Associate Professor, Computer Science, received his PhD from Carnegie Mellon in 1991, and has since been serving as a research assistant professor at the Information Sciences Institute. Dr. Tambe's important contributions in the areas of multi-agents, teamwork, coordination, negotiation and intelligent agents have merited his appointment.

From left to right: Professor Norberto Grzywacz, Biomedical Engineering; Professor Cauligi Raghavendra, Electrical Engineering/Systems; Associate Professor Leana Golubchik, Computer Science; Associate Professor Milind Tambe, Computer Science; Assistant Professor Tzung Hsiai, Biomedical Engineering.

Two additional faculty members will begin in the Summer 2002 semester.

RAMESH GOVINDAN, Associate Professor, Computer Science, has been a research assistant professor at ISI since receiving his PhD from UC Berkeley in 1992. His research focuses on computer networks, operating systems, and multimedia.

KIRK SHUNG, Professor, Biomedical Engineering, served as a distinguished professor in the Department of Bioengineering at Pennsylvania State University. His research involves high-frequency ultrasonic transducers/arrays for applications in ophthalmology and vascular therapy. His work has led to the development of novel piezoelectric materials, very high frequency single-element transducers, and linear arrays.

Alumnus Honored for Shuttle Software Reliability Model

National prestige and national security rarely intersect in the life's work of a single individual. But that's precisely the case for the 2001 winner of the Institute of Electrical and Electronic Engineers' (IEEE) Reliability Society's "Reliability Engineer of the Year" Award–Naval Postgraduate School Professor and Director of the NPS Software Metrics Laboratory, Norman F. Schneidewind (MSORE '70).

Every Space Shuttle mission, Tomahawk cruise missile launch, and readiness validation for the nation's Trident nuclear missile force, depends on the painstaking, visionary work of this 30-year professor of information sciences at the Navy's postgraduate school. In fact, all 400,000 lines of avionics software–the on-board computer code that controls and guides all aspects of the spacecraft's flight from launch, to on-orbit, through landing–have been given the NASA seal of approval after being checked and double checked for life-and

mission-threatening errors by the Schneidewind Software Reliability Model.

In addition to the Space Shuttle, Professor Schneidewind's software reliability model is also critical for the safe and accurate functioning of the nation's strategic submarine-based Trident nuclear missile force, as well as the Navy's ship-launched Tomahawk cruise missiles.

The "Reliability Engineer of the Year" award is presented annually by the IEEE Reliability Society to one individual whose work has significantly increased the reliability of hardware systems, software systems, or both. Professor Schneidewind received the honor on January 26, 2002 during the Society's annual awards banquet.

Professor Schneidewind earned his doctoral degree in operations research from the University of Southern California Graduate School of Business Administration in 1966.
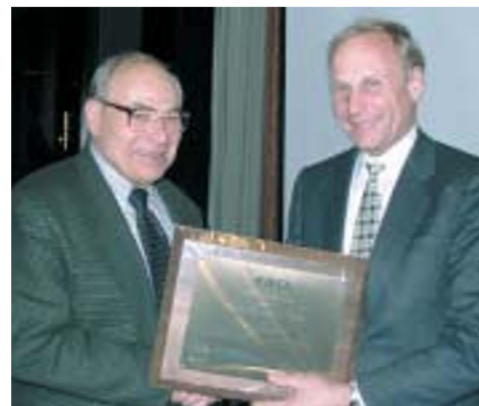
USC Alumnus Norman F. Schneidewind (left) receives his award at the IEEE banquet in Seattle on January 26, 2002. Presenting the honor is Dr. Sam Keene (right), past president of the Society.

He has three masters degrees: in operations research from USC's School of Engineering, and in computer science and electrical engineering from San Jose State University. His BS, also in electrical engineering, is from the University of California at Berkeley.

–Contributed by Barbara Honegger
Naval Postgraduate School

FACULTY ACHIEVEMENT

Ashish Goel is creating algorithms aimed at improving the performance of computer networks by taking into account issues such as fairness and availability, as well as efficiency. He plans to develop two new courses, "Algorithms for Computer Networks" and "Modern Algorithmic Techniques." "I'm looking at simple mechanisms that push selfish users toward approximately fair solutions," he said. "We need to combine this with the traditional objectives optimizing the bandwidth cost or total throughput, and we need some general rules of thumb for system developers."

Christos Papadopoulos is a computer network specialist working to develop the next generation of architec-

ture for the Internet. "There are two camps on what approach to take," said Papadopoulos. "One group holds that the Internet architecture must continue to be simple, which could make it difficult to improve performance, security, and network management. Others maintain that tomorrow's Internet will have to be a lot more intelligent— and complex—to do the things that we want it to."

Papadopoulos proposes a new paradigm governing how new computer applications interact with networks. He would decompose applications into smaller components so that much of the increased complexity resides with applications. Network components would be kept general and

simple so they could be easily implemented on existing equipment. "It means you have to think deeper about the distinction between an application and the network," he said. Papadopoulos also plans to expose students to the new concepts in his computer science classes.

Gaurav Sukhatme is performing fundamental research on large-scale, mobile, multi-robot teams. "Mobile robot teams hold the promise of performing tasks that cannot be done by a single robot. They will have increased tolerance for faults and they might be able to perform tasks more quickly," said Sukhatme. "However, a firm theory base for such systems does not exist."

Sukhatme will study large-scale robot groups experimentally by testing his hypotheses with physical and simulated robots, and theoretically, by mathematically characterizing their behavior. He said he currently works with robot groups of a dozen, but that control and communications systems needed to handle the interactions of groups numbering in the hundreds, and eventually thousands of robots, will be far more complex. Sukhatme is also an investigator on another NSF project aimed at building nanoscale robots to track ocean pollution, as well as an NSF project that investigates coordination algorithms for large-scale robotic sensor networks.

National Science Foundation Funds Biological Information Technology Research

Theodore Berger, professor of biomedical engineering and director of the USC Center for Neural Engineering, and John Granacki, director of the Advanced Systems Division of the Information Sciences Institute (ISI), have each been awarded grants worth $850,000 to $950,000 over the next three years. The National Science Foundation is funding their research to develop biologically inspired computer chips under the new Biological Information Technology Systems program. ISI is adding $250,000 to cover fabrication costs, bringing the total funding for the project to about $2 million. Berger and Granacki will act as co-principal investigators on each other's grants. Other co-principal investigators are Vasilis Marmarelis, professor of biomedical engineering and electrical engineering/systems; Armand Tanguay, professor of electrical engineering/electrophysics; and Jack Wills, senior computer/electronics engineer at ISI.

DIGITAL ACTORS NOT LIKELY TO REPLACE THE HUMAN VARIETY

As part of the Computer Science Distinguished Lecture series, Academy Award-winning computer graphics pioneer Alvy Ray Smith addressed the question, "Will Digital Actors Replace Human Ones." On January 30, faculty, staff, and students filled the auditorium at the Andrus Gerontology Center to hear Smith say that digital actors were not likely to replace the human variety anytime soon.

"Colleagues have, for years, claimed that they will eliminate the human actor from the screen," said Smith. "The appearance of actors is under threat, but the acting of actors is secure."

He argued that the animators who are creating characters with their powerful digital tools should themselves be viewed as actors. While computers can make increasingly sophisticated and realistic digital representations of humans, Smith said the machines wouldn't be able to produce the

COMPUTER GRAPHICS PIONEER ALVY RAY SMITH

emotional facet of characters anytime soon.

Smith co-founded four centers of computer graphics excellence—Altamira, Pixar, Lucasfilm and New York Tech—before joining Microsoft as its first Graphics Fellow. His work has appeared in "Star Trek II: The Wrath of Khan," "Toy Story," and "Tin Toy," the first Academy Award-winning computer-generated short film.

FACULTY ACHIEVEMENT

Won Namgoong is designing a high-performance, ultra-wideband radio based on the same standard low-cost semiconductor technology used to make microprocessors. Ultra-wideband radio is an emerging and radically different wireless technology in which data is transmitted by rapid-fire low-power pulses of radio energy spread across the entire radio spectrum rather than by radio waves tuned to narrow frequencies (see the UWB story on page 24).

While the technology could lead to highly secure wireless voice and data communications and devices such as handheld ground- and wall-penetrating radar, it also poses huge engineering design challenges. A major concern of ultra-wideband radio proponents is the ability of the radios to efficiently handle the extremely high bandwidth, dynamic range, and clock speeds—radio pulses last nanoseconds, or billionths of a second—required for ultra-wideband radio. "This research will demonstrate the feasibility and effectiveness of the proposed architecture for reception and transmission of ultra-wideband signals," said Namgoong. He proposes to channelize incoming ultra-wideband signals and to process them in parallel. "Our goal is to design a high-performance single-chip ultra-wideband radio."

Ahmed Helmy is developing protocols and the architecture to multicast to large-scale, mobile, ad hoc wireless networks. Multicasting is sending a single message to a large but selected group of individuals. Ad hoc networks are groups where participants join and leave at will. "Ad hoc networks consist of wireless devices that are able to operate without a network infrastructure. Device mobility poses an additional challenge to provide a robust and scalable multicasting service," Helmy said. "I plan to develop a series of courses on protocol design and ad hoc networking and establish a wireless networking laboratory."

Chongwu Zhou plans to design, fabricate, and evaluate molecular scale versions of two core elements in integrated circuits: transistors and memories. The transistors will be two orders of magnitude smaller than today's most advanced silicon-based transistors. "I am finding conductive molecules that

Neumann Named Director of IMSC

Ulrich Newmann, IMSC's new director

Dean C.L. Max Nikias appointed Professor Ulrich Neumann director of the School's Integrated Media Systems Center, effective March 15, 2002. Neumann is a professor of computer science, and in his new post, he will hold the Charles Lee Powell Chair in Engineering.

"I am honored to be named the new Director of IMSC," Professor Neumann says, "and I look forward to working closely with IMSC faculty, staff, and students, as well as with NSF and our corporate partners, in meeting the challenges of multimedia and Internet research in this new century."

The Integrated Media Systems Center, with an $11 million annual budget, is the National Science Foundation's only Engineering Research Center for multimedia and Internet research. The Center provides an environment where academia and industry can work together on complex, next-generation engineering systems important to the nation's future.

Neumann has been with USC since 1994 and with IMSC from its inception. He played a pivotal role in developing USC's proposal for the creation of IMSC, and Nikias lauded him "for articulating the center's vision and research agenda."

Neumann earned a Master of Science in Electrical Engineering at the State University of New York at Buffalo in 1980. He completed his PhD in Computer Science at the University of North Carolina at Chapel Hill in 1993, where his focus was on parallel algorithms for interactive volume-visualization.

His research in video-based tracking systems for Augmented Reality applications in manufacturing and training earned him a National Science Foundation Career award at USC. Also at USC, his work in 3D modeling and animation systems earned him the Junior Faculty Research Award.

Within the Integrated Media Systems Center, Neumann has overseen research into computer interfaces, interactive media, 3D computer graphics, and immersive environments. He directs the Computer Graphics and Immersive Technologies Laboratories, and his work on motion tracking is a key component in producing special effects for movies and creating interactive augmented realities for training and navigation applications. The research he has done on animating 3D facial expressions and human hair modeling has advanced the realism of these simulations and the ease with which they are created.

School of Engineering Leadership Team

Associate Dean, School of Engineering Executive Director, Information Sciences Institute
Herbert Schorr

Associate Dean, Academic Affairs
Yanis C. Yortsos

Associate Dean, Research
Randolph Hall

Associate Dean, Administration
Kathleen Ash

CEO, External Relations
Christopher J. Stoy

Assistant Dean, Undergraduate Student Affairs
Louise A. Yates

Assistant Dean, Graduate Student Affairs
Margery Berti

Assistant Dean, Program Planning and Design
Susan S. Lewis

FACULTY ACHIEVEMENT

mimic the electronic components that we fabricate from silicon today," Zhou said. "The eventual success of this program will firmly establish molecular electronics as an intriguing and practical technology with great potential to replace silicon-based electronics."

Zhou was also cited in the cover article for the December 2001 issue of *Science* for his work in creating molecular diodes for nano-circuits. *Science* selected nano-circuits as the "Breakthrough of the Year."

Jerry Mendel, professor of electrical engineering, has won the 2002 Transactions on Fuzzy Systems Outstanding Paper Award for his paper "Type-2 Fuzzy Logic Systems." The paper was co-authored by two electrical engineering graduate students: Nilesh Karnik, who received his PhD in 1998; and Qilian Liang, who received his PhD in 2000.

Clifford Neuman, senior research scientist at the USC School of Engineering's Information Sciences Institute (ISI), was named by *InfoWorld* one of the Top 10 Technical Innovators for 2001.

Neuman was cited for his work on Kerberos, a computer network authentication protocol. Kerberos is used to make sure people on the Internet are who they say they are, and that computers are what they say they are, and it has applications in electronic commerce.

The senior editors of *InfoWorld* annually choose 10 people whose contributions to technology have had the most significant impact on business. Profiles of Neuman and the other innovators ran in the March 3, 2002 issue of *InfoWorld*.

Fabio Silva, ISI programmer, earned the ISI Meritorious Service Award for the work he performed for a military technology demonstration at the Twentynine Palms Marine Base last year. The demonstration was part of a Defense Advanced Research Project Administration (DARPA) program involving military sensor information technology.

George Bekey, holder of the Gordon S. Marshall Chair in Engineering and a university professor with appointments in computer science, electrical engineering, and biomedical engineering, has been invited to be an honorary member of the Hungarian Academy of Engineering.

THE DANIEL J. EPSTEIN DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING — SAN DIEGO REAL ESTATE ENTREPRENEUR DANIEL J. EPSTEIN HAS GIVEN THE SCHOOL OF ENGINEERING $10 MILLION TO ENDOW THE INDUSTRIAL AND SYSTEMS ENGINEERING DEPARTMENT, FROM WHICH HE GRADUATED WITH HONORS IN 1962. THE DEPARTMENT HAS BEEN RENAMED IN HONOR OF HIS GIFT. MR. EPSTEIN MET WITH *USC ENGINEER* TO DISCUSS NOT JUST HIS CAREER, BUT ALSO HIS ENDORSEMENT OF DEAN NIKIAS' PLANS TO ELEVATE THE SCHOOL INTO THE RANKS OF THE NATION'S ELITE ENGINEERING SCHOOLS.

ENGINEERED FOR SUCCESS

Great outcomes sometimes turn on small pivots. For Daniel J. Epstein, it was a day at USC in 1962 when he overheard two industrial and systems engineering students discussing a trainee position being offered by the Paul Hardeman Company, a world-wide, independent construction company. Intrigued by the position's prospects for major project experience, professional growth, and promotion, Epstein characteristically thought it through quickly, made a decision, and then acted. He sought out the firm's recruiter and applied for the position.

"I interviewed for it," he recalled recently for *USC Engineer*, "and convinced them that what they really needed was an industrial and systems engineer, not a civil engineer." Not coincidentally, Epstein was an industrial and systems engineering major.

He got the job, and with USC diploma in hand, Epstein set off for Cape Canaveral, Florida, as a field engineer. The project was the National Aeronautics and Space Administration's gargantuan Vehicle Assembly Building in which the Apollo-Saturn moon rockets were to be assembled.

Time was short and the task immense. President John F. Kennedy had pledged to land men on the moon by the end of the 1960s. "To pull all the different construction elements together required a scheduling technique called 'Critical Path Method,'" Epstein said. "Fortunately for me, I'd taken a 'CPM' course at USC so I knew how to do it. And I did it."

His work habits and solid engineering skills did not escape the notice of others. Less than 10 years after graduating from USC, he had become the construction manager for a large builder of apartment complexes in Dallas, Texas. Then in 1975, he founded his own firm, the ConAm Management Group, in San Diego.

Epstein readily acknowledges that his USC education has been a major factor in his success. ConAm, which stands for Continental American, is today the tenth largest real estate and property management organization in the United States.

"I couldn't have achieved what I have without the education in industrial systems engineering I received at USC," said Epstein. "USC has really been important to me, and giving back to USC in a meaningful way fulfills a lifelong dream."

The San Diego entrepreneur has now given $10 million to the School of Engineering. In recognition of this beneficence, the Industrial and Systems Engineering Department, the same department from which he graduated in 1962, will be renamed the Daniel J. Epstein Department of Industrial and Systems Engineering. In addition, the School's Engineering Management Award, presented at the Annual Alumni Awards luncheon every spring, will now bear the title of the "Daniel J. Epstein Engineering Management Award."

Dean of the USC School of Engineering C.L. Max Nikias, expressed the University's and his own deep gratitude to the Epsteins.

"Since becoming dean last summer," Nikias said, "I have had several occasions to share with Dan my plan to take USC Engineering into the ranks of the nation's elite engineering schools. Dan's generous gift

An engineering periodical from 1965 featured the construction of the Vehicle Assembly Building at the Kennedy Space Center in Florida

"I couldn't have achieved what I have without the education in industrial systems engineering I received at USC," said Epstein. "USC has really been important to me, and giving back to USC in a meaningful way fulfills a lifelong dream."

is a most encouraging endorsement of this plan. It demonstrates that Dan truly cares about USC, about the School of Engineering, and about his own academic department."

Nikias explains that the gift, the single largest gift from an individual to name an academic department in USC history, will give a significant boost to the School's endowment fund. "Part of the gift will be allocated to establish two chairs in this discipline," he added. "And we will seek top-notch senior faculty to hold those positions." The dean promises that the ultimate purpose of this gift will be to ensure academic excellence for the ISE department so that it will be recognized as one of the nation's best. *(See ISE sidebar on page 18)*

> "I'm very pleased to become a significant supporter of the School of Engineering...I hope my gift will encourage others to consider their ties to USC. This is not just about becoming good; it's about becoming the best."

Professor Randolph Hall, associate dean for research, professor of Industrial and Systems Engineering and department chair, said that Epstein, in his role as chairman of the ISE Advisement Committee, has long advocated a curriculum that ensures future generations of engineers are well grounded in management and economics. Hall explained how the gift will allow the School of Engineering to join with the Marshall School of Business in offering cross-disciplinary undergraduate minors, as well as graduate degree programs in engineering management.

"Dan feels strongly that engineers should be able to analyze the financial implications of their engineering decisions," said Hall. "He also believes that engineers must be good commu-

nicators and has been an enthusiastic advocate of our writing program." *(See story on "Illumin" on page 9)*

Through the years, Epstein has remained connected with USC. In February, 2002, USC President Steven B. Sample announced Epstein's election to the Board of Trustees and described him as "a thoughtful and visionary addition to the board."

In addition to serving on the Engineering School's Board of Councilors for the past decade, Epstein also sits on the USC Alumni Association's Board of Governors, the executive committee of the USC Lusk Center for Real Estate Development, and is a USC Presidential Associate. In 1996, he joined the advisory committee for the Industrial and Systems Engineering Department. In 1994, he was honored at the School of Engineering Annual Awards Luncheon with the Distinguished Alumnus Award.

The Trojan spirit runs in the family. Epstein's two children are both USC graduates. Daughter Julie graduated with a master's degree in public administration in 1993, and son Michael received a BS in public administration and planning in 1994. Son-in-law, George Bronstein, is currently enrolled in the master's program for Construction Management.

"I'm very pleased to become a significant supporter of the School of Engineering," said Epstein. "I hope my gift will encourage others to consider their ties to USC. This is not just about becoming good; it's about becoming the best. That's clearly the journey Max is on."

Because of his position on the Board of Councilors, Epstein became well acquainted with Nikias and describes the dean as "an exciting visionary" with deep convictions about engineering education. Epstein recalls with enthusiasm the new dean's presentation at his inauguration last November, when Nikias laid out his vision for the School. It connected with Epstein like a jolt of electricity.

"Max had one of the most comprehensive and well thought out presentations on the School that I've ever heard," he said. "He talked about where the School was and what it needed to do to move up. It really got me excited."

Epstein also immediately grasped the key element of the plan. It was about people, not things. It was about building faculty,

not just bricks and mortar.

"To achieve the dream of moving the School up to the top tier, it's faculty, faculty, faculty," said Epstein, echoing Nikias. He recognizes the promise in the dean's plan by relating it to the success of his own company. "Although what we do at ConAm is build buildings and manage properties, our most important assets are, in fact, our people. To be successful, our associates must be the premier professionals in the industry."

Epstein visiting the Vehicle Assembly Building that he helped build at the Kennedy Space Center, Florida

Epstein's interest in people explains why he gravitated toward industrial and systems engineering which, among other things, is the branch of engineering most focused on the interaction between humans and complex systems.

He laughs when he recalls that upon graduating from USC in 1962, the expectation was that he would find work in the more "traditional" pursuits of an industrial and systems engineer—laying out plants or performing time and motion studies to improve manufacturing systems. Although these were worthy tasks, his aspirations lay elsewhere, and he translated what he learned as an ISE student into his own unique professional journey.

At USC, Epstein was taught to employ a systematic approach when solving problems.

He studied how to manage the multiple variables that determine whether a project would be completed on time, and within budget. He knew how to adjust when something went wrong.

"Systems engineering is not a strictly delineated discipline," explained Hall, "because it usually pertains to a complex network of entities."

Factory assembly lines, airline scheduling, military logistics, electric power grids, emergency medical response, and water and

savings and loans were in the business of making capital available on a favorable basis and tax laws were particularly supportive to real estate development."

Things have changed, but he is not complaining. In fact, he smiles as he talks about the changes that have made his business more difficult. He clearly relishes

Steven B. Sample, USC President, Daniel J. Epstein, and Dean C.L. Max Nikias at the ISE naming celebration

> **THINGS HAVE CHANGED, BUT HE IS NOT COMPLAINING. IN FACT, HE SMILES AS HE TALKS ABOUT THE CHANGES THAT HAVE MADE HIS BUSINESS MORE DIFFICULT. HE CLEARLY RELISHES NEW CHALLENGES.**

sewage systems are just a few examples of the kinds of complex systems that systems engineers design, operate, maintain, and continually tweak in an effort to optimize performance. How should machines and supply networks be scheduled and organized in order to keep a factory humming? How should aircraft and flight crews move around in order to carry the most passengers, without losing their baggage, while ensuring the highest profit? How should information flows be managed in today's rapidly changing technology environment?

"A systems engineer applies computer science to business problems," says Hall. "Industrial and systems engineering prepares students with a blend of technical and business skills. One of the things we will do with Epstein's gift is start an undergraduate program in information systems engineering."

In 1962, Epstein left USC armed with these skills. They proved to be essential to his mastering the extremely complex business of building and managing apartments, condominiums, single-family homes, office buildings, retail shopping centers, and hotels. His skills also included the flexibility to adapt to the inevitable changes in the industry.

"In the early days, you bought a piece of zoned property, figured out how many units you could put on it, and then built them," he said. "You didn't have all the reviews that you have now: American Disability Act, basic design, environmental reviews, radon, mold considerations and so on. Back then, the

new challenges. He's still the student who prefers a difficult task to an easy one, because he recognizes and enjoys his own competitive instincts.

Following these instincts, Epstein's career in real estate took him from Dallas, Texas, where he was building apartment complexes for the I. C. Deal Company, back to California and a position as executive vice president of American Housing Guild, a major residential developer based in San Diego. Epstein initiated the company's expansion from single-family housing into developing and managing apartments. He began to acquire sites, hire architects, determine project feasibility, develop plans, and build the properties, mainly in San Diego and around Southern California. Then in 1974 and 1975, there was a major economic downturn.

"It was a fairly serious recession so the company decided to get out of the apartment business and retrench. That was when I had an opportunity to acquire the company," said Epstein. He sought capital, borrowed, and boldly named his new company Continental American Properties.

"We knew our future lay in coast-to-coast management," he said. "Rental housing was a business for which I had intuitive inclinations. I knew what the essential ingredients were."

Building an apartment complex requires a large upfront investment. A company has to acquire property, hire architects, design, build and finally market a structure to those who will pay the rent. Success hinges on such factors as location, local politics, and local and national

At home in La Jolla on the golf course

economic variables.

"There is always a lag time between occupancy and the start of the rental cash flow", said Epstein. "Is the projected income adequate to justify the upfront investment and associated risks?" This is the kind of complex problem that a systems engineer like Epstein lives for. What he calls "intuitive inclinations" is rooted in the systems engineering that he learned at USC.

Epstein is now chairman and CEO of the ConAm Group of Companies, a full-service real estate organization that operates in about 250 cities in 14 states. Its companies include:

- ConAm Management Corp., which manages a $3 billion-plus portfolio of more than 50,000 apartment units in the nation.
- ConAm Asset Management Corp., which provides strategic direction and oversight services such as financing, brokerage, property renovation and risk management for 18,000 apartment units.
- Continental American Properties, Ltd., which has been involved in the development of more than 15,000 apartment units, and which serves as the general partner in partnerships that own more than 23,000 units.
- ConAm Research Group, which does economic and demographic research for real estate development, financial, and legal communities.

Both Epstein and his wife Phyllis grew up in West Los Angeles, but now reside in La Jolla, California. He manages to find time for golf and shoots in the mid to low 80's. He is clearly

Epstein with ConAm's Acquisitions Director, Rob Singh at "Homes for Hope" project, Tijuana, Mexico

proud of his accomplishments but is not afraid to poke fun at himself. Asked for the preferred pronunciation of the family name, he jokingly replies: "Well, I say 'ep-steen', but I have an identical twin brother who goes by 'ep-stine'."

This light-hearted humor is just one of his many facets. The characteristic that stands out most distinctly, however, is his generosity and

compassion. On a coffee table in ConAm's lobby is an album with photos of a group of workers building a small house. A closer look reveals Epstein among the crew. The photos, he explained, were taken one weekend last year when he and about two dozen ConAm employees went to Mexico to build two homes for poor families.

"There's an organization in Tijuana that will provide building materials for any group that will provide the labor to build homes for families in need," he said. "My associates heard about this and wanted to do it. So we went down, and it was a wonderful experience. The look on the faces of those families when we finished those houses was well worth the effort. We'll go back next year."

It's a curious twist on a 40-year career, one that began as a young field engineer helping to plan what was then the world's largest enclosed volume structure—almost 130 million cubic feet. And now, at the pinnacle of his corporate and philanthropic success, he is a volunteer installing dry wall on a 500 square foot, low-income house. But that's Dan Epstein. He wouldn't have it any other way.

–Bob Calverley

EXECUTIVE ENGINEERING: INDUSTRIAL AND SYSTEMS ENGINEERS COMBINE ENGINEERING WITH SAVVY BUSINESS SKILLS

Students wanting to learn the best ways of organizing people, material, capital, and information in order to produce goods and services, often major in industrial and systems engineering.

"Systems engineering is the management branch of engineering," says Randolph Hall, professor and chair of the School of Engineering's Daniel J. Epstein Department of Industrial and Systems Engineering. "And more and more, we are becoming the information technology managers of today."

In addition to production, design, computer programming, probability and statistical modeling, ISE students at USC learn how to employ the analytical tools of economics and finance. They must be able to combine good engineering with business skills.

"Engineers may work in a technical environment, but they have business responsibilities. They must understand the business impacts of their decisions," Hall says. "To be successful, they also have to be good communicators, which is why we also teach our students communications skills."

During the last five years, the number of students graduating from industrial and systems engineering at USC has steadily risen. The number of BS degrees awarded has grown from 80 in 1997, to 85 in 2001. During the same period, MS degrees have increased substantially, going from 86 to 183. PhD degrees have increased from 22 to 30.

Many of the master's degree students take their courses through the Distance Education Network at their employers' expense. Today's companies are increasingly recognizing the management value of the industrial and systems engineering curriculum.

Hall and Dean C.L. Max Nikias say that with the $10 million gift from alumnus Daniel J. Epstein, the department will concentrate on building excellence in the areas of engineering management and information systems. The department will introduce new educational programs at both undergraduate and graduate levels. In addition, the School of Engineering will introduce cross-disciplinary undergraduate minors and graduate degree programs in engineering management.

Hall studied other industrial and systems engineering departments around the nation and determined that to enter the top ten, the department needs at least 15 full-time faculty.

"Currently, we have eight and a half faculty. We have eight full-time professors and two devoting 25 percent of their time to the department," he says.

Epstein's gift will allow the addition of two new named chairs. Top-tier senior professors will fill the chairs, and new junior faculty will be added to the department as well.

"I have already interviewed several young assistant professors and senior faculty from MIT, University of Michigan, Cornell and other universities for these positions," says Nikias. "If they're the best in their field, then we want them for Industrial and Systems Engineering at USC.

ISI@30

Three decades of advanced computer science engineering

Both Keith Uncapher (right) the first director of ISI, and Herb Schorr (left) the current executive director and associate dean of the School of Engineering, are responsible for the ISI's 30 years of success

Herb Schorr sits, smiling, in a sunny, Marina del Rey high-rise office overlooking the sailboats in the harbor below and an endless golden sweep of California beach and Santa Monica Bay just beyond. His smile is not simply a result of the view. The USC School of Engineering's Information Sciences Institute, of which he is the executive director, celebrates its 30th anniversary this year, and there is much to smile about.

During his 14-year tenure, ISI has expanded greatly and pioneered many new areas of computing and computational science. Practical applications of the Institute's research are popping up in industry and academia– grid computing and artificial intelligence autonomous agents are two examples. Schorr likes to say ISI deals in "real-world results." Indeed, geophysicists are drawing upon the expansive computer resources made possible by grid computing to better study earthquakes, and a number of organizations are creating agents to do planning, robotics, and even classroom instruction.

ISI is also creating new designs for faster and more energy-efficient microchips; computer programs for better understanding, use and translation of languages; new techniques to transmit richer and more varied information with greater security over the Internet; novel ways to structure data using maps and locations instead of traditional indexes; and

more effective ways for government agencies to interact with and serve constituents.

The Institute last year utilized $58.3 million in research funds, which is roughly half of the School of Engineering's research volume. Research dollars for USC Engineering consistently rank it in the top 5 schools in the nation. ISI has a staff of 338, twenty-seven with joint academic appointments at USC Engineering.

Engineering graduate students were few at ISI when Schorr became director; now there are as many as 80 involved in different research projects. Encouraged by C.L. Max Nikias, dean of the USC School of Engineering, Schorr is now starting to bring undergraduates to ISI's tower campus in Marina del Rey as well and plans to engage still more undergraduate participation through the School's Distance Education Network.

"ISI under Herb's direction has compiled a great record," Nikias said. "In all the years I've known him, he has shown consistent, excellent leadership as well as a great technical and business sense. That's why, when I became dean last year, I wanted Herb to be associate dean of the School."

Nikias was just as laudatory about the contributions made to ISI by Keith Uncapher and Zohrab Kaprielian. The idea for the Institute came from Uncapher, then with the RAND Corporation, and its implementation came from Kaprielian, then the dean of USC

"Without Uncapher and Kaprielian," Nikias said, "ISI would not exist today."

Engineering. "Without Uncapher and Kaprielian," Nikias said, "ISI would not exist today."

At RAND, Uncapher's research had been

Researchers used modem-equipped portable computers like these when the Internet, as a new invention called ARPAnet, was being developed at ISI and other centers.

focused on information processing for U.S. military and civil applications. The Advanced Research Projects Agency, the Department of Defense's research and development organization (today known as the Defense Advanced Research Projects Agency, or DARPA) had been supporting his work in packet switching for computer communication networks and wanted him to expand both its scope and level of effort–at RAND, if possible, or, if not, at an academic institution where the research would

The Internet Guru…

Dr. Robert Kahn, a pioneer in computer communications who is widely acknowledged as the "builder of the ARPAnet" and an Internet pioneer, had this to say about ISI: "Since its inception, ISI personnel provided key support for the Internet, which enabled it to grow from a research tool to a major national and international system."

be immersed in a stimulating intellectual environment. And time was critical.

RAND management at that time was cool to the proposal and so Uncapher, assured by ARPA that it would support his research wherever he located it, approached UCLA.

But the university told Uncapher it would take at least 15 months to create an organizational structure for the work. "I don't have three weeks," Uncapher replied.

A mutual friend put Uncapher and Kaprielian in touch. The two met on several successive evenings one week in 1972 to discuss the idea and by that Friday night, had reached an agreement to establish ISI at USC. "The whole thing," Uncapher recalled, "got done in one week."

Within 30 days of the Uncapher-Kaprielian handshake, the institute began with Uncapher, a staff of four other former RAND engineers, and an umbrella grant of approximately $4 million from the Advanced Research Projects Agency. It was located in Marina del Rey, instead of University Park, because of its proximity to Los Angeles International Airport–a requirement Uncapher insisted on for the convenience of his frequent Washington, D.C. visitors.

Some exceptional research soon followed. Along with several other institutions, the Institute was one of the founders of the Internet, and staffers such as the late Jon Postel and Paul Mockapetris, now board chairman of Nominum, Inc., created much of the network's domain system–the familiar *.com, .org, .edu*, that are the provinces of email and web site addresses.

These gifted researchers also played significant roles in the development of the Transmission Control and Internet protocols (TCP/IP) that initially linked various Defense Department computer networks and were so successful precisely because they satisfied a few basic, widely needed services (file transfer, electronic mail, remote log on), across a very large number of client and server systems.

Uncapher steered the Institute into early work in artificial intelligence and also developed a unique resource for the computer community: the MOSIS (Metal Oxide Semiconductor Implementation Service) prototyping service, a cooperative arrangement that allows computer chip designers to share costs and economically produce advanced copies of their ideas. Originally conceived by Xerox, but developed by ISI, this service prototyped such famous creations as Sun Microsystems's Scalable

Processor ARChitecture (SPARC) chip, and designs that became the heart of the Million Instructions Per Section (MIPS™) system used by Silicon Graphics.

ISI continues to be a major resource for research in the engineering community, as well as the academic community, thanks to a special program that allows students free chip prototyping.
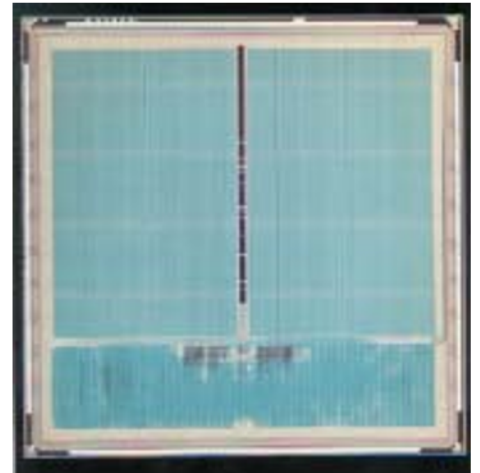
A team of hardware and software experts designed this new chip to break through a processing speed barrier imposed by delays when retrieving information from memory. The first examples are now being tested.

Schorr, a native New Yorker whose accent is pure Bronx, became the Institute's director in 1988 when Uncapher left. While interested in a wide range of art, literature and music, he decided early on, after a 1950s summer job in the then-nascent field of computers, that computers and information technology would be his life's work. He graduated from the City College of New York, and in 1963, earned his PhD from Princeton. His PhD thesis expanded on the pioneering work in digital transfer registers by Irving Reed, a noted mathematician and inventor who later joined the USC Engineering faculty. Reed received the Millennium Medal last year from the Institute of Electrical and Electronic Engineers and a Distinguished Emeriti Award from the university in 1999. Schorr expanded Reed's work into a new and more powerful basis for key computer functions, ideas that he developed when after a year as a professor at

The Great Global Grid
The Next Major Step In Computing

USC Engineering's Information Sciences Institute (ISI) is no ivory tower, Director Herb Schorr is quick to tell people, but delivers "real-world results" in both basic and applied research—and grid computing is one particular ISI project that is rapidly impacting the field of general computing worldwide.

Just as ISI research shaped the growth and development of the Internet 30 years ago, grid computing (also called "distributed computing"), is swiftly making its influence felt by pooling the power of many computers and making them available as a single access point for individual desktops or work stations.

That grid computing is an idea whose time has come was evident at the recent Global Grid Forum in Toronto, Canada. This conference attracted more than 400 participants from universities and companies around the world. The *New York Times* reported from the Forum that IBM and Microsoft are expected to announce their support for the ISI-developed Globus grid architecture, in order to integrate their Web services. Other companies were said to be nearing the same decision.

This news followed the announcement last fall that five American and three Japanese firms—Compaq, Cray, SGI, Sun Microsystems, Veridian, Fujitsu, Hitachi, and NEC, have adopted the ISI-developed Globus software for their web service platforms. Earlier in 2001, the National Science Foundation made a $12.1 million grant for a "Middleware Initiative" to establish a GRIDS center partnership involving ISI, the National Center for Supercomputing Applications at the University of Illinois, and three other universities.

"GRIDS" stands for Grids Research Integration Deployment and Support center. Web services run on Web-based servers instead of individual PCs, so users can connect to them through any device with Internet access; and "middleware" is software common to multiple applications.

"Much of the NSFnet network,

established in 1985, laid the groundwork for the dramatic success of the Internet," said an NSF spokesman. "We expect this NSF Middleware Initiative to lay foundations for the Grid, and spur adoption of the advanced services that will define the networks and distributed systems of tomorrow."

Dr. Carl Kesselman (MSEE '84), director of the USC/ISI Center for Grid Technologies and research associate professor of the School of Engineering Computer Science Department, has been a pivotal figure in the development of this software discipline. The NSF-supported National Partnership for Advanced Computational Infrastructure recently recognized his major role in the field by naming him the partnership's "chief software architect."

Since 1994, Kesselman and his collaborator Ian Foster, of the Argonne National Laboratory, have been developing the concept of grid computing, so-called by analogy to the grid used by utilities. Just as electrical power can be shared between consumers in several states, grid computing allows a user to draw upon the resources of computer systems all around the world.

The computational grid offers more than just raw computing power from remote machines. It also enables designated individuals to access special instruments, such as a space telescope, an array of oceanographic sensors, and huge data bases like those for weather modeling or genomic studies.

"The grid gives a researcher sitting at his or her own workstation the power to assemble a special computing tool to attack a problem," said Kesselman. "The tool might use computing power from idle machines in Germany, and database information from Florida or San Diego, but all the elements work together as if parts of a custom-built system."

Kesselman and Foster developed the Globus Toolkit, specially written "middleware" that bridges the gaps between computing machines and applications. It also addresses security issues arising from strangers using each
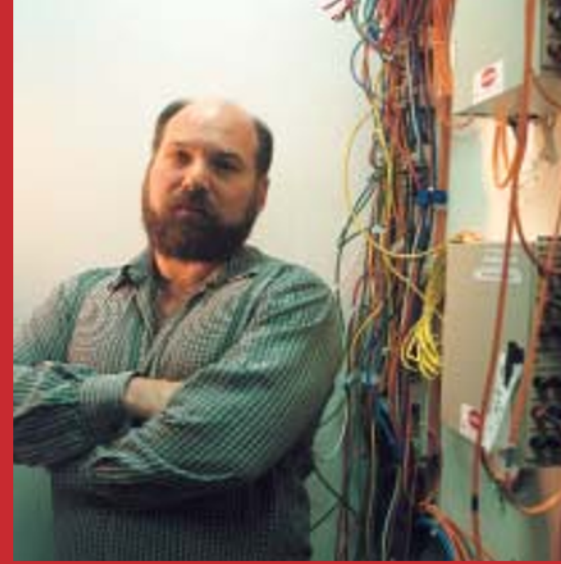
Carl Kesselman, director of the ISI Center for Grid Technologies

other's machines and resources automatically and instantly.

The two began their collaboration when they were living and working on different continents, and they have continued for years without ever working in the same city concurrently.

They met when Kesselman was a USC graduate student, and the New Zealander Foster was at Imperial College in London. Distance was no obstacle to their bouncing ideas off each other about new ways to use the Internet.

Collaboration bore fruit in 1995, when Foster was on the staff at Argonne and Kesselman was working on his Ph.D. at Caltech. The Defense Advanced Research Projects Agency funded an ambitious study project based on their concept. "If you look back at that paper, which first used the word 'Globus'," said Kesselman, "almost all the ideas we've since developed are there."

In 1997, Globus won the Global Information Infrastructure (GII) Award. Other systems have emerged to share computer resources, one of the best-known is SETI@home, which harnesses the unused time of personal computers to analyze signals from radio telescopes for signs of extraterrestrial life. However, these other systems were all special purpose, and most posed security issues.

The Globus project has remained general and open source, like Linux, rather than proprietary, Kesselman explained, and that has been an important reason for its rapid spread and acceptance.

ISI@30

Columbia University, he joined IBM.

At IBM, Schorr rose steadily, first as a researcher and then as a manager. He is particularly proud of his contribution to RISC (Reduced Instruction Set Computer, which edited down the number of base functions to speed up machines), and of being the co-author of "the world's fastest garbage collection algorithm." The latter speeds the removal of leftover electronic data from processors after they have executed a program segment, clearing them for the next job.

"But my forte, my best skill," he believes, was as a director of research–identifying talented engineers and important problems, pairing the two, and then getting the engineers to cooperate with one another. By 1987, Schorr had become a vice president for research, the first to hold that title, was responsible for the introduction of new, advanced technology, and reported directly to IBM's management committee.

Despite this success, Schorr was increasingly concerned about a continuing series of cutbacks at IBM and less confident the company was addressing the root causes of its slowdown. He looked for a change, and of the several opportunities that presented themselves to him, he chose ISI and never looked back.

Schorr said that his immediate challenge at ISI was to move the Institute away from its original umbrella grant structure, to a more flexible arrangement in which a wide variety of projects would get funding from an increased number of places.

To do this, Schorr explained, ISI had to broaden its base of expertise, building on its proven reputation in networking and software engineering, along with promising work in artificial intelligence. It was particularly important, he decided, to recruit fresh talent in a few important areas.

"We had silos of competence, but not competence across the board," he recalled, and so he went looking for expertise in such areas as systems architecture compilers, and Very

Large Scale Integration (VLSI) chip design. ISI had to show it had the research muscle to undertake a wider variety of jobs, which typically require collaboration by numerous experts.

Schorr was looking for more than just expertise, however. "We needed people who could not only do research," he said, "but people who could write proposals for contracts and grants, people who could sell their ideas to the funders." Under Schorr, the Institute has tripled its research budget.

As one example of this new breed of Institute engineers, Schorr points to Carl Kesselman, a young researcher who had a vision of an operating system that would allow distributed computing on an enormous magnitude scale, carried out over high-bandwidth connections.

This research thrust paid off handsomely this year, when the Globus Toolkit developed by Kesselman, his group, and collaborators at the Argonne National Laboratory, was adopted by the largest corporate developers of hardware and software in the United States as the standard for grid computing. The toolkit has also become part of a National Science Foundation initiative. *(See sidebar on page 21)*

Another major example of successful ISI expansion has been Artificial Intelligence, particularly the development of "agents"– software exhibiting such characteristics as autonomy, purposefulness, behavioral flexibility, and even a capacity for social interaction.

ISI is now among the leading world centers in artificial intelligence, running

The Immersedesk, used for advance imaging and interactive applications, offers a three-dimensional view that changes when the user's head moves.

remarkable projects in which agents teach human students, and schedule and coordinate the complicated interactions of numerous people and machines. Agent programs can also direct modular mini-robots to knit themselves together into larger robots for special tasks, such as search and rescue operations, or reconnaissance in hazardous or difficult-to-reach areas.

Other key artificial intelligence arenas include adaptive learning and pattern recognition. There is also ISI's venture into a brand new area: "Digital Government," a National Science Foundation-funded effort using information technology to make government services at all levels more efficient and more accessible to citizens.

Networking, ISI's longstanding strong point, has not been neglected. ISI researchers are pioneering the next generation Internet, including new ways to transmit full bandwidth high-definition television over the Internet. A special application of the technology will create a "virtual amphitheater" for education and entertainment.

Internet security, at a time when the integrity of complex modern systems is constantly being challenged, is also a priority, and the Institute is exploring several different countermeasures. Some efforts bolster the security of the information itself; others are

ISI is now among the leading world centers in artificial intelligence, running remarkable projects in which agents teach human students, and schedule and coordinate the complicated interactions of numerous people and machines.

aimed at making the system as a whole, at a time when the Internet has become a critical artery of commerce, less vulnerable to sabotage.

Still other initiatives are new computer architectures–faster and more flexible chips, linked together in new architectures, and new and more ingenious uses for the technology of embedded systems. And Schorr continues to branch out. This year, ISI collaborated with USC Information Services to open the High Performance Computing and Communications (HPCC) center on the USC campus, including the most powerful cluster computer in Southern California academia.

With this as a base, and working with other Engineering departments, the USC Keck School of Medicine, and the College of Letters, Arts and Sciences, ISI plans to enter the exploding field of computational biology, already a major area of USC scientific strength. And finally, ISI will be a central part of the USC School of Engineering plans to expand its Distance Learning program, which already enrolls hundreds of students in companies all across the country who study and receive USC credits from their workplaces.

ISI played a central role, along with the Integrated Media Systems Center, the School of Cinema-Television, and the Annenberg School for Communication, in winning the U.S. Army's contract to establish the Institute for Creative Technologies in 1999.

"Even at age 30, ISI is only beginning to hit its stride," Dean Nikias said. "With Herb's leadership and with the staff he's assembled, the future of ISI, like that of the Engineering School itself, is very bright."

–Eric Mankin

> "…the future of ISI, like that of the Engineering School itself, is very bright."

Oil Man *continued from page 9*

medical doctor. In part due to his Russian heritage and the petroleum reserves in his native Caucasus, Chilingar has significant ties to the Russian scientific community. He serves as president of the U.S. branch of the Russian Academy of Natural Sciences, 17 of his 45 books have been translated into Russian, and in 2001 he co-authored a book on petroleum engineering with a Russian scientist.

In recognition of these contributions, the Russian Academy of Sciences recently honored him as a Knight of Arts and Sciences. Fellow USC Engineering professor Dr. Solomon Golomb received a similar award at the same ceremony.

Significant Achievements

In more than a half-century of academic achievement, Chilingar has published 45 books and hundreds of articles in the fields of geology, petroleum engineering, and environmental engineering. With bachelor's and master's degrees in petroleum engineering and a PhD in geology, all earned at USC, Chilingar is a pioneer in the concept of interdisciplinary study.

His greatest contribution to the petroleum industry is a means of identifying oil-rich rock by analyzing the ratio of Calcium/Magnesium in core samples. This method was used in discovering one of Iran's largest oil fields, which is fittingly named "Chilingar."

He also played a key role in the development of Thailand's offshore oil reserves. While western companies drilled without success onshore and were preparing to depart from Thailand as a potential source of oil, Chilingar saw natural gas bubbles in the Gulf of Siam and redirected exploratory efforts, thus saving the nascent Thai oil industry.

PULSE OF THE FUTURE

Ultra-wideband (UWB) is an emerging radio technology that is forcing a reevaluation of all the narrow-band radio assumptions and premises engineers have made since the time of Marconi. It promises a dramatic shift in the design and use of many consumer electronics products, from wireless home computer networks to security systems incorporating UWB-based radar.

The Federal Communications Commission (FCC) recently eased restrictions on ultra-wideband in spite of continuing opposition to the technology from the airlines, who believe ultra-wideband could interfere with their navigation systems.

USC Engineering, the Integrated Media Systems Center (IMSC), and the School's leading ultra-wideband investigator, Dr. Bob Scholtz of Electrical Engineering/Systems, have pioneered academic research into ultra-wideband technology for more than seven years. Scholtz and his research team have been collaborating with the technology's private patent holders, a number of companies interested in the technology, and the U.S. military. Ultra-wideband is exactly the type of leading-edge and relevant technology that Dean C.L. Max Nikias wants the School to pursue.

PULSE RADIO

Whereas standard wireless systems emit radio waves on specific frequencies, ultra-wideband transmits digital information with pulses of radio energy. It works by sending out weak radio energy pulses that are extremely short, less than a nanosecond (a billionth of a second) in duration, millions of times each second. The pulses are emitted over a broad (ultra-wide) portion of the radio frequency spectrum.

In short, ultra-wideband impulse signals represent small amounts of energy sprinkled across an extremely wide portion of the radio spectrum, including frequencies reserved for military agencies and civilian aviation, thus the commercial air transport industry's concerns and the great interest from the military.

Because standard wireless technology is approaching its developmental limit—major improvements in information bandwidth (the rate at which data is transmitted), and channelization (number of simultaneous users), are not foreseen. Ultra-wideband technology offers a new way ahead.

Other advantages to ultra-wideband are:

- More immunity to radio-signal fading effects
- Potentially simpler low-power implementation
- Increased ability to penetrate physical objects because UWB provides a comparable bandwidth in a lower portion of the electromagnetic spectrum
- A near immunity to eavesdropping because the extra bandwidth can be used for encryption purposes
- The tolerance of significant levels of interference

Preliminary laboratory results for ultra-wideband radio indicate that in comparison with other systems in the same frequency range, this new technology's coded pulses, transmitted and measured precisely in time, can carry orders of magnitude and more data because of dramatically increased radio-frequency bandwidth. It, therefore, can potentially support a larger number of users over short distances, a constraint imposed by the new FCC regulations, than conventional radio systems.

CONSUMER DEVICES

Thanks to the recent loosening of regulations by the FCC, consumer electronics firms are now free to develop a range of new products incorporating ultra-wideband. Rather than using cable connections, camcorders in the not-too-distant future will be able to download video to PCs through an ultra-wideband wireless connection.

While cable will remain a primary connection to the Internet, wireless computer networking systems within the confines of a building can be based on UWB transmissions. Think of UWB-based wireless networks as Macintosh's AirPort system multiplied by a factor of 10.

Daimler/Chrysler and other automakers are working on accident-avoidance systems employing UWB-based radar. When the ultra-wideband radar in either the car's nose or tail senses objects that might cause an accident, the car's central computer takes control and applies brakes and stability control systems to help avoid a collision.

WIDER APPLICATIONS

Beyond obvious home and office electronics applications, ultra-wideband might also bring great changes and new uses to radar.

The systems send up to one billion pulses of radio energy per second, and by the precise timing of returning pulses, can sense objects and measure their position much more accurately than standard radar.

Prior to the FCC's recent steps to ease regulations, ultra-wideband gained its first practical field service this fall when the FCC allowed federal and local authorities to use UWB-based high-resolution ground-penetrating radar systems to locate victims buried in the rubble of the World Trade Center. Similar radar systems could be used for land mine detection, an application that could have significant impact on the development of peaceful life in Afghanistan and other war-torn countries with documented and undocumented minefields.

It's not hard to imagine a consumer version of UWB-based radar as an integral part of a home's security system, identifying possible intruders with finely tuned radar pulses.

depend on the actual local radio frequency interference environment and on the regulatory restrictions placed on ultra-wideband radio emissions by the FCC.

Presently, Professor Scholtz is leading a team of top researchers at USC, the University of Massachusetts at Amherst, and the University of California at Berkeley, who are studying critical problems in short-range ultra-wideband radio applications under a three-year, $3.6 million grant awarded by the U.S. Army in 2001. Other investigators from USC are Professors Keith Chugg and Won Namgoong.

Team members outside of USC who are well known in the field include, Professors David Pozar, Dan Schaubert, and Dennis Goeckel from the University of Massachusetts, and Professors Bob Brodersen and David Tse from UC Berkeley. Dr. Brodersen is the co-founder and head of UC Berkeley's Wireless Research Center.

> **Ultra-wideband gained its first practical field service this fall when the FCC allowed federal and local authorities to use UWB-based high-resolution ground-penetrating radar systems to locate victims buried in the rubble of the World Trade Center**

A handheld military variation of ultra-wideband radar could be used to identify enemy combatants hiding behind walls when military units are sweeping buildings in urban combat situations.

Special Forces units carrying out such actions might also use short-range ultra-wideband radio transmissions to communicate because UWB radio is completely digital, thus making encryption possible. A military radio receiver can be programmed with a code to translate pulses into digital ones and zeroes. A "zero" might be indicated by transmitting an irregularly spaced, or coded, string of pulses 100 picoseconds (trillionths of a second) early and a "one" by sending it 100 picoseconds late, relative to a known clock. A receiver without the proper code and clock would receive no information. Unless enemy forces had access to the exact codes used on a specific mission, they would be hard-pressed to intercept and decipher messages.

The ability of radio to determine range is inversely proportional to its bandwidth. Global positioning satellites currently span 1 megahertz of bandwidth to determine location quickly via satellite to an accuracy of roughly 10 meters. Ultra-wideband radios transmit over a gigahertz or more of bandwidth. "That's a factor of a thousand times more bandwidth, enabling measurements that are a thousand times more accurate than GPS," said Scholtz. "Ranging down to a centimeter or less, perhaps through walls and foliage, should be possible."

In a more conventional application, the School's IMSC ultra-wideband research team has collaborated with the U.S. Navy to evaluate the potential for a UWB-based inventory tracking system for use on warships.

USC RESEARCH

Dr. Scholtz, who established the Ultra-wideband Laboratory (UltRa Lab) at USC in 1996, said that ultra-wideband's future applications will

This multi-university team is in many ways the product of years of work at USC. In 1998, Dr. Scholtz organized an IMSC workshop on ultra-wideband radio that served as a catalyst for focusing private industry concerns on regulatory constraints of the FCC that hindered comprehensive research and commercialization of ultra-wideband systems. In 1999, the FCC issued waivers to three companies to produce limited numbers of ultra-wideband systems and granted an experimental license to Dr. Scholtz to conduct tests up to 15 miles from the confines of the laboratory.

In 2000, through Dr. Scholtz's efforts, IMSC's research in ultra-wideband was boosted by a $200,000 contribution by computer industry pioneer Paul Allen, a co-founder of Microsoft Corp., to build an RF anechoic chamber for ultra-wideband research. The chamber, which opened on campus in 2001, is shown in the photo above.

Dr. Scholtz said the Allen test facility enables careful measurement of ultra-wideband signals in a controlled electromagnetic environment. He pointed out that the facility allows researchers to characterize ultra-wideband radio antennae without having to worry about the multipath effects and interference that normally occur in a laboratory environment.

THE FUTURE IS NOW

The FCC's easing of regulations means that the first generation of UWB-based consumer products—from camcorders and computer networking systems to radar home security systems—will be in American homes as soon as this year. As academic institutions like the School's UltRa Lab continue their research of the next generation of ultra-wideband, the technology's applications will become even more widespread.

–*Rick Keir*

Lilliputians of Troy

USC ENGINEERS LOOK FOR OCEAN PATHOGENS WITH SWARMS OF TINY ROBOTS

The concept seems reminiscent of a *Star Trek: The Next Generation* episode, in which a glittering metallic swarm of artificial life forms called the Nanites have taken over all controls of the Starship Enterprise, only releasing the ship after appropriate steps for coexistence have been negotiated.

Yet a team of researchers at the USC School of Engineering has already laid out the fundamentals to create a swarm of nanoscale robots that will swim our coastal waters, monitoring potentially dangerous microorganisms in the ocean. In theory, when these Lilliputian citizens of Troy have identified a problem in the water—like Brown Tide or a toxic spill—they will relay that information back to shore, alerting swimmers not to dive into water that's considerably less than pure blue.

"With increasing urban runoff, sewage spills, and blooms of harmful algae near heavily populated coastal areas, it is very important to be able to sense, and then identify, particular ocean microorganisms quickly," says Ari Requicha, a 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."

To sustain this research, the National Science Foundation's Information Technology Research program recently granted Requicha and his team $1.5 million. The project is a prototype for the sort of interdisciplinary research that Engineering Dean C.L. Max Nikias is encouraging. It spans the fields of nanotechnology, robotics, computer science, and marine biology. The central thrust of the current program is the refinement of the nanomanufacturing process, as well as the development of the ultra-small robotic sensors and software systems that will control the actions of the nanorobots.

Requicha directs the School of Engineering's Laboratory for Molecular Robotics. There, his team has been experimenting with nanometer-scale structures for nearly seven years. In comprehending the nature of this work, it's best to carry a measuring stick: one nanometer is one-to-one billionth of a meter. In other words, a nanometer is to a meter what a small grape is to the entire Earth.

Construction Methods

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 could also sometimes move 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.

> "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."

Ari Requicha and David Caron in their lab

Working with colloidal gold and silver balls as small as two nanometers, and string-like organic molecules called dithiols, which 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 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," Requicha explains.

Thus far, Requicha's group has constructed 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.

Moving to the construction of nanostructures is a crucial step in achieving Requicha's vision of true nanorobots. The team will progress from simple, single-function nanoscale objects to far more complex structures. In creating nanostructures, Requicha and his team will be using a "sacrificial" material that holds the assemblies in place by surrounding each layer. This material will be removed when all the layers are complete, leaving a tiny nano-electromechanical 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 believes it will be possible to build nanoscale devices with electrical and mechanical components so that the devices

can propel themselves, send electronic signals, and even compute. While individual nanoscale devices will have far less computing power and capability than full-sized devices, Requicha's 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 will be automated once the computer programming is perfected. Other labs are working on atomic force microscopes with more than one tip. Requicha says a single atomic force microscope could theoretically have an array containing thousands or even millions of tips, all controlled by the same computer program. If such a capability is developed, the manufacture of large numbers of nanoscale devices should be possible.

Enter Marine Biology

David Caron, professor of biological sciences and a co-investigator on the project, says seafaring 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 with the robots closest to it. The swarm would form an information chain not unlike those used by ants, with each robot relaying information to the next robot in the network, culminating in a link to the Internet from the final robots in the sequence.

In the next 12 months, 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," says 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 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.

Technology Spin-off

Along the way, Requicha and Caron hope 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 says. "The bit density is 10 gigabytes per square centimeter, which means we have data storage that is 100 times better than today's compact discs. And it could be even greater with smaller particles and spacing."

Development Process

Requicha's team of researchers will first build small robots, not to nanoscale, that will move, sense, and communicate while tethered in a tank of water in a laboratory. They will gradually progress to building and controlling increasingly larger numbers of increasingly smaller freely moving robots. The ultimate 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," says 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, all of which are freely moving in the ocean. Each robot will have limited capability and will only communicate with other robots that are close to it. That is a daunting problem, and we must start laying out the foundations for large numbers of robots long before they are a reality."

Maja Mataric, associate professor of computer science, is another investigator working on these issues. Deborah Estrin, a computer networking specialist from UCLA, and a former Information Science Institute researcher, will play a significant role in developing protocols that will enable thousands of individual nanorobots to communicate.

Requicha says that nanotechnology today is at the same stage of development that the Internet was in the late 1960s. "The idea that we'll have swarms of nanorobots in the ocean is no more improbable than the idea of connecting millions of computers was 35 years ago," he says. "I don't think these robots will be confined to the ocean. We will eventually make robots to hunt down pathogens or repair cells in the human body, not unlike the story line in the 1960s movie *Fantastic Voyage*."

—Bob Calverley

ALICE P. GAST, BSCHE '80

Dr. Alice P. Gast has recently been named the vice president for research and associate provost at the Massachusetts Institute of Technology, an achievement in engineering and academia that should serve as an inspiration to all USC engineering students and alumni.

In addition to her administrative positions, Gast is the Robert T. Haslam Professor of Chemical Engineering. Prior to accepting the position at MIT, Gast was the associate chair of the Department of Chemical Engineering at Stanford University.

At MIT, Gast coordinates policy regarding research and graduate education and oversees the Institute's large inter-school laboratories. She also reports to Chancellor Phillip L. Clay on matters of graduate education policy.

FORMATIVE EXPERIENCES AT USC

Recently, Dean C. L. Max Nikias had the pleasure of speaking and exchange e-mails with Dr. Gast, and took the opportunity to ask about her experiences at USC. She shared some vivid memories of her time at USC, memories that will undoubtedly be appreciated by many alumni readers.

"I was blessed by excellent teachers, progressive educational opportunities, and forward-thinking leaders in the School," Gast said. Among those inspirational leaders was Dean Zohrab Kaprielian who, Gast believes, "had a wonderful influence over the School and the University during my student years." Gast mentioned that she was "also in awe of John Marburger, Dean of Letters, Arts, and Sciences, partly because he was a physicist who could play the harpsichord."

Of her studies at the School of Engineering, Gast said that "among my best courses were the graduate transport phenomena course taught by Joe Goddard, the polymer science courses taught by Ron Salovey, the kinetics and reactor design course taught by Theodore Tsotsis—I taught this course myself for seven years at Stanford—and the materials science laboratory where we got to play with a real electron microscope!"

Beyond engineering, Gast mentioned that she was significantly influenced by the chemistry faculty and a wonderful curriculum ranging from freshman chemistry with Otto Schnepp, to graduate quantum mechanics with David Dows. "The great mentoring by Joe Goddard and Victor Chang convinced me that I could pursue the research I wanted as an engineer rather than a chemist," she said. "I have always been extremely grateful for that advice, and while I work closely with chemists, I am very happy to be an engineer.

"Another engineer and physicist who had a great influence on me is Bob Hellwarth, who let me into his lab to work with lasers on nonlinear optics for my project on piezoelectric polymers with Victor Chang. I remember the day I met Bob by knocking on his door to apply for a Rhodes scholarship, though it was probably good that I didn't win. Pursuing a research project with Victor in the laboratory of Bob Hellwarth was a great step toward my graduate studies. It gave me the confidence to pursue my PhD in a rather competitive environment my first year at Princeton."

The flexibility of her coursework at USC helped shape her career. "The School of Engineering Honors Program run by Willard Rush had a big impact on me. It brought excellent speakers that I still remember, and it allowed me to rearrange my schedule to follow my love of chemistry. I managed to substitute the graduate quantum class I took for my engineering economics, and to duck out of circuits to take the graduate transport class. As a student taking qualifying exams at Princeton and later in my own lab, I had to make up these deficits in my curriculum, but I was always grateful for the mathematics those two classes taught me in a way that no pure math class could."

Gast pursued the sort of well-rounded, interdisciplinary studies considered crucial in a USC education. "Outside science," she said, "I must mention three other people at USC who had a big influence on me. Doyce B. Nunis, whose constitutional history class gave me a great appreciation for our constitution and the law. His lectures were an absolute inspiration.

"Thom Mason, my music teacher, was also important. His class on the history of jazz probably had the largest impact on my life and continuing love of jazz.

"And Dick Caldwell's classics and Greek language course on the island of Skopelos was a life-changing event. Epharisto!"

She also mentioned Joan Schaeffer, the mentor of Mortar Board. Mortar Board, Inc. is a national honor society that recognizes college seniors for distinguished ability and achievement in scholarship, leadership, and service. "That experience gave me much needed contact with other brilliant women."

AT MIT

Dr. Gast's new employers are singing the praises of this distinguished member of the Trojan Family. "Alice is a renowned researcher,

> ALICE P. GAST HAS AN IDEAL BACKGROUND, INTERESTS, AND SKILLS TO FOSTER INTERDISCIPLINARY RESEARCH AT MIT. HER OWN WORK HAS BEEN AT THE INTERFACE OF SCIENCE AND ENGINEERING

scholar, educator, and a tremendous advocate for research," said MIT Provost Robert A. Brown in announcing her appointment. "She will add a wonderful perspective to the leadership of MIT in these and other important areas."

MIT President Charles M. Vest added, "Alice Gast has an ideal background, interests, and skills to foster interdisciplinary research at MIT. Her own work has been at the interface of science and engineering. She has thought deeply about how to create supportive

Photo by Donna Coveney/MIT

JAY L. KEAR, BSME '60

Jay L. Kear is one of the original early pioneers in high technology. While he was attending USC in the late '50s and early '60s, the School of Engineering had one Univac computer system that was used for accounting functions. In those days, there were no courses offered by any university in computer software or hardware. Electronic calculators had not yet been invented, requiring all of the engineering students to use slide rules for calculating solutions to problems. Upon graduation in 1960 with a bachelor's degree in Mechanical Engineering, Jay turned down a job offer from IBM, as he was not sure that computers were here to stay. Instead he joined the General Electric Company where it quickly became clear to him that computers indeed were going to be the industry of the future. He transferred to the GE Computer Department where he became a systems engineer for GE business and scientific computers.

In those early days, a large mainframe would require a dedicated air-conditioned room with raised floors to house the cool air plenum, as well as the massive power and logic cables. Programming was not performed with compilers, but rather by binary machine language that was input by paper tape or punched cards. By comparison, a multi-million-dollar computer system in the early '60s did not have the computational power of our modern-day notebook computers. When the General Electric Company decided to get out of the computer business in the late 1960s, Jay made the decision to stay in the business by joining General Automation, an early minicomputer company. From that point on, his career led him to several high technology companies, working with several other early pioneers.

Perhaps of greatest interest was Jay's mentor, Ray Noorda, whom he worked with at General Electric and General Automation. Following this, Jay worked with him again when Noorda was chairman and CEO of Novell. Jay's role was to make and manage venture capital investments in high-technology companies. In this capacity, he represented Noorda and his venture capital company on the board of directors of several portfolio companies.

While working with Noorda, Jay presented a company to him that wanted a $1.5 million venture investment. After hearing the company's business plan, Noorda told Jay that he would invest the $1.5 million if Jay would join its Board of Directors as Chairman and teach the CEO how to be a CEO. This created an opportunity for Jay to work with this company, as well as several others, as a mentor for their CEO's. "I felt that I could give back to the younger executives by sharing some of the lessons that I learned from many years in the industry," says Jay. One of his most rewarding moments came when a CEO that he was working with became the Ernst & Young Entrepreneur of the Year for Orange County, California.

In 1993, Jay formed Kear Enterprises to provide early stage investments and board-level services for emerging growth high-technology companies. Kear Enterprises addresses such critical issues as:

- PROPER CORPORATE GOVERNANCE
- STRATEGIC PLANNING
- MARKETING AND SALES
- FINANCING STRATEGY
- MANAGEMENT TEAMS
- BOARDS OF DIRECTORS
- INCREASING SHAREHOLDER VALUE
- STRATEGIC PATHS TO LIQUIDITY

Since being elected to his first board of directors in 1970, Jay has served on over 40 corporate boards, both public and private.

At the present time, Jay is a board member of LeadingWay, Aspeon Solutions, Think Outside, Microspeed, Sequel, and In.Vision

Research. These companies are either private or public high technology companies. He also participates on the board of several LLC's, some non-profit boards and numerous advisory boards.

In 1998, the Orange County Forum for Corporate Directors honored Jay as the Director of the Year for Emerging Growth Companies. He remains one of the most sought-after individuals for the role of director at software and hardware high technology companies in Southern California.

Skiing and golf are Jay's great athletic passions, but even when playing he finds business opportunities. He built a personal

Dean C.L. Max Nikias, Lauren and Jay L. Kear at a reception in San Diego in February

residence in Telluride, Colorado, to pursue his passion for the mountains, golf, and skiing. While in Telluride, he started a real estate development business, successfully completing a single-family spec house, several condominiums and a large 110-unit condominium hotel, which is currently managed by Wyndham Resorts. His enthusiasm for athletics eventually landed him on the board of a company called University Netcasting, which is an Internet affinity sports site for most major universities, including USC.

Connections to the School of Engineering remain strong, as Jay currently serves as the Chairman of the School's Board of Councilors, an advisory board to the dean made up of

snapshots

USC School of Engineering Events
Fall 2001 & Winter 2002

Dena Scaffidi (BSBMME '99), Kara Crawford, and Timur Taluy (BSEE '98) at the Pasadena reception

Lindy Yow (BSBME '82, MSEE '86) and David D'Argenio, chair of Biomedical Engineering, at the Orange County Dean's Circle reception

Bruce Barnes (BSBUS '59), Laurie Firestone, John MacLeod, and Randy Glein (MSEE '90) at the Chicago reception

DEAN'S CIRCLE RECEPTIONS

Held on August 12, 2001, the Summer Dean's Circle Reception featured Engineering's new dean, Dr. C.L. Max Nikias. Held at the home of Hanna and Jack McConaghy (BSME '66, MSME '68) in Pasadena, over 70 alumni, friends and special guests were gathered for the evening reception at which Dean Nikias shared his vision of excellence for the USC School of Engineering.

Cayley and Philip MacDonald (BSCE '70) hosted the Winter Dean's Circle Reception at their home in Irvine on December 2, 2001. Dr. Herbert Schorr, associate dean of Engineering, provided an update on the state of the USC School of Engineering, and Dr. David Z. D'Argenio, professor and Dwight C. and Hildegarde E. Baum Chair of Biomedical Engineering, delivered a presentation titled "Engineering the Future of Medicine."

The Dean's Circle is pleased to present the engineering community with a series of informal, informational receptions throughout the Southern California region. Each reception is held at the home of a member of the Dean's Circle, highlights the current research of different faculty members, and provides engineering alumni and friends with the opportunity to network and socialize.

ORANGE COUNTY BREAKFAST

Held at the Irvine Marriott on October 10, 2001, over 200 people attended the kickoff breakfast of the 19th Annual Orange County Executive Briefing Series. Dean C.L. Max Nikias led a panel discussion, titled "Leadership and New Technology on the Internet." Panelists included Gerard Medioni, chair of USC's Computer Science Department; Ulrich Neumann, director of USC's Integrated Media Systems Center; and Herbert Schorr, associate dean of Engineering and executive director of USC's Information Sciences Institute.

CHICAGO RECEPTION

On October 19, 2001, the USC School of Engineering held a reception prior to the Alumni Association's USC v. Notre Dame Pep Rally in Chicago. Nearly 40 alumni, parents, and friends joined Dean C.L. Max Nikias at the Navy Pier gathering, and enjoyed "balcony seating" for the main-floor rally. Although the mighty Trojans suffered a loss to the Fighting Irish on the football field that weekend (27-16), all in attendance reveled in the opportunity to celebrate the 75th anniversary of this great rivalry.

HOMECOMING AND REUNION CELEBRATION

The School of Engineering 2001 Homecoming and Reunion Celebration was held on Saturday, November 3, prior to the USC vs. Oregon State football game. Dean C.L. Max Nikias joined nearly 200 engineering alumni, family, and friends at the pre-game barbecue on the south lawn of Doheny Library, and over 200 more

Engineering Alumni at the Homecoming Celebration on November 3, 2001

Dean C.L. Max Nikias, President Steven B. Sample and USC Trustee Mark Stevens at the celebration of the dean's appointment

USC Trustee Andrew Viterbi, Erna Viterbi, and Andreas Polydoros at the Rancho Santa Fe reception

cheered on our team at the Coliseum. A drawing benefiting the Engineering Student Scholarship Fund included numerous Trojan spirit prizes such as USC hats and t-shirts, and the grand prize: four seats on the 50-yard line! Pete Carroll's USC Trojans capped the celebration with a 16-13 win over the OSU Beavers.

Robert Hockey, and Kay and John Lambert at the Menlo Park reception

Menlo Park Reception

Mark A. Stevens (BSEE '81, MSCENG '84), USC Trustee and General Partner of Sequoia Capital, introduced Dean C.L. Max Nikias to our Northern California engineering community at a reception held at the Menlo Park Country Club on November 9, 2001. Over 80 alumni, friends, and special guests gathered to hear the Dean's goals for the School and plans for activity in the area. USC Presidential Associates, Cynthia and Robert Hockey graciously sponsored the use of the Menlo Park Country Club.

"Excellence and Innovation"

To celebrate the appointment of the School of Engineering's new dean, Dr. C.L. Max Nikias, over 250 distinguished alumni, friends, and special guests attended a reception and dinner at The Omni Hotel in Los Angeles on November 16, 2001. Master of Ceremonies Jay L. Kear (BSME '60), chairman of the USC School of Engineering Board of Councilors, welcomed all in attendance and introduced special guests Dr. Steven B. Sample, President of the University of Southern California, and Mark A. Stevens (BSEE '81, MSCENG '84), USC Trustee and member of the School of Engineering Board of Councilors. Both President Sample and Stevens delivered supporting remarks, and the Dean concluded the evening by sharing his vision of excellence and innovation for the school.

Hong-Kong Alumni Conference

Dean C.L. Max Nikias delivered the keynote address on "USC's Information Technology Innovations" at the first-ever USC International Alumni Conference held in Hong Kong last fall. Dean Nikias also addressed more than 300

Rancho Santa Fe Reception with the Dean

On February 27, 2002, Trustees Daniel J. Epstein (BSISE '62) and Andrew Viterbi (PhD EE '62) hosted a reception with Dean C. L. Max Nikias at the Fairbanks Ranch Country Club in Rancho Santa Fe. Over 80 alumni and friends of the School of Engineering enjoyed Dean Nikias' presentation about his plans for the School in the next decade. Mr. Epstein graciously sponsored the entire event and gave introductory remarks.

Dean C.L. Max Nikias at the three-day International Alumni Conference in Hong-Kong last fall

parents and students at a special USC Admissions gathering. Over 250 people were in attendance for the three-day event featuring seminars, workshops, and keynote speeches by prominent alumni, corporate professionals, and academic leaders in Asia, as well as from USC. Dean Nikias is scheduled to participate in the 2002 conference to be held in Shanghai, China.

Derek Hazeur of Microsoft speaks with an undergraduate engineering student.

USC alumnus Richard Chiang (PhD EE '88) of Boeing speaks with aerospace engineering student Chi-hao Ho (left).

USC alumnus and QUALCOMM recruiter Tong Tang (MSCE.NG '98) speaks with Nabil Sadaha, a master's candidate in EE/Systems (right).

EWEEK

During the week of February 18, Archimedes Plaza (known to all as E-quad) was teeming with activity as representatives of Boeing, Microsoft, QualComm, and dozens of other engineering and high-tech firms interviewed USC engineering students for prospective employment. The Career Expo is the key event of National Engineering Week at USC, as contacts made often lead to a position after graduation. For information about participating in the 2003 Career Expo, contact the School of Engineering Career Services office at 213/740-4530.

DEAN NIKIAS HOSTS HIS FIRST BOARD OF COUNCILORS MEETING

Hosting his first meeting of the annual gathering of the Board of Councilors on November 16, 2001, Dean C.L. Max Nikias explained how he plans to elevate the USC School of Engineering into the ranks of the nation's elite engineering schools. The foundation of his vision is building academic excellence.

"We need to lift three or four of our academic departments into the top ten," Nikias said, "and that will benefit both the School and other departments. My plan begins and ends with recruiting the very best scholarly faculty."

Dean Nikias described the following logic train:

ONE, the foundation of academic excellence is a scholarly faculty.

TWO, a scholarly faculty leads to expanded and respected research.

THREE, good research elevates our image and reputation

Board members (from front to back) Dean Allen (BSME '57), Andrew Beers of Microsoft TV, USC Trustee Malcolm Currie, and Steven Dorfman (MSEE '59) at a laboratory presentation

and attracts quality students demanding both a first-rate education and opportunities to participate in exciting, cutting-edge research.

FOUR, corporations, universities, and others preferentially recruit our graduates.

FIVE, supporters and alumni see all these indicators of quality and are moved to increase their support.

SIX, greater resources enable us to provide all that's necessary to attract more first-rank faculty.

At the meeting, David D'Argenio, professor and chair of the Biomedical Engineering Department addressed the Board about the School of Engineering's Biomedical Technology initiative. Carl Kesselman, director of the new Center for Grid Technologies at the Information Sciences Institute and a research associate professor of computer science, made a presentation on grid computing. Paul Ronney, professor of aerospace and mechanical engineering, described his research on microscale power generation.

Bart Kosko, associate professor in the Signal and Image Processing Institute and author of several popular books on fuzzy logic, delivered the keynote address, "Fuzz and Noise in the Biotech Era." Later in the day, the Board toured laboratories in the Integrated Media Systems Center, the Neural Engineering Center, and the Alfred Mann Institute.

The day's activities concluded with a reception and installation dinner at The Omni Hotel in Los Angeles attended by USC President Steven B. Sample and Mrs. Sample, several trustees, other USC deans, and many other friends of USC Engineering. After Dean Nikias presented his vision and strategic plan for the School, he received a standing ovation from the more than 250 guests in attendance.

DANIEL J. EPSTEIN DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING NAMING CELEBRATION

On March 20, 2002, nearly 300 alumni, friends, faculty, and special guests of Daniel J. Epstein gathered at the Regent Beverly Wilshire Hotel in Beverly Hills to celebrate his generous gift to name the Industrial and Systems Engineering Department. Both Dean Nikias and President Steven B. Sample spoke about Epstein's accomplished career and dedication to the School of Engineering. President Sample presented Mr. Epstein with a stunning crystal statue in recognition

Daniel J. Epstein (BSISE '62) and his wife Phyllis congratulate Elaine Chew on her performance

of his support, and Dean Nikias gave him a variety of golf items embroidered with the new name of the department–The Daniel J. Epstein Department of Industrial and Systems Engineering. The evening concluded with a moving piano concert by Dr. Elaine Chew, ISE professor and classical pianist. Her performance was dedicated to the memory of Mr. Epstein's mother, herself an accomplished classical pianist.

TIME CAPSULE–*what year is this and who's the chili chef?* Email uscengineer@usc.edu

Daniel J. Epstein photo by Lee Salem

MARK YOUR CALENDAR!

Events for Late Spring, Summer and Fall 2002

Please call External Relations at the School of Engineering at 213/740-2502 for more information about these and additional future events. This list does not include all events scheduled.

Commencement
May 10, 2002
Main Ceremony at 9:00 am Alumni Park
School of Engineering Ceremonies Engineering Quad
Undergraduate at 10:30 am
Graduate at 2:30 pm
Receptions will immediately follow the ceremonies
Honoring new graduates and their families

USC Wrigley Marine Science Center Open House on Catalina Island
July 27, 2002 and **August 10, 2002**
Noon – 8:00 pm
This event is sponsored by the USC Associates. For more information, contact the Associates Office at 213/740-8722, or the Wrigley Institute at 213/740-6780. Space is limited.

USC Engineering On-the-Road Series: Tech Transfer Workshop
August 2002
San Diego Area, Location and Time TBA
This Saturday workshop will feature presentations and discussions about Tech Transfer led by a panel of esteemed USC faculty, alumni and corporate leaders in the region. Opportunities for networking and information sharing.

Reception with the Dean
September 2002
Seattle Area, Location and Time TBA

Trojan Family Day
October 12, 2002
USC vs. Cal/Berkeley, Time TBA
Parent and student picnic to take place 3 hours prior to kick-off, Engineering Quad, USC

Reception with the Dean
November 8, 2002
San Francisco Area, Location and Time TBA

2002 Board of Councilors Meeting
November 15, 2002
USC Campus, Location and Time TBA

Alumni
news & notes

Summer 2001-Winter 2002

1939

Robert E. Sellers (BSCHE '39) and wife Carol Osterlund have written the book *Arrival Time – A Journal of Love* for Fithian Press. The book is hailed as "proof that romantic love is alive and well in the twenty-first century" and illustrates their twelve year courtship through letters, poems, and phone calls.

1948

Donald Cummings (BSEE '48) and wife Naomi Jackson Cummings (BS '47, MS '54) celebrated their 50th wedding anniversary on July 1, 2000.

Louis Glist (BSME '48) has written a book published by Emerald Ink entitled *China Mailbag-Uncensored.* The book reveals China through his eyes as an American soldier during World War II and through correspondence with his young wife, Lottie. Glist was attached to the Chinese Army as an Ordnance Officer in the Chinese Combat Command and also worked in Shanghai after its recovery from the Japanese.

1960

Karl Kohlhoff (MSCE '60, MPA '69) has joined HDR as National Director of Water Business.

Ralph L. McCormick (MSAE '60) and Helen Hampton Melvin (BSBUS '51) were married.

1962

Albert A. Dorman (MSCE '62) has received the award for Outstanding Lifetime Achievement in Leadership from the American Society of Civil Engineers. He is

Founding Chairman of the Los Angeles-based AECOM Technology Corporation, a global group of architecture and engineering firms.

Andrew J. Viterbi (PhD EE '62) has joined Continuous Computing Corporation's Board of Directors. The company is a leading provider of voice-over packet platform solutions for telecom equipment manufacturers. Dr. Viterbi is the inventor of the Viterbi Algorithm and Co-Founder of Linkabit Corporation as well as Co-Founder and retired Vice-Chairman of Qualcomm. He is presently involved in venture capital investing through the Viterbi Group.

1963

Scott Manatt (BSME '63, MSME '68) has been elected as a corresponding member of the International Academy of Astronautics and serves in its life sciences division.

1967

Wesley G. Bradford (MSEE '67) is a member of the clinical faculty in family medicine at Harbor-UCLA Medical Center and is Vice President for Business Development of Meridian Holdings, Inc. and Medical Director of Capnet IPA Network.

1969

Kenneth C. Dahlberg (MSEE '69) has been named Executive Vice President for General Dynamics' Information Systems and Technology Group.

1970

Norman Schneidewind (MSORE '70) of the Naval Postgraduate School, received

the Institute of Electrical and Electronic Engineers "Reliability Engineer of the Year" Award on January 26, 2002. *(See article on page 11)*

1971

David Crain (MSMASC '71, PhD MASC '76) has been named Vice President of Marketing for Radiant Technology Corp. He is also an Adjunct Professor of Business Strategy at both Pepperdine University and USC.

Peter L. McAdam (MSEE '71, PhD ENGR '74) has joined Peregrine Semiconductor Corporation as Vice President of Corporate Development.

1972

Harvey R. Gobas (BSCE '72, MSENVE '75) has accepted a position with Brown and Caldwell as Director of Water Resources in Southern California. Brown and Caldwell designs and executes environmental solutions for public, government, and private industries.

1973

Roger A. Fontes (MSCE '73) is a spokesperson for the California Power Network, a statewide coalition of publicly owned electrical utilities. He is also Assistant General Manager of Northern California Power Agency.

William R. Lee (BSME '73) has been sworn in for a 14 year term as the bankruptcy judge in the Ninth Circuit Court, Court of Appeals, in Fresno, CA. This Court is one of the top five busiest bankruptcy divisions in the nation.

1974

Clemente Teng (BSEE '74) has joined KB Home as Director of Investor Relations.

1975

Joseph L. Ardini (MSEE '75) has been appointed VP of Strategy and Business Development for NetOctave, Inc.

Dipankar Ganguly (MSEE '75, MSBME '76) has been named Executive VP and CTO of LifeSpex, Inc.

Bruce Kuhse (BSAE '75, MSSM '84) has received his law degree from Florida State University, College of Law and is currently an associate attorney in Tallahassee, Florida with Katz, Kutter, Haigler, Alderman, Bryant & Yon.

Darrell Tamosuinas (BSME '75) announces the formation of Volition Advisory Group LLC. Tamosuinas founded the company with Steve Friswold and Bruce Senske; the three will serve as managing directors for the company specializing in small to mid-sized companies with financial and operational difficulties.

1976

Wayne A. Beninger (BSPTE '76) of Foremost Operating, LLC has been chosen as the Operations Consultant for Warrior Resources, Inc.

1978

Heidrun Mumper-Drumm (MSENVE '78) is owner and proprietor of Perrin & Kabel Design & Publishing, which recently published *Manners-in-a-Minute* co-authored by Pamela Hillings Tegtmeyer (BA '83) and Phyllis Hillings (BA '47). Drumm is also an instructor at the Art Center College of Design in Pasadena, CA.

1979

Kenneth R. Richardson (MSSM '79) is the manager of Technical Publications for Resource Consultants Inc.

Carey W. Terasaki (BSAPMA '79) is the new Assistant Chief Counsel for the Federal Aviation Administration in its Europe, Africa, and Middle East area office in Brussels, Belgium.

Mark T. Thatcher (MSME '79) is the new President and CEO for ABB Vetco Gray, Inc., which specializes in drilling and production equipment for the petroleum industry.

YoungAlumni**profile**

Timur Taluy, BSEE '98

Less than three years after visiting the USC campus as a high school sophomore, Timur Taluy was a Trojan studying electrical engineering. "I remember returning home and telling my family I had made the decision to attend USC, and I was only a sophomore in high school at the time," Timur told *USC Engineer*.

Not content to simply earn high marks during his time at USC, Timur's approach to campus life mixed scholarship with organized social activities and entrepreneurial pursuits. "I like the way my experience at USC blended learning, social growth, and a wonderful network of people who have remained important to me," Timur said.

In 1995 he became a dot.com entrepreneur, creating a business out of his campus apartment. Building from the platform of his father's well-established tax preparation and financial planning firm, Timur launched FileYourTaxes.com, one of the first successful online tax preparation companies.

Timur assumed an active role in the Student Senate, Engineering Student Council, and the Order of Omega leadership society. As a sophomore he was selected for the leadership class taught by President Steven B. Sample and Dr. Warren Bennis. During his senior year, Timur worked for Louise Yates' Engineering Student Affairs Office as a student tutor, offering free mentoring to engineering students.

Upon graduation in 1998, IBM hired Timur as a circuit designer for its Power 4 line of processors. Shortly after moving to IBM's Austin, Texas, facility, he founded the USC Central Texas Alumni Association, which aids USC recruiting efforts and throws send-off parties for Texans heading for Troy. Timur also served as IBM's Technical Leader for Campus Recruiting at USC, visiting the campus often to help graduating seniors and grad students find opportunities within IBM.

Two years after moving to Austin, Timur's father asked him to come home to Oxnard. FileYourTaxes.com had grown considerably and survived the dot.com implosion, but Timur's father needed his help. "Business is going well now," Timur said, "with significant growth over last year. We have also introduced some new services that are taking a strong hold in the tax filing community."

After resettling in Oxnard, Timur joined the USC Associates. and became a member of the Dean's Circle within the School of Engineering.

As a member of the Dean's Circle and the USC Associates, Timur encourages young alumni to interact with the University by supporting regional recruiting events and speaking in high school classes. He is currently working with the Dean's Circle on a new young alumni membership drive in Ventura, and is growing more deeply involved with the Ventura and Santa Barbara Alumni Club. "The football games and pre-game events are as always a blast, a place where I can make new friends and run into old ones."

In a move that weds his two greatest passions in life, Timur hopes to establish a program at FileYourTaxes.com that triggers a donation to the School whenever any USC alumni, students, faculty, staff, or associated person does business with him. "This year, we have even begun working with my associates from USC in a range of marketing ventures. Being involved with other USC alumni benefits the business and myself through its wealth of experience and connections," Timur said.

As always, his new life in Oxnard perfectly blends his desire to achieve with a sense of fraternity, civic duty, family ties, and devotion to his alma mater.

1980

David K. Grant (BSCSCI '80) is presently at Sumter County Youth Development Center in Georgia. In addition to teaching, he has released an album entitled *Songs from the Big House* and an educational journal, the *Parable of the Sower*. He and wife Sharon announce the birth of future Trojan, Karol Dietrich.

1981

Edmund Aramayo (BSEE '81) works for a well-known technology company. He and his wife, Lisa Marie, have two children, Edmund Alexander, 3, and Andrew Javier, 1.

Mark Stevens (BSEE '81, MSCENG '84) and wife, Mary, announce the birth of their daughter Samantha Noel, born on December 16, 2001.

Cyril Eze Wanorue (MSPTE '81) is happily married with four children, three boys and one girl.

1982

Karen M. Lade (BSCHE '82) has joined Pharmacia & Upjohn Animal Health as e-business Director. Pharmacia & Upjohn develops products designed to promote the health of pets and livestock.

Michael D. Mount (BSME '82) joined R. J. Rudden Associates, Inc. as a Managing Consultant in July 2001.

Keith Nobuhara (BSCHE '82) and wife Mary Ellen request a Trojan Welcome for their new son Dylan Koji.

Edmond Sardariani (BSEE '82) has received his MS degree in Engineering from San Jose State University.

Susan L. Sloan (BSME '82) has been appointed Director of Integrated Satellite Factory Operations for the Boeing Satellite Systems Inc. She also received a nomination from the Society of Women Engineers for Woman Engineer of the Year.

1983

Megan Eskey (BSME '83, MSCSCI '87) has directed *After the Apocalypse: Burning Man*, a short film that was screened at the New York International Film Festival and the Los Angeles Video Festival.

Vincent R. Kagawan (BSPTE '83, MSPTE '86) has married Lisa H. Wallace (BSACCT '88).

Roy Myose (BSAE '83, PhD AE '91) was honored as a Fullbright Scholar to the University of Limerick in Ireland last spring and summer. Presently, he is an Associate Professor of Aerospace Engineering at Wichita State University.

Douglas A. Thiessen (BSCE '83) has been named Chief Harbor Engineer for the Port of Long Beach. His new responsibilities include overseeing all port engineering and construction projects.

1984

Pravin Kumar (MSIE '84) has been promoted to Principal Consultant for Pricewaterhouse Coopers in Atlanta, GA.

Daniel J. Neimann, Senior Vice President, Trammell Crow Company, is an alumnus and a member of the School's Board of Councilors, and is the executive in charge of "2000 Avenue of the Stars", an exciting new mixed-use project in Century City, that will replace the existing ABC Entertainment Center. The project is approximately 1 million square feet of office and retail space, which combined with the Century Plaza Towers, is a 3.2 million square foot asset. The existing plaza will be removed and replaced with an expansive 4 acre park-type open space. The project is currently the largest commercial real estate building project in Southern California. Neimann's responsibilities include oversight of the planning, design, entitlements, financing, leasing and construction of the project. He was named a real estate pro to watch in the January 1, 2002 edition of the *Los Angeles Times* Real Estate section. Planned completion for the project is the first quarter 2005. Neimann (left) is pictured here with Andrew Cohen of Gensler.

Carl Sarrazolla (BSEE '84) and wife Gretchen have founded Tivera Consulting, Inc., a new information services and consulting company. They reside in Carlsbad, CA with their two sons, Nathaniel and Damien.

1985

Erwin C. Hudson (BSEE '85) has been promoted to President of WildBlue Communications Inc.

John W. Mulligan (BSBME '85) and wife Michele announce the birth of future Trojan, Connor Patrick.

James K. Shiba (MSCE '85) and wife Judi request a Trojan Welcome for new son Jonathan Kunio.

Kevin J. Woods (BSEE '85) has been promoted to VP of Product Marketing at TollBridge Technologies, a provider of voice-over-broadband solutions to the new generation of carriers.

1986

Steven Nakagawa (BSME '86) married Jennifer A. Rische.

Donald L. Thoma (MSAE '86) has been appointed VP of Data Business Development for Iridium Satellite, LLC.

1987

William Abboud (MSEE '87) has been named VP of Engineering for Denver-based Fischer Imaging Corp.

Simon Cao (MAPHYS '85, MSEE '87, PhD EE '90) and wife, Whitney Lu, announce the birth of their daughter, Anica, born on January 27, 2002.

Jason Kuo-Chaw Chen (MSENE '87, PhD ENV '92) has joined the Viquity Corp. as VP of Engineering. Viquity is a leader in the development and management of e-business networks.

David C. Flattum (BSEE '87) has been named Head of United States Corporate Services and United States General Counsel for Allianz Asset Management.

Ramiro Garnica (BSCHE '87) has been appointed VP and Wealth Management Consultant for Sanwa Bank California in the San Diego region.

Kirt E. Maxwell (MSSM '87) has received his MS degree in Mechanical Engineering from San Jose State University.

Dietmar Ostermann (MSISE '87) has been promoted to CEO of A.T. Kearney Europe, a global management consulting firm.

Parsa Rohani (BSEE '87) has been named VP of Marketing and Strategic Planning for Procom, Inc., a manufacturer of data storage and access appliances.

Gary Vonderlinden (BSAE '87) is currently with Lockheed Martin Corp. managing systems engineering analysis on the THAAD Missile Defense.

1988

Wanda M. Austin (PhD ISE '88) has been named Senior VP of Engineering and Technology at the Aerospace Corp.

Donald E. Townswick (BSME '88) and wife Sarah celebrate the birth of daughter, Charlotte Margaret Elise.

1989

Heather Cruz (BSISE '89) is currently living in New York City. After receiving an MBA and a JD from New York University, she is practicing corporate law at Skadden, Arps, Slate, Meagher & Flom LLP.

Ashok Kumar (MSCENG '89) is the Senior VP of Engineering and CTO for enterprise performance management leader, Again Technologies, Inc.

1990

Shannon S. (Davis) Clark (BSAE '90) is currently a test director for the Boeing Company on board the F-22 Flying Testbed, a highly modified Boeing 757 used to test F-22 avionics and sensors prior to customer delivery. In addition, she and husband Alfred announce the birth of daughter, Emily Michelle, born April 3, 2001.

Ronald R. Dull (MSEE '90) has joined Cincinnati-based tech company Bluespring Software as VP of Solutions Delivery.

Gary Flack (BSEE '90) and his wife happily announce the birth of their son, Kevin Richard Flack, on October 6, 2001.

Ahmet Cevdet Gokcek (BSEE '90) has received an MS degree in Electrical Engineering from San Jose State University.

Ki S. Kim (BSCSCI '90) joined PricewaterhouseCoopers Management Consulting as a principal consultant. Additionally, the Kims announce the birth of son and future Trojan, Ethan Sun-Woo.

Janine Nghiem (BSEE '90) and husband **Michael B. Diamond** (MSME '91) announce the birth of Trojan daughter, Rachel Ariel Diamond.

Jack S. Thomas (BSISE '90) and wife Heather Krishine announce the birth of daughter of Troy, Jessica Arielle.

1991

Eric A. Anderson (MSCHE '91) has been promoted to VP of the Bender Corp. Inc., an engineering consulting firm and member of the Badische Stahl Engineering Group in Beverly Hills, CA.

Stanley M. Jaskot (MSCHE '91) married Barbara Ann Fourcade at St. Catherine of Siena Church in Metairie, LA on November 25, 2000.

Greg Mendolia (MSEE '91) has joined e-tenna Corporation, a Titan Subsidiary, as an Executive VP.

Tarique Mustafa (MSMFE '91) spoke at Wireless Internet UCLA on November 9, 2001. He is CEO of Network Utilities Inc.

and an acknowledged expert in the areas of large-scale databases, artificial intelligence, and large-scale software architecture.

Min Yang (PhD CHE '91) has been running Plymath, SAT Prep. & College Consultation, for the last 10 years. Polymath has served more than 5000 students so far in Los Angeles, South Bay, and La Crescenta/La Canada areas of California.

1992

Hugo A. Bernardo (MSEE '92) and wife Lilia welcomed daughter Sophia Lily on March 29, 2001.

Mark Klezig (BSISE '92) has 2 kids, a new house, and recently left a small consulting firm in favor of a large radar system manufacturer.

Scott T. Toborg (PhD CENG '92) has been appointed CIO for 360networks, an international provider of broadband network services in Seattle, WA.

1993

Eric Busbey (BSEE '93) was married on September 8, 2001.

Jay S. Chang (MSORE '93) has been named Senior VP of Providian Financial.

Joyce (Cushman) Freymiller (BSBMME '93) was married on September 1, 2001. She works as a mechanical engineer in Albuquerque.

Thomas E. Vice (BSAE '93) has been promoted by the Northrop Grumman Corp. to VP of Material.

1994

Victor E. Alvarez (BSAE '94, MSSAE '99) married Shannon L. Dolan at St. Peter's Catholic Church in Lancaster, PA on November 11, 2000. The couple resides in Redondo Beach, CA.

Andrea L. Amram (MSSAE '94) has been named Principal Director of the Architecture and Design subdivision of the Systems Engineering Division at Aerospace Corp.

Michael E. Dunlop (BSCHEE '94) was commissioned by the United States Air Force as a Bio-Environmental Engineering Officer on May 2, 2000. He is stationed at Kirtland Air Force Base in Albuquerque, NM with his wife, Kendall R. Semays.

Ian M. Overholt (BSEE '94) married Gina Macias in September 2000.

Mark A. Ruzon (BSCSCI '94) has received his PhD in Computer Science from Stanford University and is presently working with Quindi Corp. in Palo Alto, CA. In addition, he and wife Lesley (Vuillemenot) (BA '96) announce the birth of Trojan daughter, Samantha Marie.

Walter A. Tackett (PhD CENG '94) was the featured speaker at the BOT 2001 East Conference in Boston in June 2001. Dr. Tackett is the CEO and founder of NativeMinds, Inc., a leading provider of software and service, creating automated natural-language customer service software.

1995

David S. Atteberry (BSBME '95) graduated from the University of Pittsburg School of Medicine and has begun his residency at the University of Pittsburg Medical Center in neurological surgery. He also announces his marriage to Carla Spagnoletti.

Kyle T. Fujikawa (BSEE '95, MSCENG '00) and Jennifer K. Kawakami (BARCH '96) were married.

Miriam (Dixon) McKenna (BSCE '95) has been named Project Manager for Berryman & Henigar. She was also a team member in the California State, ASCE award-winning Urban Water Run-Off Diversion and Penaquitos projects.

1996

Brian D. Anderson (BSCECS '96) and Jennifer Ott (BACAAS '96) were married.

Mark Chechelnitsky (MSCSCI '96) has been named VP and CTO of iVideoNow, Inc., a supplier of Internet video solutions.

Francisco A. Rubio-Campos (MSEE '96) has joined the Los Angeles office of Sonnenschein Nath & Rosenthal Attorneys. Rubio-Campos is specializing in intellectual property and technology, as well as patents, trademarks, licensing, portfolio management and strategy.

Scott Shultz (BSME '96) and Vivian Quon (BABRJO '96) were married.

1997

Jay Scott Goldstein (PhD EE '97) became a Fellow of the Institute of Electrical and Electronics Engineers on December 4, 2000. He is presently an Assistant VP at Science Applications International Corp. Goldstein also

announces the birth of his son, Jayson Daniel, born on October 17, 2000.

Omar A. Siddiqui (MSENVE '97) has graduated with a JD degree from Loyola Law School and passed the California bar exam.

1998

David Escandon (BSEE '98) is the proud owner of a new townhouse in the beautiful city of Thousand Oaks.

Armando Santana (BSCECS '98) and his wife Nora celebrate a birth of their first daughter Alexandria Grace. He has recently been promoted to technical staff at Walt Disney Imagineering Research and Development, Inc.

Sean P. Shelvin (BSBMME '98) has received his Master's of Education degree at USC. He is presently teaching high school algebra and geometry and coaching the girls waterpolo and swim teams at Valencia High School.

1999

Manoj Asnani (MSCSCI '99) was married.

Hyuk Man Kwon (BSISE '99) has been promoted to Director of Planning & Managing at Sung Bo Development Co., Ltd. located in Seoul, Korea. He also celebrates the birth of his new baby.

Jonathan A. Leitner (MSEE '99) is currently working with Conexant Systems in the wireless communications division as an Applications Engineer.

Roy Nwaisser (MSCSCI '99) attended more than 100 consecutive USC home and road football games. He started his streak during his junior year as a Trojan.

Mike T. Repede (BSEE '99) has been promoted to Staff Engineer at IBM's eServer Engineering Software group.

2000

Matthew Denio (BSME '00) joined Teradyne, Inc. as a manufacturing engineer. Teradyne manufactures test equipment for electronics, communications, and software industries.

Chiram Littleton (MSCSSE '00) has been hired as a software engineer for Mixed Signals Technologies, a pioneer in interactive television technology.

Philip Ruder (BSCECS '00) is pursuing his MS in Computer Science at USC. He is expected to graduate in May 2002.

2001

Hui-Fen Chen (MSISE '01) and **Chun-Wei Chang** (MSEE '00) were married.

Board of Councilors News

N.R. Narayana Murthy, chairman of Infosys Technologies, made headlines around the globe this year, snatching top honors like "Emerging Markets CEO of the Year Award" and "IT Man of the Year."

Business Week chose him as one of "The Stars of Asia" for three consecutive years and *Asiaweek* selected him for its "Power-50," a distinguished group of Asia's most powerful people. He also received the "JRD Tata Corporate Leadership Award for 1996-1997." Today, Murthy is a member of the National Information Technology Task Force of India, a member of the Prime Minister's Council on Trade and Industry, as well as a member of the USC School of Engineering's Board of Councilors. He also symbolizes the power of Indian IT and its role in the global phenomenon as Infosys heralds the era of the New Economy in the country.

This edition of class notes represents updates received between January 2001 and March 2002.

Please keep us informed of your personal and professional progress, as well as changes in your contact information by visiting **www.usc.edu/engineering** and clicking on alumni. Or by writing to the Alumni Relations Office at the USC School of Engineering, Olin Hall 300, Los Angeles, California 90089-1454

Recent Gifts
to The USC School of Engineering

There are numerous ways to support the School of Engineering. We are pleased to share a selection of recent gifts that demonstrate the variety of ways to support the School.* From gifts of stock and securities, to planned giving opportunities, to outright contributions, our departments, programs, faculty and students can benefit greatly from your philanthropy.

Please call External Relations at the School of Engineering at 213/740-2502, to discuss the wide-range of giving options.

ARCS Foundation – $180,960 *In support of graduate and undergraduate student scholarships*

The ARCS (Achievement Rewards for College Students) Foundation Scholarships will provide vital assistance to students in Biomedical/Biochemical Engineering, Civil Engineering, Industrial and Systems Engineering, Chemical Engineering, Electrical Engineering, Mechanical Engineering, and Environmental Engineering.

Philip R. MacDonald (BSCE '70, MBA '72) – $20,000 *In support of a $100,000 pledge to the Engineering Academic Center*

The new Engineering Academic Center will house state-of-art teaching and research laboratories, and provide much needed space for innovative educational advances.

Gloria Lee Wilson (BSEE '64, MS '66) – $5,000 *In support of the Engineering Annual Fund*

The Engineering Annual Fund supports the School's most critical needs, including emergency scholarship supplements, vital curriculum development, and technological enhancements.

Scott R. Shoults (BSEE '88) – $1.8 million *A charitable remainder trust in general support of the School of Engineering*

A charitable remainder trust at USC is an excellent option for individuals wishing to preserve asset values and make thoughtful allocation arrangements for long-term charitable goals, including those involving children, grand-children and other loved ones.

Emrick A. Webb (BSISE '50) – $100,000 *A gift annuity in general support of the School of Engineering*

Gift annuities at USC enable individuals to contribute to the growth and success of the university while taking advantage of guaranteed income important in the current market climate.

Peter Willcox (BSME '65, MSME '71, PhD ENGR '74) – $25,000 *Including a matching ITT Industries gift in support of the Posch Biomedical Engineering Endowed Fellowship in honor of Peter's wife, Nancy Willcox, mother of Theodore "Ted" Posch Jr.*

Established in 1996 to honor Ted's father, Theodore Eugene Posch (BAPSYC '65, MSEE '70), the Posch Fellowship is awarded to a top PhD candidate in the Department of Biomedical Engineering who intends to pursue research in the field of Neural Engineering.

*The above list is not a comprehensive record of all gifts received, but rather a sampling of gift options and categories at the USC School of Engineering.

Dean C.L. Max Nikias and Merwyn C. Gill at the October 19 dinner to celebrate Gill's gift to the Center for Composite Materials

Alumnus Merwyn C. Gill Pledges Support for the Center for Composite Materials

A Pasadena industrialist who started a company in his garage 55 years ago has given $7 million to the USC School of Engineering's Center for Composite Materials

Merwyn C. Gill (BSCHE '37), Chairman of the Board of M.C. Gill Corporation in El Monte, California, has pledged $7 million through the M.C. Gill Foundation to endow the Merwyn C. Gill Foundation Composites Center and will provide an additional $250,000 per year for eight years to support operations.

"The world of materials science has advanced tremendously since my early days, and composite materials are an increasingly important aspect of our everyday lives," said Gill. "It is important that the USC School of Engineering play a bigger role in composite materials research and education."

The center was established in 1995 for research and development in composite technology. It continues to collaborate with corporate partners in the Los Angeles area. Composites are used in everything from fishing rods and wall paneling to bullet-proof vests and satellites.

Center director Steven Nutt, holder of the M.C. Gill Chair in Composite Materials, points out that the center harbors more than a dozen projects, involving eight faculty members from six different departments.

In 1945, Gill began making "Wallfab," a washable, laminated, decorative wall covering. It evolved into "Gillfab," a puncture-resistant liner for aircraft cargo compartments. The El Monte company is now the world's largest manufacturer of cargo liners for passenger and freight aircraft.

Gill is a member of the School of Engineering Board of Councilors, a Presidential Associate, a member of Cardinal and Gold, and the USC Norris Auxiliary. He resides in Pasadena with his wife, Hester.

Ensuring an Excellent Future –*Endowment Naming Opportunities*

Gifts to the USC School of Engineering that build the endowment are the foundation of our academic excellence. Endowment naming gifts provide an enduring base that enables the School to achieve more and to continually grow. Daniel J. Epstein recognized the importance of supporting an individual department with a endowed naming gift that will establish two new chairs and considerably increase the department's and the School's endowments. There are numerous other giving opportunities that will have significant impact for the School, and our ability to achieve future success.

Named Departments and Centers

Daniel J. Epstein Department of Industrial and Systems Engineering
Merwyn C. Gill Foundation Composites Center

Academic Department Naming Opportunities

Aerospace and Mechanical Engineering
Biomedical Engineering
Chemical Engineering
Civil and Environmental Engineering
Computer Science
Electrical Engineering- Electrophysics
Electrical Engineering- Systems
Material Sciences

Research Center and Institute Naming Opportunities

(this represents a partial list)
Communications Science Institute
Center for Photonic Technology
Engineering Technology Transfer Center
Information Sciences Institute
Institute for Robotics and Intelligent Systems
Integrated Media Systems Center
Signal and Image Processing Institute

Faculty Chairs in Various Disciplines
Undergraduate and Graduate Student Fellowships
Undergraduate and Graduate Research Fellowships

For more information on endowment naming opportunities to the USC School of Engineering, please contact Holly Preble, Executive Director of Development, at 213/740-2502.

ALUMNI PROFILE ALICE P. GAST

environments and facilities for faculty who want to pursue research and education that cross traditional boundaries. I very much look forward to working with her."

Gast, who joined the Stanford faculty in 1985 after earning her masters in 1981 and PhD in 1984 from Princeton University, is an expert on complex fluids and colloids. Her research explores the frontiers of the chemical physics of colloidal and polymer solutions, polymer absorption, and most recently proteins, using experimental scattering methods and statistical mechanics. She is the co-author of a classic textbook on colloid and surface phenomena. Her achievements have been recognized with an array of honors, including a Camille and Henry Dreyfus Teacher Scholar Award, and the Allan P. Colburn Award of the American Institute of Chemical Engineers. She was elected to the National Academy of Engineering last spring.

On April 26th, the USC School of Engineering will honor Dr. Gast at the 24th Annual Engineering Awards Luncheon in Los Angeles. She will receive the Distinguished Alumni Award in Academia. This year marks the inauguration of the award, which recognizes an alumnus or alumna who has excelled in a leadership role within higher education. Dr. Gast's accomplishments have certainly helped to define this new honor.

ALUMNI PROFILE JAY L. KEAR

alumni and business professionals. Dean C.L. Max Nikias enjoys a close working relationship with Jay. "I enjoy speaking with Jay and getting his advice on decisions we are making for the school." Nikias says, "He truly cares about engineering and has great ideas and talents to share."

Jay echoes these sentiments for himself when talking about his involvement with the School. "I love USC, and I love the School of Engineering. I'm trying to give back of my time and my talents. It's very rewarding and I enjoy it a lot." When asked where he thinks the school is headed, he is truly excited about the future. "I think if we follow Max's vision, USC will become one the top engineering schools in the country and that will position us with some pretty good company!"

In addition to several years of service on the Board of Councilors, Jay also served on the Commercialization Advisory Board. He is also co-chair of the USC Orange County Advisory Council Development Subcommittee. He has been a guest speaker in the Dean's Seminar on Entrepreneurship, a class jointly taught through the Marshall School of Business and the School of Engineering.

While employed by the General Electric Company, Jay found time to attend the Graduate School of Business at the University of Rochester and the University of Southern California. He has co-authored a book on software business startups.

Jay resides in Newport Coast, California with his wife, Lauren. Jay has three grown daughters who also reside in Southern California and are all USC graduates. His plans include his four grandchildren following in the Trojan Family tradition and one day attending USC. Who knows, we may even have another USC engineer or two in the Kear family.

USC School of Engineering Alumni Website

Teaching | Research | Students | Alumni
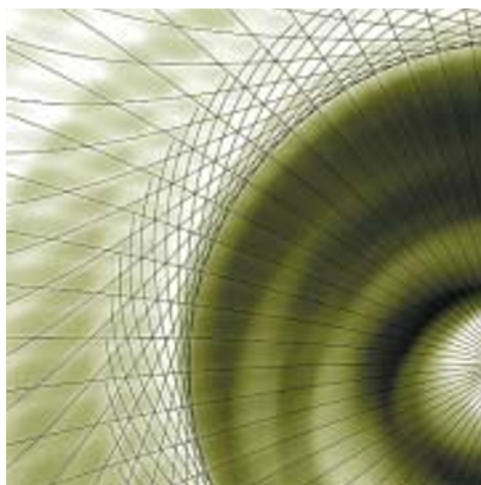
USC SCHOOL OF ENGINEERING

About the School

Dean's Message

News and Events

Administration

Faculty Photos

Facts

Celebrating Excellence in Engineering

USC Engineering News

24th Annual Awards Luncheon…
Full Story

The Integrated Media Systems Center…
Full Story

Leonard Adleman…
Full Story

S E V E R A L   N E W   A N D   I M P R O V E D   F E A T U R E S   A N D   S E R V I C E S   I N C L U D I N G :

- School of Engineering Directory
- Calendar of Events
- Alumni in the News
- Volunteer Opportunities
- Job Board
- Career Mentoring
- Event Photos
- SoE Alumni Clubs
- Reunion Information
- On-Line Giving
- Important Links

The School of Engineering Alumni Relations Office welcomes your suggestions about new services and programs that you would like us to offer through our website. Please email us at uscengineer@usc.edu with your ideas.

USC SCHOOL OF ENGINEERING

**ACADEMIC
SUPPORT SERVICES**

Distance Education Network
213/740-4488
den.usc.edu

Science and Engineering Library
213/740-8507
www.usc.edu/isd/locations/science/sci

**ACADEMIC
DEPARTMENTS**

**Aerospace and Mechanical
Engineering**
213/740-4303 *Aerospace*
213/740-0484 *Mechanical*
ame-www.usc.edu

Biomedical Engineering
213/740-7237
bme.usc.edu

Chemical Engineering
213/740-2225
www.usc.edu/dept/che/index.html

Civil Engineering
213/740-0603
www.usc.edu/dept/civil_eng/dept

Computer Science
213/740-4494
www.cs.usc.edu

**Daniel J. Epstein Department of
Industrial and Systems Engineering**
213/740-4893
www.usc.edu/dept/ise

**Electrical Engineering–
Electrophysics**
213/740-4700
www.usc.edu/dept/ee

Electrical Engineering–Systems
213/740-4446
www.usc.edu/dept/ee

Materials Science
213/740-4339
www.usc.edu/dept/materials_science

**ORGANIZED
RESEARCH UNITS**

Biomedical Simulations Resource
213/740-0342
bmsr.usc.edu

**Center for Advanced Transportation
Technologies**
213/740-4452
www.usc.edu/dept/ee/catt

**Center for Electron Microscopy
and Microanalysis**
213/740-1990
www.usc.edu/dept/CEMMA/cemma.html

Center for Neural Engineering
213/740-7237
www.usc.edu/dept/engineering/CNE

Center for Photonic Technology
213/740-0257
www.usc.edu/dept/engineering/eleceng/
    photonics

**Center for Research on Applied
Signal Processing**
213/740-0877

Center for Software Engineering
213/740-5703
sunset.usc.edu/index.html

Communication Sciences Institute
213/740-4685

**Engineering Technology Transfer
Center**
213/743-2353
www.usc.edu/dept/engineering/TTC

**Foundation for Cross-Connection
Control and Hydraulic Research**
213/740-2032
www.usc.edu/fccchr

Information Sciences Institute
310/822-1511
www.isi.edu

**Institute for Robotics and Intelligent
Systems**
213/740-6428
iris.usc.edu

Integrated Media Systems Center
213/740-0877
imsc.usc.edu

**International Institute for Innovative
Risk Reduction Research on Civil
Infrastructure Systems**
213/740-7840

**Merwyn C. Gill Foundation
Composites Center**
213/740-1634
www.usc.edu/dept/materials_science/ccr

PTTC West Coast Resource Center
213/740-8076

**Signal and Image Processing
Institute**
213/740-4145
sipi.usc.edu

Sustainable Cities Program
213/821-1325

**Western Research Application
Center**
213/743-2788
www.usc.edu/dept/engineering/wesrac

**Western Trade Adjustment
Assistance Center**
213/743-2732
www.usc.edu/dept/engineering/wtaac

Jeff Corwin

www.usc.edu/engineering

USC Engineer
A Journal for Alumni & Friends

SCHOOL OF ENGINEERING
UNIVERSITY OF SOUTHERN CALIFORNIA
OLIN HALL 300
LOS ANGELES, CA 90089-1454