At the Viterbi School, our research sparks great things.

YOUR SUPPORT IGNITES THAT SPARK—ESPECIALLY WITH YOUR COMPANY’S MATCHING GIFT PROGRAM.

Your gift helps fund our pioneering research to cut carbon emissions. Develop green technologies. Spur biomedical advances. We change the world in meaningful ways at the USC Viterbi School of Engineering. Yet we can’t do it without you. Your gift allows us to perform this cutting-edge research, and it’s likely that your employer will match it. More than 1,000 companies sponsor a gift-matching program, so that your donation to USC can be doubled or even tripled in size. All you have to do is ask your human resources office for a matching gift form.

FIND OUT MORE ABOUT THE MATCHING GIFT PROGRAM: 213.821.2730 or Viterbi.giving@usc.edu
The Changing Face of Engineering

Inevitably, therefore, the new phase of engineering is leading to a new face of engineering: naturally, spontaneously, irresponsibly. Today’s engineering is not your father’s engineering—more than ever before it relies on the creation of new intellectual property for challenges and opportunities which are global, and have a strong societal importance.

Consider the NAE Grand Challenges, of which our own Viterbi School has been a strong advocate. Summarized in the four general categories of sustainability, security, health and the joy of living, almost all address societal and global issues. Meeting them will not be only an inspiration for technologies. It will motivate and attract younger generations of innovators, across the human spectrum. Indeed, the new face of engineering is not that of “Dilbert” in the cartoons. It is the face of bright women and men, spanning societal, racial and ethnic divides. Technology has demolished barriers to access; it has empowered society.

And innovation flourishes—it empowers engineering when diverse ideas and disruptive concepts spring from a wide spectrum of talented hearts and minds. In this view, therefore, diversity is not a political slogan, it is an essential ingredient. The chain of innovation, from seeding new research in disruptive technologies, to creation of start-ups, to the development and mentoring of the talent needed, must be continuous, dynamic and well-oiled.

I have good news in this area, at least from my own school. The face of USC engineering is that of very bright and multi-talented kids, more than one-third of whom at undergraduate level are women; more than 15 percent say that with the help of programs such as WiSE (Women in Science and Engineering) at USC, the number of our female faculty has grown by a factor of seven in the last ten years. While the same cannot be said of the national average, which for undergraduate engineering women has hovered around 18 percent, the realization is urgently needed. Indeed, the democratization of knowledge and the distribution of innovation power across the world, society participates in discovery and innovation as never before. I use the simple schematic below to illustrate the point. Setting this circle in motion and cranking it at increasing speeds will most certainly dictate our economic future and our well-being as a nation.

The Viterbi School has been a strong advocate. Through open collaboration, the instant diffusion of information, the wonderful, virtuous feedback loop, we can also claim: society is empowering engineering. Through open collaboration, the instant diffusion of information, the democratization of knowledge and the distribution of innovation power across the world, society participates in discovery and innovation as never before. I use the simple schematic below to illustrate the point. Setting this circle in motion and cranking it at increasing speeds will most certainly dictate our economic future and our well-being as a nation.
Scientists have developed a way to turn memories on and off—literally with a flip of a switch.

Using an electronic system that duplicates the neural signals associated with memory, they managed to replicate the brain function in rats associated with long-term learned behavior, even when the rats had been drugged to forget. “Flip the switch on, and the rats remember. Flip it off, and the rats forget,” said Theodore Berger of the USC Viterbi School of Engineering’s Department of Biomedical Engineering. Berger is the lead author of a recent article in the Journal of Neural Engineering. His team worked with scientists from Wake Forest University in the study, building on recent advances in our understanding of the brain area known as the hippocampus and its role in learning.

In the experiment, the researchers had rats learn a task, pressing one lever rather than another to receive a reward. Using embedded electrical probes, the experimental research team, led by Sam A. Deadwyler of the Wake Forest Department of Physiology and Pharmacology, recorded changes in the rat’s brain activity between the two major internal divisions of the hippocampus, known as subregions CA3 and CA1. During the learning process, the hippocampus converts short-term memory into long-term memory, the researchers prior work has shown.

“No hippocampus,” says Berger, “no long-term memory, but still short-term memory.” CA3 and CA1 interact to create long-term memory, prior research has shown.

In a dramatic demonstration, the experimenters blocked the normal neural interactions between the two areas using pharmacological agents. The previously trained rats then no longer displayed the long-term learned behavior.

“The rats still showed that they knew ‘when you press left first, then press right next time, and vice-versa,’” Berger said. “And they still knew in general to press levers for water, but they could only remember whether they had pressed left or right for 5-10 seconds.” Using a model created by the pros- thetics research team led by Berger, the teams then went further and developed an artificial hippocampal system that could duplicate the pattern of interaction between CA3-CA1 interactions.

Long-term memory capability returned to the pharmacologically blocked rats when the team activated the elec- tronic device programmed to duplicate the memory-encoding function. In addition, the researchers went on to show that if a prosthetic device and its associated electrodes were implanted in animals with a normal, functioning hippocampus, the device could actually strengthen the memory being generated internally in the brain and enhance the memory capability of normal rats.

“These integrated experimental modeling studies show for the first time that with sufficient information about the neural coding of memories, a neural prosthesis capable of real-time identification and manipulation of the encoding process can restore and even enhance cognitive mnemonic processes,” says the paper.

Next steps, according to Berger and Deadwyler, will be attempts to duplicate the rat results in primates (monkeys), with the aim of eventually creating prostheses that might help the human victims of Alzheimer’s disease, stroke or injury recover function.

The paper is entitled “A Cortical Neural Prosthesis for Restoring and Enhancing Memory.” Besides Deadwyler and Berger, the other authors are, from USC, BME Professor Vaithil Z. Marmarelis and Research Assistant Professor Dong Song, and from Wake Forest Associate Professor Robert E. Hampson and Post-Doctoral Fellow Anumadika Gomaratunga.

Berger, who holds the David Packard Chair in Engineering, is the director of the USC Center for Neural Engineering.

USC: Viterbi School of Engineering faculty members Jernej Barbic and Bhaskar Krishnamachari have been named among the world’s top innovators under the age of 35 by Technology Review magazine.

“The publication listed 35 scholars working in energy, medicine, computing, communications, nanotechnology and other emerging fields. In a global list that includes Yahoo!, Microsoft and Google, only USC, Stanford University and IBM have two honorees. The honor previously went to USC faculty members Michelle Pravincelli (2010), Andrea Amirante and Matthew Meng (2009).

Barbic, an assistant professor of computer science, was selected for developing a way for computer simulations to run in real time. Krishnamachari, an associate professor of electrical engineering systems, was selected for his work on algorithms for next-generation wireless networks.

Both professors were chosen by a panel of judges and the editorial staff of the magazine, which evaluated more than 300 nominations.

“Technology innovation is key to driving growth and progress in the areas of research, medicine, business and economics,” said Jason Pontin, editor-in-chief and publisher of Technology Review.

“This year’s group of recipients is driving the next wave of transformative technology and making an impact on the way we live, work and interact. In his computer graphics research at USC, Barbic is tackling interdisciplinary problems in animation, simulation and haptics (the study of sense of touch). His overarching scientific goal is to approximate complex physical systems with simpler, yet principled models, for interactive simulation and control in computer graphics and engineering.” Speedier modeling and control are aimed at enabling more immersive medical training, more entertaining computer games, and faster and more reliable computer-aided design and computer-aided manufacturing.

Krishnamachari’s research focuses on designing algorithms for next-generation wireless networks to improve their efficiency and to enable their use in new applications such as in smart buildings and vehicular networks.

Increasingly, wireless networks form the main fabric of communication that weaves together human interactions with each other and with the environment,” Krishnamachari said. “As a society, we are starting to rely on omnipresent wireless connectivity not only for voice communications and entertain- ment, but also in other settings such as industrial sensing, smart buildings and intelligent vehicles.”

The USC faculty members will discuss their achievements with other honorees at the 2010 Technology Review TR35 Summit on Oct. 18-19. This year’s TR35 winners also will be featured in the September/October issue of Technology Review.

**MIT’s TR35 List: Viterbi Adds Two More Faces**

USC one of only two universities in the world with multiple names among world’s top innovators

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**MORK FAMILY GIVES HISTORIC GIFT OF $110 MILLION TO UNDERGRADUATE SCHOLARSHIPS**

USC has received $110 million—the single largest gift in the university’s history for undergraduate scholarships and one of only seven gifts to USC of $100 million or more — from USC supporters and devoted philanthropists Julie and John Mork (BSME ’70).

“The gift forever changes the educa- tional landscape at USC and will help us attract the most talented and deserving students,” said President C.L. Max Nikias.

The gift to create the USC Mork Family Scholars Program will support undergraduates on full tuition, four-year scholarships with additional $5,000 living stipends per year. This comes five years after the Mork family contributed $75 million to the USC Viterbi School of Engineering that resulted in the naming of the Department of Chemical Engineering and Materials Science after the Mork family.
Two Viterbi Faculty Win MURI Awards

TWO PROFESSORS RECEIVE HIGHLY COMPETITIVE AND SOUGHT-AFTER FIVE-YEAR GRANTS FOR INTERDISCIPLINARY BASIC RESEARCH

Daniel Lidar and Milind Tambe both won Department of Defense Multidisciplinary Research Initiative (MURI) support to lead multi-institutional efforts in their respective fields. USC joined MIT and several other elite institutions in the elite lineup of institutions receiving two MURI awards.

“For the first time, USC has been awarded two grants simultaneously under this very important and prestigious program,” said USC Vice President for Research Randolph Hall. “This attests to our growing success as a major research institution, and the work is supported on game theory and quantum computing will greatly increase our leadership position in these sciences.”

“This award spotlights two important and long-standing achievements within USC Viterbi —our transformational faculty and our interdisciplinary mission,” said Yannis C. Yortsos, dean of USC Viterbi. “Professors Tambe and Lidar epitomize the USC faculty model, and the awarding of the MURIs, with focus across the university and across the nation, is a demonstrative endorsement.”

After discussions with the Department of Defense and analysis of funding awards, the USC Office of Research Advancement was instrumental in identifying and guiding the principal investigators through the application process, Yortsos said, as well as in evaluating the potential of the grants by editors trained in the sciences.

“In this increasingly competitive funding environment, it’s clear that universities need to have a strategic approach to large initiatives such as this one,” said Steven Mollin, executive director of the USC Washington, D.C., Office of Research Advancement.

“That’s the approach we took here, and we are really pleased with our results.”

“We are extremely proud of Professor Tambe for his faculty awards, and we are proud that Viterbi School Vice Dean Dick Marzilli and Tucker have worked on their collaborative, interdisciplinary efforts for some time, bringing relevant faculty investigators together across USC. It is wonderful to see that they have now taken their efforts to the national level, assembling multi-university teams that have each been selected for highly competitive MURI awards. We look forward to their progress on the two innovative research projects.”

MILIND TAMBE

Milind Tambe, a professor in the Department of Computer Science, will direct a six-university initiative building on his successful efforts to make airport operations more secure by making them more unpredictable.

Tambe-led research teams at USC have created an innovative system of recent projects that law enforcement agencies, including the Los Angeles International Airport, the Transportation Security Administration, the Federal Air Marshals and most recently the U.S. Coast Guard now employ. These make it impossible for observers to detect patterns in the activity of the platforms, while still maintaining high standards of coverage.

The focus of the new five-year effort, “Sizable, Stochastic and Spatially Temporal Game Theory for Real World Human Adversarial Behavior,” will try to expand the field through basic research in the relevant areas of game theory.

The key, says Tambe, is robust mathematics that effectively addresses not only threats from rational, cooperating, coordinated adversaries, but also threats from scattered hostile groups of competitive rivals with differing agendas. “In Star Trek parlance,” wrote the scientist, "we are not facing a Vulcian adversary, but instead a Klingon-Romulan horde. " The theoretical attack will be in three areas — first, to build in bounded adversary irrationality, second, to build in adversary multiplicity of motives and means, and third, to spread the application of these first two elements effectively over space and time. Rajeev Maheswaran of the Viterbi School’s Information Sciences Institute will work on the project. USC will segment the three elements and collaborate with five other schools: UCLA, UC Irvine, Stanford, Duke, and C.S.U. Northridge on the project.

DANIEL LIDAR

Daniel Lidar, a professor in the Ming Hsieh Department of Electrical Engineering and the Department of Chemistry, will be the leader of an advanced effort that will include four other U.S. universities attempting to realize the promise of direct quantum control for quantum systems.

Quantum physics research has revealed a rich but little-known early bewildering universe of interactions between subatomic particles in which the rules affect each other's state. In the quantum world, everything is different from the ordinary classical world to which we have access through our senses. For decades, physicists have proposed—and, increasingly, have demonstrated—that quantum systems can process information. Microscopic quantum systems play a role analogous to processors on classical computer chips (each of which holds a single bit, or “yes/no” value). Quantum systems could function more quickly and efficiently than any classical system by exploiting quantum effects such as superposition and entanglement. However, quantum systems are also extremely fragile: the slightest stray interaction could completely derail a quantum control process. The problem, says Lidar, is performing robust quantum control. Numerical physical processes can create or break quantum interactions—but inserting classical intermediaries slows and complicates the system. The ideal is to have the two systems effectively control themselves, with the results of quantum processes feeding directly as quantum signals back into the system: “coherent feedback control.”

This idea has been in circulation for a few years, but the Lidar effort, conducted with seven USC specialists, in addition to faculty at other schools, will make a multi-pronged attack on the problems involving some critical new insights.

One threat will deal directly with theoretical quantum computing issues, trying to ascertain the feedback-ground rules—what theoretically might or definitely would not work for such controls. How can the controls be best fitted to the system that is being controlled? The problem: those theories are hard to demonstrate in the laboratory. “Experiments on quantum control are in general far behind the theory,” says Lidar, “so it would be unrealistic to plan experimental verification of all the theoretical elements on their own within the work’s five year time frame.”

The USC Viterbi School of Engineering has been selected to develop the design software for the F6 satellite.

The F6 is a project of the Defense Advanced Research Projects Agency (DARPA). It is “fractionated”—that is, it is not a single satellite, but a cluster of modules orbiting the earth together. The modules communicate with one another like computers on a network.

The Viterbi School’s Information Sciences Institute (ISI) has partnered with the Lockheed Martin Corporation on a 2½ year, $5 million effort to develop software to guide directions for designs, missions, and components for its revolutionary concept. Gordon Roesler, a center director at ISI, is the principal investigator. He says he is not designing any new satellite, but rather developing a space-based architecture that uses different orbits to keep them useful longer. It was designed on the cover of the magazine Aerospace America in 2006.

“The F6 program will lead to a whole new approach to exploring and using space,” Roesler said. “Our society gets many benefits from satellites today—GPS, HDTV, Google Earth, weather, climate monitoring. Why can’t a satellite have several free-flying modules instead of a single object? It gives more flexibility in how the system is launched into space. It allows you to add functionality any time you want. It lowers costs and makes the system more robust.”

The software that will form the core of the F6 design software uses artificial intelligence to sort through the many choices that designers have to make. Its inventor is Tatiana Kichakova, a computer scientist at ISI. A specialist in automated planning and scheduling, her work is finding numerous applications in the engineering of very complex systems, like F6.

ISI already conducts both R&D and educational programs on space vehicles. In Space Engineering Research Center (SERC), co-located at Viterbi’s Aviation and Space Business, which is entering a new phase of growth and innovation.”
The USC Viterbi School of Engineering, Keck School of Medicine of USC, the USC Stevens Institute for Innovation, and the Los Angeles Basin Clinical Translational Science Institute (CTSI) have been selected to participate in the exclusive Coulter Translational Research Partnership Program.

“Announced by the Wallace H. Coulter Foundation, the prestigious program awards pioneering institutions that are fostering tomorrow’s technology and innovations in biomedical health care. The Coulter Foundation invited the USC Department of Biomedical Engineering (BME) to apply based on its number one ranking in any size market, in any discipline, in any country around the world. The foundation’s broad mandate addresses any disease or condition, suffering from any disease or condition, in any size market, in any discipline, in any country around the world. It also fits well with the university’s vision to complement the university’s vision to foster interdisciplinary and translational research programs. In innovation, the Coulter Foundation augmented the Coulter Foundation augmented $333,000 of contributions from the USC Viterbi School of Engineering, the CTSI, and the USC Stevens Institute for Innovation. The Coulter Foundation will form a working partnership with USC, to promote translational research. The new program will promote increasing the number of effective collaborations between biomedical engineers and clinicians. The Coulter grant targets and fosters promising technologies that will translate into direct clinical application. The ultimate goal of this partnership is to focus on outcomes that will save, extend, and improve patient lives. The foundation’s broad mandate addresses any disease or condition, suffering from any disease or condition, in any size market, in any discipline, in any country around the world.”

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**Interdisciplinary Team Wins Prestigious Coulter Grant**

THE FIVE MILLION DOLLAR PROGRAM WILL DEVELOP BIOMEDICAL ENGINEERED SOLUTIONS THAT WILL SAVE, EXTEND, AND IMPROVE PATIENT LIVES

**Video Game Programs Help Propel USC’s**

#1 Princeton Review Ranking

MIKE ZYDA’S GAMEPIPE LABORATORY COMBINES COMPUTER SCIENCE AND INTERACTIVE MEDIA

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**University**

USC was voted the #1 game design school in North America for its graduate and undergraduate degree programs by the Princeton Review and GamePro Media for 2011. This distinction was jointly awarded to the School of Cinematic Arts’ Interactive Media Division and the Viterbi School of Engineering’s Department of Computer Science.

“In the short span of five years since its inception,” commented Viterbi Dean Yannis C. Yortsos, “the USC GamePipe program has become the national leader in education and professional game development. It is a testament to the program’s quality, its leadership and the interdisciplinary strength at USC, which combines computer science, cinematic arts and fine arts in a unique partnership.”

The Princeton Review list, “Top Schools for Video Game Design Study for 2011,” names institutions in all (15 undergraduate and 15 graduate) for their outstanding game design education programs.

The Princeton Review statistics note that 90 students are currently enrolled in the Viterbi program offering an M.S. in computer science with concentration in game development, including multiple courses in areas such as serious games (games meant to teach, rather than to entertain), cognition and games, game infrastructure, and immersive environments. Viterbi also offers B.S. and Ph.D. degrees in the field. Since submission of the figures, the program has grown: more than 125 undergrads are currently in the Viterbi B.S. in CS/Games degree program, more than 100 are working toward M.S. degrees in CS/Games Development.

The GamePipe program supplement rigorous academic requirements with hands-on opportunities by teams, including team members from other schools. “Game development requires design, artistry and engineering—you saw all of those together and you get USC’s program,” said Michael Zyda, who heads USC’s GamePipe Laboratory. “It’s the joint nature of the program between Cinematic Arts’ Interactive Media Division, GamePipe and the Computer Science Department at the Viterbi that makes it so special.”

GamePipe stages two “Demo Days” per year, at the conclusion of fall and spring semesters, events at which Zyda entertains a capacity audience of representatives from the games industry and talent agencies.

Some 70 representatives from companies including Disney Interactive, Sony, LucasArts, MTV Networks, Electronic Arts, Activision, Nokita Research, Zynga, Intel, Mozilla, Applied Minds, Naughtydog, THQ, iBots, Creative Artists Agency, Blizzard, Zynga, and HappyFun Games were on hand.

“Every seat was filled,” said Zyda, “and we had students sitting in the aisles. I couldn’t be happier with the level of innovation displayed with the student projects, and the amount of positive feedback I received from industry execs.”

For the reps from HappyFun Games, it was a return to the alma mater, the company is a spinoff formed by former USC students. Even non-alums were enthusiastic. “Pretty much every game we’ve seen here has been unique,” industry executive, Giacomo Velti told the Los Angeles Daily News. “We talked to some of the students during the lunch break and exchanged information. If they want to do an internship or, if they’re graduating, apply for a job, they can.”

Demo Day is not the only place that USC games have shone. The 2009 award for “Next Great Mobile Game” went to “Reflection,” built by a group of USC students, now being commercially marketed.

“The joy of a professor,” commented Zyda at the time, “is to see your students start out from nothing and then get to the point where they are actually doing just phenomenally great work.”
China Meets Taiwan in Viterbi’s “No Distance” Classroom

Imagine top students with top faculty—connected around the world under Viterbi’s iPodia technology. Stephen Lu already has

According to a recent Thomson-Reuters study, USC Viterbi’s Mark Family Department of Chemical Engineering and Materials Science ranked seventh among global academic institutions in citation impact in materials science research. The Global Research Report, based on over 11,500 publications from 2001 to 2011, analyzed output, citations, and citation impact of materials science research from countries and institutions around the world. The report reviewed materials science and technology, a core area of research of profound interest in most economies because of its potential contribution to manufacturing processes and innovative products.

Said Steve Nast, M.G. Gill Professor and Chair, Mark Family Department of Chemical Engineering and Materials Science, “The impact factor is the most important metric of scholarship quality, reflecting the recognition of a group’s research in the academic community and the high frequency with which our publications are cited by other groups. USC’s materials science program, while small relative to other schools, has a disproportionate impact on the community because of the high quality of the research produced here. The top ten ranking in impact is achieved because of the consistently high quality of materials research performed at USC.”

**Deep Impact**

REPORT ON MATERIALS SCIENCE PLACES VITERBI AMONG WORLD’S BEST

WE BRING TOGETHER TOP STUDENTS FROM SOME OF THE BEST UNIVERSITIES TO TAKE ON A CUTTING EDGE TOPIC TAUGHT BY THE BEST PROFESSOR IN THE SUBJECT MATTER.

“I have not seen such a burst of pizza. I have not seen such a burst of energy among students. It is borderless ‘no distance education.’ ”

Lu acknowledges that he is merely the first professor in what he hopes will be a long line of world-class professors teaching iPodia-style courses. He envisions a coming era in which the best students from a wider set of universities can be brought together by telepresence with the best professor qualified to teach the class with a new pedagogy.

“We are enthusiastic to expand iPodia next year and hope to include the Korea Advanced Institute of Science and Technology (KAIST), Korea’s finest engineering school, and ‘Einstein’s top engineering school, among a field of other globally renowned universities,” Yortsos noted during his visit to PKU.

“Imagine being at USC, one of the world’s best engineering schools, but also being able to take classes from some of the world’s best professors and learn together with the brightest youngsters at other collaborating iPodia schools worldwide. Then you can grasp the full potential of iPodia and ‘no distance learning,” Lu muses. “This capability is a hallmark of Viterbi’s globalization efforts and will definitely assure our engineering students receive the world-class education we promised them.”

**Rank**  **Institution**  **Impact Score**

1  University of Washington  30.41
2  University of California Santa Barbara  27.41
3  University of California Berkeley  26.58
4  University of Michigan  25.07
5  Harvard University  24.46
6  Massachusetts Institute of Technology  23.61
7  University of Southern California  21.11
8  University of California Los Angeles  19.23
9  Stanford University  18.34
10  University of Minnesota  17.35
11  Max Planck Society, Germany  17.31
12  Georgia Institute of Technology  17.02
13  Northwestern University, USA  16.39
14  Cornell University  16.06
15  University of Michigan  15.70
16  University of Massachusetts  15.62
17  Drexel University  15.53
18  Eindhoven University of Technology  15.29
19  University Pierre & Marie Curie  14.96
20  Rensselaer Polytechnic Institute  14.71

*Based on a Web of Science, 2001-2011 by Thomson Reuters

Professor Stephen Lu calls it “no distance learning.”

“This, of course, despite the fact his 2011 class used the USC Viterbi Distance Education Network’s telepresence capabilities to deliver content to undergraduate students spanning one island, two continents and three globally renowned universities. Lu’s iPodia class taught principle and practice of global innovation to students simultaneously in real-time at three prominent engineering schools to unite disparate learning groups and remove the institutional boundaries between universities and remove the distance that hinders interactive learning among students. It is borderless ‘no distance education.’ ”

Lu was challenging his students from all backgrounds to “learn to view everything from the viewpoint of the customer, not your own preconceived point of view.”

“The concept of iPodia is simple, yet profound,” Lu explained. “We bring together top students from some of the best universities to take on a cutting edge topic taught by the best professor in the subject matter. Using telepresence technology we eliminate for the very first time both political and physical distance. We also get away from the institutional boundaries between universities and remove the distance that hinders interactive learning among students. It is borderless ‘no distance education.’ ”

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Top 10: Ranking of Institutes and Universities for Materials Science Research*
Murali Annavaram of the Ming Hsieh Department of Electrical Engineering (EE) received the USC Stevens Institute’s Innovation Inside Curriculum Award for his new graduate course in energy efficiency and reliability in cloud computing.

Maged Dessouky of the Daniel J. Epstein Department of Industrial and Systems Engineering (ISE) received the Orange County Engineering Council’s Distinguished Engineering Educator Award, for promoting student excellence in industry.

Alex Dimakis of EE received a five-year NSF CAREER Award for research in novel use of network coding for significantly improved reliability and cost of modern distributed cloud storage systems.

Martin Eskitjian of the Sonny Astani Department of Civil and Environmental Engineering (CEE), received the 2011 Charles Martin Duke Lifeline Earthquake Engineering (WTS) has named J. Epstein Department of Industrial and Systems Engineering (ISE) received the 2011 Society of Civil Engineers.

Charles Martin Duke Lifeline Earthquake Engineering (CEE), received the 2011 Department of Civil and Environmental Engineering (AME), was awarded the 2011 Family Department of Chemical Engineering (CHEMS), was awarded a three-year NSF Innovation grant.

Andrea Hodge of the Department of Aerospace and Mechanical Engineering (AME), was awarded a three-year Alexander Humboldt Foundation Research Fellowship. Hodge’s research in nanomaterials will be carried out at the Institute of Nanotechnology at the Karlsruhe Institute of Technology in Germany.

Kai Hwang of EE and CS won the 2011 Founders Award of the International Parallel and Distributed Processing Symposium.

Bhaskar Krishnamachari of EE and CS received the 2010EtaKappaNu Outstanding Young Electrical and Computer Engineer Award.

Jay Kuo of EE and CS was appointed editor-in-chief of the Institute of Electrical and Electronic Engineers Transactions on Information Forensic and Security for 2012-2014.

Terence Langdon of AME was selected to the Austrian Academy of Sciences, was named co-recipient of IEEE’s Donald G. Fink Prize Paper Award, and was selected winner of the James Evans Avant Garde Award of the IEEE Vehicular Technology Society.

Vice Dean and ISE Professor James E. Moore, II, and ISE colleague Maged Dessouky, are both executive board members of METRANS Transportation Center, the USCGal State Long Beach collaborative that was named 2011 Organization of the Year by the California Transportation Foundation.

Donald Paul, executive director of the USC Energy Institute, and research professor of engineering, earth sciences and policy, planning and development, was named winner of the Society of Petroleum Engineer’s 2011 Management and Information Award, a top international honor.

The Vietnam Edication Foundation named Cyrus Shahabi of CS a visiting Faculty Scholar for 2011-2012. Grantees will engage in academic activities in Vietnam, and are considered ambassadors who will “represent with pride” their country and culture.

John Brooks Slaughter of EE and the Rossier School received an honorary doctorate from Howard University, bringing his total of such degrees to nearly 30.

Milind Tambe of CS and ISE won the David Rist Prize of the Military Operations Research Society, his third honor this year. Members of Tambe’s TEAMCORE Research Group and members of USC Viterbi’s National Center for Risk and Economic Analysis of Terrorist Events also received a best paper award for their Game-Theoretic Uncontrollable and Randomly Deployed Security system.

Costas Synolakis, civil engineering professor and director of the USC Tsunami Research Center, has been a vital presence in the media following the natural disasters in Japan and around the globe. He has covered topics in tsunami causes and prediction, tools and improved warning systems, and overall characteristics and impact of tsunamis.

Theodore Tossis was named recipient of the 2011 President’s Award of the Orange County Engineering Council. His efforts have led to many student-driven scientific achievements with industry applications.

Michael S. Waterman of USC Dornsife College and CS, known for his work on the Human Genome Project, received an honorary doctorate from Tel Aviv University.

Internationally acclaimed optics and photonics innovator Alan Willner of EE received the 2011 IEEE Photonics Society’s (IPS) Engineering Achievement Award.

Dean Vannis Vortos was elected an honorary member of the Society of Petroleum Engineers, the highest international acknowledgement of a select group of its members. Vortos was also appointed to a two-year term on the Engineering Deans Council (EDC) Executive Board of the American Association for Engineering Education.
Jannae Fong remembers the first time she saw the castle.

A princess lives there, she said to her self; Fong was only three years then, but she was a fairly good judge of princess castles. She wanted to live in one herself, and Disneyland Park’s “Sleeping Beauty Castle”—all 77 feet of it at the heart of Main Street, U.S.A.—did not disappoint.

Today, the 20-year-old Fong just wants to design the places that enchanted her three-year-old self, except as a Disney Imagineer. Last June, Fong and her fellow USC students, Molly Martens and Joe Rothenberg made a good start in winning the 2011 Disney ImagicAnimations competition with their vision for Disneyland Shangai: “Adventure Is UP There.” Their winning design, a balloon cart ride through the jungles of South America, inspired by the 2009 Disney Pixar smash “Up,” hosted some 500 college students for the $3000 grand prize in Pixar smash “Up”, bested some 500 college students. Fong, a USC senior from the College of Engineering and Computer Science, and her two roommates, seeking to blend Chinese tradition with Pixar fantasy. Martens spent her spring semester abroad in Singapore and drew extensively from conversations with her Chinese roommates, seeking to blend Chinese natural elements—earth, fire, wood, water and metal—with tradition and adventure of “Indiana Jones.” Elements of “Peter Pan” and the experience of a Chinese natural elements—earth, fire, wood, water and metal—opened the design to the audience.

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Adventure Is, Indeed, UP There

TEAM FROM USC WINS $3,000 IN DISNEY DESIGN COMPETITION.

The three seniors—Fong and Martens of Viterbi Aerospace and Mechanical Engineering and Rothenberg of USC’s John C. Hench Division of Animation and Digital Arts—joined forces to create a ride “with the flying elements of ‘Peter Pan’ and the experience and adventure of Indiana Jones.” Macaroni and cheese-flavored brainstorming sessions at Rothenberg’s apartment followed, with Fong and Martens describing the look and technology, and Rothenberg furiously sketching the ideas in real time.

An elephant grayyard ride from “The Lion King” was briefly considered and abandoned. Finally, after a deep video reconnaissance of the Disney library, “l.j” was seized upon as the perfect blend of immersive storytelling—from the perspective of Junior Wildlife Explorer, Russell—and technology—a swirling robotic arm plunges the audiences through canyons and into the mist and foliage of the jungle itself. The ride entils the audience on a rescue mission of one of the film’s popular characters, a flightless bird named “Kevin,” culminating in a lightning-streaked showdown with a zep- pelin and fighter planes.

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An impressive gathering of the Trojan Family last April 5th honored three extraordinary Trojans—Orna Berry, Ronald N. Tutor and Chengyu Fu—at the 33rd Viterbi Awards Banquet.

Hosted by Viterbi School of Engineering dean, Yannis C. Vortes, in the company of his predecessor, USC President C.L. Max Nikias, the group of more than 300 distinguished guests that filled the California Club included senior USC officials and trustees, members of the Viterbi School Board of Councilors and school namesake, Andrew J. Viterbi.

Vortes explained how “since it began in 1978, this occasion has become our signature annual event, our way to celebrate engineering and to honor outstanding engineers.”

The first honor, computer scientist Orna Berry (Ph.D. ’96) stepped onto the stage to receive the Mark A. Stevens Distinguished Alumni Award, named, as Vortes noted, for “a distinguished engineer, entrepreneur, venture capitalist and USC engineering alumnus.”

The awardee brought with her a similar resume, one Yortsos called “astonishing.” Berry has been a maker, investor, advisor, senior executive, educator and for three years, the CEO of Tutor Perini Corporation has offered a shuttle or a taxi to take them to the most fascinating place in the university. “The transformation,” said Tutor, “has been truly remarkable.”

President Nikias presented the evening’s final honor, the Global Leadership in Engineering Award, to China National Offshore Oil Corporation President Chengyu Fu—at the 33rd Viterbi Awards Banquet. Overall, 383 distinguished alumni and guests, including senior USC officials, trustees and school name- sakes Andrew J. Vortes, the California Club last April.

“I am very thankful to the Viterbi School for honoring and inviting me, " said Fu. "With this award the school is honoring all students of international heritage—in this case Chinese, in particular—who have attended USC or are on their way to this world-class institution. I am fortunate to have been a student at USC 27 years ago.”

Tutor, who was also 2010 Walt Disney Man of the Year, said, “This has been a love affair between USC and Ron Tutor for an awful lot of years. I was fortunate enough to work with Dr. (former dean Leonard) Silverman at a time in which we were struggling to get young engineers out of high school and into the university.”

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Guide Vests—Robotic Navigation Aids for the Visually Impaired

USC engineers improving high-tech help for blind and partially blind people long depending on white canes as their only aid in getting around.

by Robert Bradford

For the visually impaired, navigating city streets or neighborhoods has constant challenges. And the reality is that a significant number of such people still must rely on a very rudimentary technology—a simple cane—to help them make their way through a world filled with obstacles.

A group of USC Viterbi School of Engineering researchers is working to change this by developing a robot vision-based mobility aid for the visually impaired. A design first shown a year ago is now being further developed.

For the Viterbi team, the need is clear. According to the World Health Organization, 39 million people worldwide are totally blind and a much larger number, 284 million, are visually impaired. In the United States, according to the American Foundation for the Blind, 109,000 visually impaired people use long white canes to get around. Worldwide, 7.3 million are now using similar aids.

“There are many limitations to canes for the visually impaired, from low hanging branches to large objects,” accord- ing to Gérard Medioni, a professor in the Institute for Robotics and Intelligent Systems at USC Viterbi. “We wanted to build an effective system that would provide new opportunities for the visually impaired.”

Medioni and his colleagues, including James Weiland, a Viterbi School associate professor of biomedical engineering, who is also a professor of ophthalmology at USC’s Doheny Eye Institute, and Vivek Pradeep, a recent Viterbi Ph.D who is now at the Applied Sciences Group of Microsoft, have developed software that “sees” the world and linked it to a system that provides tactile messages to alert users about objects in their paths. Pradeep won the 2010 USC Department of Biomedical Engineering Grosatos Graduate Research Award and a USC Stevens Institute “most inventive” award for his contributions to the project.

The system uses Simultaneous Localization and Mapping (SLAM) software to build three-dimensional maps of the environment and identify a safe path through obstacles. The route information is conveyed to the user through a guide vest that includes four micro motors located on an individual’s shoulder and waist that vibrate like cell phones.

For example, a vibration on the left shoulder indicates a higher object to the left, such as a low-hanging branch, and the individual can in turn use that information to take a new path. Medioni said that canes have clear limitations with larger objects, from walls to concrete structures, and the technology will enable users to avoid falls and injuries.

The USC team tested the system at blind subjects at the Braille Institute. The users “like the system, and they feel it really helps them,” Medioni said.

“We greatly appreciate the cooperation and help of the Institute and the test subjects,” added Weiland.

Medioni is pleased with the prototype of the system presented at the 2010 International IEEE Engineering in Medicine and Biology Society (EMBS) Conference, and more recently, May 1 at the 2011 meeting of Association for Research in Vision and Ophthalmology. But he and the team are now working to improve it. The current head-mounted camera is bulky, and the team is now working on a micro-camera system that could be attached to glasses. The goal is to have a new system in place by the end of 2011, Medioni said.

The National Science Foundation and the U.S. Army funded the research, which will be used to help veterans who have been blinded during their service in the military, along with the W.M. Keck Foundation.

Some fancy glasses—the Vuze WRAP 3D AR—see the world. Eye mounted cameras capture two separate images. The images from the glasses are transmitted to the computer via wireless hub. A computer fuses the two separate images together to create 3D information. A special algorithm—Simultaneous Localization and Mapping (SLAM)—is used to interpret the image, identifying a safe path through potential obstacles. Based on this, the controller (atop the computer) sends a signal to the vest’s wireless receiver. The wireless receiver talks to one of the vest’s four micro-motors (similar to cell phone buzzers), mounted on the shoulders and hips, if a shoulder-mounted motor vibrates—user should sidestep in that direction. If a hip mounted motor vibrates—user should change angle of their direction. If all four motors vibrate, that signals the user to turn around and go somewhere else.

Guiding users through obstacles

1. Eye-mounted cameras capture two separate images.
2. A computer fuses these images together to create 3D information.
3. A special algorithm—Simultaneous Localization and Mapping (SLAM)—interpret the image identifying a safe path through potential obstacles.
4. Based on this, the controller sends a signal to the vest’s wireless receiver.
5. The receiver sends a signal to one of the vest’s four motors.
6. A computer fuses the two separate images together to create 3D information.
7. The images from the glasses are transmitted to the computer via a wireless hub.
This had no success, nor did an alternate attack that assumed that the code used multiple equivalents for the same original text letter, to avoid obvious letter frequency patterns.

The next step was more complex, starting from the hypotheses about the text suggested by his linguist colleague on linguistic structures and shuffles these to groups of words in the two languages virtually without reference to grammatical or linguistic structures and using letter distribution patterns and other clues to seek patterns.

After testing and confirming more hypotheses, followed by close examination of the text by proficient German speakers, a translation emerged. It contained instructions for the initiation of a new apprentice into a secret society, the identity of which will be a challenge for historians, but may emerge with the translation of the balance of the text.

The work, says Knight, began when “I gave a talk on decryp-
tization in Uppsala [Sweden]. A professor there had a copy of this book, which she could never read, which her professor had given her.” The original is now in Uppsala, sent by its German owner, and it was upon this that Knight turned his tools.

Did the situation remind him of a little of “The Da Vinci Code”? “I should read that book,” said Knight, “so I know what to look out for.”

Meanwhile, Knight is continuing his cryptography. With ISI colleague Sujith Ravi he is attacking coded messages sent in the early 1700s. It is meticulously handwritten in a mysterious code, half Latin alphabet letters, half strange abstract symbols.

Knight has decoupled the code’s machine translation, finding in the machine translation of written languages (English-Chinese, English-Arabic, etc.) for decades, and is now also attacking the related but quite distinct problem of decryption.

Modern machine translation relies on purely statistical analysis of “parallel texts,” cross-comparing tremendous volumes of machine-translation data built in digital form online.

Massive computer power finds recurring associations between groups of words in the two languages virtually without reference to grammatical or linguistic structures and shuffles these to create translations.

Decoding involves a very different approach, one that focuses on linguistic structures, essentially bringing computer power to bear on the familiar strategies long used by human codebreakers such as using letter distribution patterns and other clues to seek patterns.

The Copiale code is considerably more sophisticated than a simple one-symbol equals one-letter cryptogram—and the researchers began without knowing what language was coded.

Knight’s first step was to transcribe a machine-readable version of the text, creating standardized digital alphanumeric equivalents for all of the 90 or so different letters and symbols in the text. The next step was entering them by hand on a keyboard. Knight and his linguist colleague arranged their input alphabetically and in the same order as the original.

A USC computer code-breaking system that has deciphered long untranslatable written down centuries ago by a secret society in Germany. The same system is now attacking the San Francisco Zoo’s Zodiac Killer’s message.

Kevin Knight of the USC Viterbi School of Engineering’s Information Sciences Institute is a lead author of a paper on the decoding of “The Copiale Capix.” The code encrypting a 105-page manuscript found in the East Berlin Academy.

This document is labeled “Copiale 3” in plain text, along with a name and date, “Philip 1866,” though a historian who has examined it believes it is much older, from the early 1700s. It is meticulously handwritten in a mysterious code, half Latin alphabet letters, half strange abstract symbols.

Shasta to San Diego County immersed themselves in the study of the decoding of “The Copiale Cipher,” the code encrypting a manuscript with a waiting room full of patients.

Welcome to a Secret Society: The original code (top left), found in a mysterious 105-page manuscript in the East Berlin Academy, was translated by Knight’s team into German and English (above).
THE MANY LIVES OF Engineers

“I have learned that ‘bending it like Beckham’ takes more than understanding the aerodynamics of the soccer ball.”

— YANNIS C. YORTSOS

“I grew up in Colombia—dancing is a birthright, as long as a little baby can move, they learn to dance. Engineering is a very creative job, and anything that lifts you up, energizes you, helps you be more creative for designing and implementing new ideas.”

— ANDREA HODGE

“My very first National Science Foundation grant was in music. I’m simply drawn to both worlds, I still practice every day. These days veena is a mythological instrument. Even Shiva was a veena player. For any pleasant sounding thing, they always say, ‘It sounds like a veena.’”

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— ANDREAS ANAND
“Football has much more of a mental side than people realize. You need to know a lot about how systems work, especially on defense. Think of it as one big system: if one piece fails, someone misses an assignment, the whole system fails.”

Augusto “Goose” Alonso
Linebacker, USC Trojans
Senior, Biomedical Engineering

“In Mexico, we have volcanoes that go well above 17,000 feet. Some of the largest cave systems in the world are also in Mexico. When I was in high school, my friends and I would go into the jungles with lots of rope and food—looking for caves deeper than 3,000 feet. We’d rappel deep into these caves, spending three or four days deep underground.”

Francisco Valero-Cuevas
Professor of Biomedical Engineering
Associate Professor of Biokinesiology and Physical Therapy

“In engineering, you’re always striving for that beautiful, elegant solution. The same aesthetic that makes for a good artist—but particularly a good musician—makes for a good engineer. You must have technical excellence and taste.”

Elaine Chew
Professor, Epstein Department of Industrial and Systems Engineering

“Karl Kesselman”
The new face of engineering is not that of ‘Dilbert’ in the cartoons. It is the face of bright women and men, spanning societal, racial and ethnic divides...

—Dean Yannis C. Yortsos

Editor’s Note: Having scoured archival black and white images from Viterbi’s 107-year history, we wanted to create a sense of visual continuity between the school’s past and present. In this case, it meant re-staging the lighting and angle of the original photos, juxtaposing modern faculty, students and props with their monochrome predecessors.
The WiSE Women of Engineering

DIVERSIFYING THE FACULTY RANKS—AND REAPING THE REWARDS

by Lenora Chu

In today’s global economic competition, American research universities need all the brainpower they can get. In 2000 there were only three women faculty across Viterbi’s eight departments. Today, 10 years after launching a steady campaign to diversify the faculty ranks and continue to draw the best and brightest to USC, the School is reaping the rewards in the form of increased research power and a greater and more diverse faculty.

After nanophotonic expert Michelle Potvliet completed her postdoctoral work in 2008, the tenure-track faculty job offers began rolling in. In all, she received seven offers from top-20-ranked electrical engineering departments at major research universities. She chose USC.

Biophotonics expert Andrea Armani was recruited by five other universities. Nanomechanics specialist Andrea Hodge interviewed at 12 universities and also got multiple offers. Both also decided to become Trojans.

Attracting highly sought after faculty recruits can be as competitive as the NBA draft. The reasons these women chose Southern California are varied, and include everything from research opportunities to family geography to the availability of state-of-the-art lab equipment. But there is a common thread in why USC sealed the deal for them: all three credit the WiSE program at USC and a community outreach effort by Viterbi faculty and staff that included phone calls and a warm welcome mat.

“WiSE factored into my decision to come to USC,” says Armani, citing research fellowships, travel grants and other support available to women faculty through WiSE. “Many of their programs also support many of my personal goals, such as encouraging more female undergraduates to pursue Ph.D.s.”

Hodge says that in visiting a dozen universities she did not find any other school with a similar program for women in engineering. “Throughout the WiSE network,” she found women mentors inside and outside of USC; one of her inspirations today is a world-renowned professor emeritus at Northwestern University, with whom she is working on a publication about nanotwinned copper.

“She always reminds me to be strong, aim high and get my hair done by a good stylist,” Hodge says, with a smile.

It’s been long-known that both industry and academia suffer from a dearth of women in science and engineering. Recalculating the problem has been a driving concern for policymakers and educators, and the momentum to tackle the issue at USC came in 2000 with an anonymous donor’s $20 million gift for the establishment of WiSE, which supports women scientists and engineers.

The WiSE endowment—and its interest income—gave USC the financial means to pursue its goals. Meanwhile, the institutional support of two Viterbi deans over the last decade launched a shift in the culture of the School, and continue to draw the best and brightest to academia such as Ph.D. programs—but not only in traditional pipelines for industry and post-doctorate positions. During his years of helping Kassner and a faculty recruitment team whittled more than 1,000 applications—including a large number of female, Hispanic and African-American candidates—down to a shortlist of finalists. Then the contest began to draw the desired candidates to USC. Securing top recruits is competitive, Kassner says, and the Viterbi School often found itself battling other top universities for candidates. Many of the female candidates had as many, if not more, offers from other leading universities.

Enter WiSE. For the female candidates, Kassner was able to “sweeten the deal” with WiSE-backed initiatives such as start-up lab funds, eligibility for research support and travel grants. Kassner credits his success in recruiting women “in no small part to the aggressiveness of WiSE.” While serving as AME chair from 2003 to 2009, Kassner observed the hiring of several new faculty, including three women.

“Today, a decade after WiSE came to USC, the Viterbi School boasts 21 women in tenured and tenure-track positions—a seven-fold increase.”

When Mike Kassner took the chairmanship of the Viterbi School’s Department of Aerospace and Mechanical Engineering (AME) in 2003, he noticed something “troubling.”

“There were 27 faculty, but no women, no Hispanics, and no African-Americans,” Kassner says. “Which means we’re not including groups that could be a tremendous source of talent.”

With the support of Viterbi administration and funding from WiSE, Kassner set about bringing diversity to the department. It was no small challenge, Kassner noted—only about 10 percent of Ph.D.s awarded in mechanical engineering go to women.

His solution was to focus on expanding the applicant pool by seeking outstanding women in all places—not only in traditional pipelines for industry and post-doctorate positions. During his years of helping Kassner and a faculty recruitment team whittled more than 1,000 applications—including a large number of female, Hispanic and African-American candidates—down to a shortlist of finalists. Then the contest began to draw the desired candidates to USC. Securing top recruits is competitive, Kassner says, and the Viterbi School often found itself battling other top universities for candidates. Many of the female candidates had as many, if not more, offers from other leading universities.

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SPOTLIGHT: Bringing Diversity to AME

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The WiSE Women of Engineering continued...
The Many Faces of USC Viterbi

FROM LEFT TO RIGHT:
Tayeb Ayatollahy Tafti (Ph.D. candidate, Petroleum Engineering) and Minoo Malek (M.S., Petroleum Engineering)—husband and wife
Hometown: Tehran, Iran
“We met during a hiking program at Tochal Mountain, north of Tehran. Our first date was at USC two years later—she was visiting, asked me to introduce her to some of the professors. I fell in love. I proposed two weeks later.”
— Tayeb Ayatollahy Tafti

Maryann Hiller (Ph.D., Industrial Systems Engineering)
Hometown: Atherton, CA
“I’m a fourth generation pilot. For my ISE senior capstone project at Viterbi, I really wanted to be around planes. We worked in FedEx’s aircraft maintenance area at LAX, and it was an eye opening experience. As a systems engineer, they were so antiquated in all their legacy systems.”
— Maryann Hiller

Asma Tameem (M.S., Computer Science)
Hometown: Mumbai, India
“Viterbi has one of the best games programs in the country—it was extremely well suited for what I wanted to do in graphics and animation. I’d like to develop the next Maya or Photoshop. Right now, for example, we’re applying the laws of physics to create better waterfalls.”
— Asma Tameem

Yin-Ray Rick Huang (Ph.D., Signal Processing)
Hometown: Kaoshiung, Taiwan
“When I was in Taiwan, I’d heard that (Professor) Jay Kuo’s research group in signal processing is one of the best in the world. At Viterbi, my interest is getting computers to understand music content automatically. Imagine a computer that could go through all of Jimi Hendrix’s songs, automatically transcribe the way he played and tell you how you made the mistakes.”
— Yin-Ray Rick Huang
Romancing Kids With Robots

VITERBI FINDS INNOVATIVE WAYS TO BUILD THE STEM PIPELINE THROUGH ITS K-12 OUTREACH PROGRAMS

by Alana Klein-Prisco

Louis Gavidia, a recent graduate of the K-12 Foshay Learning Center, one of “USC’s Family of Schools” located in the heart of South Central Los Angeles, discovered his talent for science unexpectedly. During his first week of tenth grade, Gavidia says a “scheduling mix-up” occurred that left him one class shy of a full schedule. When a coveted spot opened up in a robotics class, which was inspired by USC’s nationally-recognized robotics program, Gavidia jumped at the opportunity.

In doing so, he also gained entry into one of the most sought-after, state-funded academic programs, known as MESA (Mathematics, Engineering, Science Achievement). MESA gives students the opportunity to excel in math and science and become eligible to compete for the most rigorous colleges and universities. The Foshay Learning Center represents just one of the 22 MESA schools in Los Angeles (including 14 high schools, seven middle schools and one elementary school), with which USC has partnered.

Gavidia says he never imagined that he would learn how to build life-size robots, compete in robotics competitions and develop such an affinity for science that he would set his sights on becoming an astrophysicist. “Robotics opened so many doors for me. I went into the class a shy and timid student and came out a confident leader,” says Gavidia, who became captain of the FIRST robotics team during his senior year. He led a team of 40 students to win the prestigious Engineering Inspiration award at a regional robotics competition, and also took home an individual award.

But his achievements don’t end there—he is also the first person in his family to attend college. He will attend UC Irvine in the fall and plans on majoring in physics. “My parents always told me they wanted me to succeed, follow my dreams and have a good life,” he says. “I am taking their advice.”

Students Respond to Outreach

Gavidia represents just one of the many MESA program success stories. More than 74 percent of MESA students graduate from high school, compared to 41 percent of the California student population that graduates from high school, according to 2011 statistics from MESA. In addition to increasing graduation rates, MESA is also doing its part to build the pipeline of STEM majors, as 60 percent of MESA students end up majoring in science, technology, engineering or math.

“The stereotypes about science and those who enter the field also come into play. ‘It’s so important to show kids that science doesn’t have to involve sitting in a cubicle or a lab—but that it can be very creative and fun,’” Mataric says. USC has found many ways to break down these perceptions and make science more approachable. The field of robotics, which deals with the design, construction, operation, and application of robots, represents a great entry point to the sciences. “The notion of creating something real from scratch that actually moves and works is very compelling to students,” Mataric says. Last April, Mataric led the second annual national robotics week at USC, which attracted more than 1,000 attendees and featured robot dogs, exercise coaches, humanoids that make eye contact and robots that help treat autism.

The Key to Student Engagement

But even with a sexy subject like robotics, students need great teachers to motivate and inspire them. USC has its fair share of those, such as Dasm Gray, science coordinator for the MESA program who previously worked as an electrical engineer at Hughes Aircraft. “It’s hard to lure engineers out of industry and into education—but for me, teaching has been very rewarding,” Gray says. “I love to build the pipeline of STEM students starts as early as elementary school. “We are targeting students at the middle school level or earlier because that’s when students are still interested in science,” Lim says. By high school, it’s too late, he says. “We find that students lose interest in science, and not because of intimidation, but boredom. Science could be taught in a more exciting way at the high-school level.”

“Robotics opened so many doors for me. I went into the class a shy and timid student and came out a confident leader.”

Supporting the National STEM agenda

These outreach programs not only align with the Viterbi school’s mission, but they also support the national agenda to increase the pipeline of students who go to college and graduate with STEM degrees. Over the past 10 years, growth in STEM jobs was three times greater than that of non-STEM jobs, according to a 2011 report from the Economics and Statistics Administration within the United States Department of Commerce, and STEM jobs are expected to continue to grow at a faster rate than other jobs in the coming decade. Engineering, in particular, has been the subject of much attention from the Obama administration, with the president’s recent initiative aimed at training an additional 10,000 engineers each year. “There’s an increasing realization at the national level that there is a weakness in our educational system in regard of robotics, which deals with the design, construction, operation, and application of robots, represents a great entry point to the sciences. “The notion of creating something real from scratch that actually moves and works is very compelling to students,” Mataric says. Last April, Mataric led the second annual national robotics week at USC, which attracted more than 1,000 attendees and featured robot dogs, exercise coaches, humanoids that make eye contact and robots that help treat autism.

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Empowering Students Through STEM continued…

How to Make 7th Graders Love Viscosity

The National Science Foundation has awarded more than $1.3 million to a team of four USC Viterbi School of Engineering professors who hope to increase interest in science and engineering at the middle school level.

With the federal funding, professor Maja J. Matarić, and associate professors Dr. Krishna S. Nayak, Dr. Andrea M. Hodges and Dr. Gisele Ragusa have started a five-year program called “Body Engineering, Los Angeles” that sends doctoral candidates into local middle schools to teach engineering. Instructors will show students how their bodies work and how that connects to engineering, emphasizing that the human body is a machine to be studied, analyzed and experimented upon.

The creators designed BE-LA to improve the lack of engagement between math and science education and K-12 schools, Nayak said, and simultaneously help the instructors grow as leaders and communicators.

“People who can convey passion about their field, who are enthusiastic about their subject matter—that’s contagious,” Nayak said. “To be in the classroom and have that will create change.”

Starting in January, nine doctoral students will spend 10 hours a week partnered with a middle school science teacher, assisting with teaching and creating three units of their own: one related to their research, one that teaches measurement and data analysis, and a third that encourages students to create a science experiment at home using their own body. For example, testing how levers work by placing varying weights on an arm, then flexing.

“A body is something that everyone has, and everyone relates to,” Nayak said. “We’ve seen in the past that when we talk about the body, students are engaged and interested.”

The human body showcases a range of science topics, Nayak said, from basic ideas like fluid viscosity to more challenging concepts like muscle control, perception, reasoning and planning.

BE-LA has been developed in conjunction with Viterbi’s Engineers as Teachers program and iGEM, a non-profit that fosters children’s curiosity in science, technology and engineering. It is the first USC GK-12 program to offer tuition stipends equivalent to those of fellowships or research assistant grants.

NSF funding, approved in mid-August, takes effect immediately. An estimated 35-40 students will apply for nine spots, which should be filled by the end of October, Nayak said. An external consultant will monitor the program’s progress through a series of surveys, and the 13 Viterbi faculty members on BE-LA’s governing board will also visit the classrooms to observe, Nayak said.

In May, Viterbi will host a public gala to showcase the BE-LA program. At the end of the five-year grant, Viterbi will continue to partially fund the program, Nayak said, in hopes that BE-LA can become permanent.

getting kids excited about math and science and watching them realize that they can be the next Einstein or rocket scientist,” he says, admitting that sometimes the roles do get reversed in the classroom. “They challenge me every time I walk in the room and make improvements to every project I give them.”

Gray says Projects in Gray’s classroom range from homemade microscopes to cotton candy machines and prosthetic arms.

These programs also give students the confidence to apply what they’ve learned in the classroom to other pursuits. Gray recounts the story of an eighth-grade Mission Science student, whose previous teacher had described her as disengaged. Her attitude changed when Gray offered her quite an alluring incentive. Several old computers had been donated to the school and Gray told his class, “If you can make them work, you can have them.” This student made it her mission to figure out how to recycle the old computer parts and make them usable again. Gray says she became so proficient at it that she was able to create a side business of restoring computers. “By her senior year she was going to the penny saver store buying dead computers and bringing them back to life,” Gray says.

In addition to using incentives to motivate students, competition is also another effective tool for student engagement. “The only competition many of these students see is athletic competition. They often don’t have the opportunity to compete in an academic event, let alone win trophies, medals and ribbons for their academic successes,” Lim says. The USC-MESA program offers students the opportunity to compete in several math and science competitions, including the JETS team competition, in which students apply math and science concepts to real-world problems, and the FIRST Robotics competition, in which Gavieda competed, where students and engineers work together to brainstorm, design and construct a robot.

While most universities see a need for this type of outreach to students, “USC is at the cutting edge of these programs,” Lim says. “The instructors involved in the MESA program teach much more than the fundamentals of math and science—they teach students to see their potential, which can be equally as powerful as the academic learning that takes place. “Thirty years ago there were not a lot of outreach programs to interest kids in becoming an engineer. Usually it was the children of engineers who went on to become engineers. But we’re here to change that,” Lim says.
The Only Game in Town

Our ability to continue innovating relies more than ever before on the creation of new engineering, nor is it like 'Dilbert' in the cartoons. It isn’t like you’re just sitting in your cubicle and doing your thing, you might as well be in India. You need the type of people who stand up and look around. We need to teach people it is not good enough just to do your job. It is your responsibility to think about how you can make your whole company more effective.

Through a $1 million gift from entrepreneur Farbod Maszle, MEPC allows Viterbi students to “stand up and look around” with $50,000 worth of seed money for the best business plan. Last year’s winning team, Abtum—a duo of research assistant, Behnam Anahid and Hossein Hashemi, associate professor in the Ming Hsieh Department of Electrical Engineering—were particularly grateful for the mentorship component.

Abtum, “The best part of the entire process was being assigned a mentor (Vacit Arat, chief executive officer of Microfarmal)—we met with him at least once a week. Our business is non-traditional, non-humanitarian; our first version was far less aggressive.”

Michael Zyda, director of Viterbi’s GamePipe laboratory, notes that Vitek’s cross-disciplinary bent is a critical shift from his own days as a graduate computer scientist. “Traditionally, when you learned computer science, your projects were student based. In the game programs now, we run in quite large teams because that’s the way industry works. It’s not atypical in our 492/521 joint game classes that we’ll have engineers in there, designers from cinema, artists, musicians all working together. The team might be 32 students large.”

Zyda’s program is on the vanguard of the Viterbi Department of Computer Science’s evolution from writing theories to building things that compete in a crowded IP marketplace.

“I believe,” said Zyda, “in the modern engineering school, patents are of more value than journal papers. I think our dean recognizes that.”

For his part, Lasch, now executive director of USC’s Mann Institute for Biomedical Engineering, remembers his own evolution. “I was a guy at the bench who made compounds. I was in my little world—I was just trying to push my technology into the marketplace. We can’t return to that place.”

“A real eye opener for Lasch: “The audience was the design team and the students large.”

The conversation that day, 25 years ago, “We don’t really care what you think. We’d like to make a doll that tans,” the Abtums said.

“Either you can make a doll than tans or you want it to tan.”

Things like what a business plan looks like, how do you talk to a customer, how do you determine if your idea is going to sell, how hard is it to go to build, who will be the suppliers, what the adoption curve is, who are your competitors, all these kind of questions. We need to teach the engineers the language. It’s not a clear boundary: the engineer does the engineering and the business guy does the business.”

The ideas (Sampling from 2011 Competition):

• Abtum, Inc. (2011 Winner): Enable the development of low-power, low-cost, wireless low-cost design that is cost-effective, creates, and shares iconic dance moves across real-time social networks.

• Anomaly Robotics: Bring robotics to the home through the Do-It-Yourself community by providing a range of services to cost-effectively provide, rent, and buy robots and kits for the home.

• Fitness-3: Enable real-time quality health informatics for clinical and therapeutic use via an accurate, personalized, and flexible fitness monitoring solution using on-body movement sensors with mobile phones to augment, process and share information via social networks.

• IQ Long International Group, Inc: Deliver a commercialized blind-spot detection system that will detect any vehicle or object moving into the blind spot and warn the driver when there is imminent danger of a side-to-side collision.

WHAT’S NEXT: Build a network of alumni through this program and connect to all students large.

MEPC X Prize combinatorics: Education & Global Development; Energy & Environment; Exploration, and Life Sciences. At the end of the semester, students present their ideas to senior Foundation leaders and members of the X Prize Foundation’s Board of Directors.

FACULTY: Jon Lasch, executive director of USC’s Viterbi Mann Institute for Biomedical Engineering; Gene Miller, director of the Lloyd Greif Center for Entrepreneurial Studies at USC Marshall School of Business.

CHALLENGE IDEAS (SAMPLING FROM 2011 COMPEITION):

• Cleaning Up the Water’s World: Design a self-sustaining unit that can process unclean water and output potable water that meets EPA standards for microorganism and virus reduction and passively outputs 100 mL per minute for a year. The unit should cost $2 per person initially, cost $1 per person per year subsequently, and have a longevity of 4,400, L per person.

• Under the Sea: Build a self-contained submarine vehicle that can sustain 3 humans in the deep sea and roam for 3 months while continuously transmitting data to a surface data center.

• Holophyte: Develop a genetically modified crop taking advantage of high-salt-water resources for the production of biofuel.

WHAT’S NEXT: Visioneering Day 2012—the first X Prize Foundation has partnered with an academic institution to create a 24 hour brainstorming session. With 40 invited student and alumni participants, the USC hosted event on January 27 will flyfully outputs 1 L per minute per person. The unit should cost $2 per person initially, cost $1 per person per year subsequently, and have a longevity of 4,400, L per person.

• Viterbi GamePipe Laboratory

WHAT IT IS: Top ranked video game program in North America, per Game Pro Media and Princeton Review—a joint program between The School of Cinematic Arts and the Viterbi School’s Department of Computer Science.

FACULTY: Mike Zyda, Viterbi computer science professor and director of USC GamePipe Laboratory.

SAMPLE GAMES FROM 2011 DEMO DAY:

The Bridge: Visuals of Star Trek, Kraken, the player to command a stattship entirely with voice control.

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Inside The Corridors of (SCE) Power

AS TOLD TO ADAM SMITH

The first time Alan Fohrer ever worked in an office was at Southern California Edison (SCE). It was 1973. He was a civil engineer coming out of USC. His last day working in an office was also at SCE—37 years later, retiring as chief executive officer.

From working on the San Onofre nuclear power plant as a young engineer to helming SCE in the aftermath of the California energy crisis, Fohrer still maintains: “I am the typical introverted engineer. The former president of SCE once said the only thing you’re comfortable talking to is your shoes.”

Here’s some snapshots from the evolution of an engineer.

FIVE LESSONS: AN ENGINEER TURNED CEO

1. There’s a World Beyond Your Desk. Take It.

Al Guerrero at SCE pushed me to one a year cross-training program in finance. I didn’t want to do it. He didn’t give me a choice—actually, he gave me three choices:
- I could quit.
- I could report to Farmington, New Mexico for a year (the Four Corners Power Plant).
- Or I could go to the treasury department.

Suddenly, finance looked pretty good for a year. His boss, Mike Noel became a good mentor and friend. A number of times along the way, when there was a safe choice and an unsafe choice—Al pushed me to do what was more risky. This led to meeting people like John Bryson, the future chairman of the company and current nominee for U.S. Secretary of Commerce.

2. Your Investment Portfolio: Consider Human.

I’ve had young people come up to SCE, and I’ve talked to them and later on, several years later, they’ll come back and say, “Oh, remember when you said this?” And honestly don’t. But clearly that five minutes had meant an awful lot to them. Taking time for people is probably the most important thing we do.

3. The Higher Up You Go, the Less You Do Yourself.

You get everything done by other people. And how you treat people—that loyalty and commitment you want, it doesn’t come from money. It comes from the fact they feel valued. It isn’t just saying, oh, you’re valuable. Anybody can do that.

What I’d like to do during our management meetings, I wanted to make sure everyone felt like they could challenge me. If someone came into my office to see me, they treated it as if I was doing them a big favor—I tried to let them know what a big favor they were doing by coming in and talking.

3. The Showdown

There were a couple of us that went to see Dr. Kaprielen, the legendary dean of the school, later president. I went to meet with him and caused all kinds of problems... I later learned undergraduates don’t see Dr. Kaprielen. I told him there are problems with undergraduate education, and I’d like to have a meeting. He set up a meeting with me and all the department heads. Later, (the week before graduation) they had a meeting of all the professors in Ohm Hall—my roommate and I came and addressed all the professors on problems in undergraduate education. Clark Howard encouraged us to get involved. He encouraged us to get involved. One of the things we put on the first year we were out of school was career day. It was an offshoot of my senior year when I didn’t think we did enough. As a young engineer just out of school, we organized companies—Disney, Edison, Hughes Aircraft—to come in and spend time addressing freshmen and sophomores. In our view, the school was losing an awful lot of people during their freshman and sophomore years because they had no idea what an engineer did. So we got the companies to come in and set up booths and focus on younger people, as opposed to just graduating people.

If they’re afraid to tell you something, they’ll watch you walk off the plank.


Being a regulated utility, legislators and regulators have a big impact on us. You’ll have people who advocate strongly against your position. And if you take it personally, then you really do make enemies. What you find is that same person, later on, is very much the person you’re in line with. What helped was getting to know them as people. Not just ‘you’re the enemy and I’m over here,’ but actually sitting down with them and getting to know them. That type of civility made a big difference.

5. You’re Not Alone.

I had a young guy, even in recent years, come up and say, “You look like you’re carrying the whole weight of the world on your shoulders.” You’d realize, I’m internalizing things too much. You want to remind yourself to have fun.

Edison went through a near death experience during the 2000 energy crisis. I think the people at the company at the time, they never lost sight of the good things in people. I love teasing and bantering with people. It’s almost like you set the tone for that type of thing’s all right. When everything becomes too serious and people feel on edge all the time, they lose that sense of fun. I had a number of our younger officers that just loved this. They felt free to take a cheap shot that would get everyone laughing. When you set the tone that you can laugh at yourself, then people feel when there’s a real serious issue, they feel they can challenge you.

EDISON:

Edison came from money. It comes from the fact I was a 50—I’d never had a score like that. I had something like 17. I had something like a 50—I’d never had a score like that. I went into see him because I was thinking about dropping the class and changing to business. I was just lost. Now, I’ve never seen anyone that could intimidate 200 people at one time. And when you’re in his office, I remember walking in and I remember walking out and I don’t think I remember anything else. Except for him saying, “And you will do fine, ja?” He had this thick German accent.

On the second test, I got a 90, which was the highest or second highest grade of 200 people. The only thing I could think later was that he terrified you so much that you had to do well. That was such a turning point because I was literally going to drop out of engineering.

2. The Mentor

Towards end of senior year, there was an associate dean at Viterbi who had a profound impact on a lot of us. His name was Clark Howard.

It was the first time somebody said to me, “I want you to be more of a leader, I want you to step up.” That really shaped how I started to see myself after school. Clark, once he got a hold of you, you never really got away.

We’d come to Clark about problems with undergraduate education, and he said, “Well, what are you doing about it?” We’re looking at each other, going, “What do you mean, What are we doing about it?” He encouraged us to get involved.

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Nano-Scale Architect

LYNDE ARCHER (B.S. ’89) REFLECTS ON ALL MANNER OF BONDS, BOTH COVALENT AND TROJAN by Adam Sueli

When African-American students in Lynden Archer’s sophomore fluid mechanics course see him at the head of the class, they often feel “he’s one of us”—an African-American like them who has risen to the head of Cornell’s School of Chemical and Biomolecular Engineering.

However, it took the intervention of USC for Archer to feel like “one of them.” “The beauty of what USC did,” said Archer, “was give me the chance to come to the U.S. and be taken out of context—someone from Guyana (South America) of African descent—and find myself in a whole new context, as an African-American.”

In 1986, Archer received one of the very first international merit scholarships from USC. He said goodbye to his family and took a plane to Los Angeles. He signed up for a degree in chemical engineering from Columbia University.

Archer matched him: he earned a B.S., Chemical Engineering (Polymer Science) from USC in 1989. He did it in three years.

Archer has two children now, a son and daughter, ages 11 and 14, respectively—“the exact ages he was when his father and mother died, prompting the defining ‘emotional and spiritual struggle of my childhood.’” He has the directorship of a prestigious Ivy League engineering program, a $25 million grant from King Abdullah of Saudi Arabia to study the big carbon issues of the region and the world, a start-up company, NOHM Technology, based on his Cornell research, and a garden where he grows “boring things like Japanese eggplants.”

And yet through all of it, he still can’t shake the words of his mother, Joyce Maria Archer, words he heard over and over again as a child: “Anything worth doing is worth doing well.”

Archer once despised hearing those words. Now, he finds himself repeating them to his own children: “If you aspire to be a janitor, aspire to be the very best that ever was.”

Archer does his own aspiring these days in the world of Nanoparticle Ionic Materials (NIMs)—a new material discovered at Cornell. NIMs, a hybrid of organic polymers and inorganic particles, can be shaped and molded in all sorts of remarkable ways. For carbon dioxide, NIMs have the knack of capturing them, bonding with them in a sort of molecular Stockholm Syndrome and re-making them as something useful and benign, so, a polymer that can be re-purposed for the windshield of your car.

In addition to kidnapping greenhouse gases, NIMs have shown promise as materials for solar energy conversion, water desalination, and even greater promise as electrode and electrolyte materials for the creation of high-performance, long life, rechargeable batteries. Needless to say, it wasn’t long before King Abdullah University of Science and Technology (KAUST) came knocking on Archer’s door in the form of a new KAUST-Cornell Center for Energy and Sustainability. As co-director of the KAUST-Cornell Center, Archer coordinates the resources of seven partner universities, focusing on the basic science and applications-oriented research critical to Saudi Arabia and the world.

Archer has never forgotten the merit scholarship from USC that paid his full tuition—to him, it remains one of the important ways of ensuring diversity both in the classroom and in the realm of ideas.

“Every generation we’ve replenished our stock of engineers and scientists by recruiting from the world,” Archer said. “This cycle gets repeated again and again.”

For Archer, that cycle began with one of his early mentors, Viterbi Professor Theodore Tossis, post chair of the Mork Family Department of Chemical Engineering and Materials Science—himself an expatriate of Athens, Greece. “He had a great impact on me,” Archer said. “There was a big focus on acid rain at the time. As an undergraduate, I worked with Theo on a research project aimed at converting a hydrogen chloride waste gas streams into chlorine, a very useful commodity.”

Archer’s excitement these days is increas-ingly turning to rechargeABLE batteries—namely, using NIMs as electrolytes and electrode materials to create new lithium batteries for cell phones, laptops and electric vehicles. His company, NOHM Technology, has ambitious plans—smaller, safer lithium batteries with 10 times the cycling life and storage capacity.

Frankly, Joyce Maria Archer would insist. //

Alumnus Lynden Archer, now co-director of the KAUST-Cornell Center for Energy and Sustainability, leads a seven-university research consortium with Saudi Arabia.

Lynden A. Archer
William C. Mooty Director of Cornell’s School of Chemical and Biomolecular Engineering


Favorite USC professor: Theo Tossis (departing chair, Mork Family Department of Chemical Engineering and Materials Science). I was trained in that department.

Bragging rights: A sense of pride when I look back on where I came from.

Kids (what do they want to be?) My wife is also a chemical engineer. You put two engineers in a household, and you can be pretty sure their kids are not going to want to be engineers! Our kids are very bright and enjoy math and science. When the time comes for decisions about their career, I am certain engineering will feature highly among their choices. My daughter named our company, NOHM Technology (focused on nano-material solutions for higher-energy, long life batteries). Batteries are something they know about and can understand the need for improvement. They play video games and know better batteries are needed to increase play time before recharge. So, in this instance science finds expression in a product that is familiar.

On the nightstand: World Without End by Ken Follett (sequel to The Pillars of the Earth)—I am a big fan of history and of historical fiction.

How do you spend your free hours? I cycle for fun. Ithaca (New York, where Cornell is based) is an excellent locale for cycling. The terrain is wonderful and the scenery idyllic—lots of hills and valleys. I also garden. Very boring stuff, really—Japanese eggplants, spinach, Chinese long beans. I like to grow these vegetables because they are easy to cook, but difficult to grow in the up-state New York climate.

Favorite movie: “The Matrix,” “The Lord of the Rings” and “Segonds of the Fall”

In the next 10 years: I’m a one step at a time person. I usually don’t think in terms of grand plans by decade. I will say the challenge of this decade has been and will be leadership. The next decade will likely be focused on commer-cializing technologies from my research—growing our company—our kids will be in college by that point!

Things I’d save from the fire: Laptop. It contains an unbroken record of everything I have ever worked on.

I wish I’d invented: A NMds gasoline additive that boosts efficiency of the internal combustion engine.

Indispensable web-sites: BBC, Google, MSNBC, Yahoo! Finance. 


Me...Engineered
When Neil Siegel ’74, vice president and chief engineer at Northrop Grumman Information Systems, isn’t inventing groundbreaking military systems, he’s likely reading one of his 10,000 books or playing his favorite Persian instrument, the ney and tār. The Brooklyn-born, L.A.-raised award-winning scientist and engineer, who added a Ph.D. from USC to his long list of accomplishments last March after being designated as a fellow in arts and sciences divide, proving that creativity is an integral part of discovery. Simply put, “Like to create art,” Siegel says. “I find the creative process very satisfying because it combines technical skills and art, which explains why I have been a musician my whole life and why I chose the field of systems engineering.”

As the son of an electrical engineer (his mother, USC ’57 and ’62) and a chemical engineer (his father), Siegel was destined to follow suit. He majored in mathematics as an undergraduate at USC, and then earned a master’s degree in the field two years later. “Math was not very popular in those days. It was very rigorous, but I liked it,” he says. He then took a job at TRW, which was later bought by Northrop Grumman, as a computer programmer. He continued a career in computer programming for another few years, but increasingly felt a pull toward systems engineering. “I fell in love with it. I found it so interesting and foundational,” he says. From then on, systems engineering became his focus and passion. As a systems engineer, he invented several successful military and intelligence systems, including the Blue-Force Tracking system, a GPN-enabled system that has also found its way into consumer products, the Forward-Area Air Defense systems, and the Army’s first unmanned aerial vehicle, among many others. One work assignment took Siegel and his wife, who is also an accomplished singer and dancer, to the Bristol region of England, where he worked for the British Ministry of Defense. “I had always dreamed of living overseas,” he says. Opting for an adventure, he and his wife chose to live in the village of Castle Combe, with a population of 100, in North Wiltshire, England. For such a prolific inventor of military programs, Siegel says he got involved in military projects by happenstance. “I probably had some disadvantages as an older student, but also some advantages having seen so much of the world,” Siegel says.

In Memoriam

Elaine Masako Iha (MSEE, ’88), 50, of Mission Viejo/Tribuco Canyon passed away on August 22 after a brief battle with lung cancer. An electrical engineering graduate employed by Raytheon, her passion was athletics—the competed in USA Track and Field Trials and America’s Cup races, and played Women’s Professional Tackle Football, concluding her career as a captain and quarterback for the Southern California Breakers. Elaine is survived by her husband of 19 years, Randy Messenger, mother June, step-mother Margaret, sisters Nadine, Diane, Lynn, brother Wayne, step-sister Mylene, and many nieces and nephews.

John H. Marburger, III., 70, former USCF professor of physics and electrical engineering, and later chairman of the physics department and dean of the university’s College of Letters, Arts and Sciences, died July 30 at his home in Port Jefferson, Long Island. A former president of Stony Brook University, he was a Democrat who served as science advisor to President George W. Bush. His survivors include his wife, Cami; their two sons, John and Alexander; and a grandson. His younger sister, Mary Hoffman-Habig, also survives.

Charles Luck (BSEE, ’57, 77), and his wife, Laping “Rose” Tang-Luck, died July 24 when their small plane crashed in the mountains near Janesville. Luck had been flying since 1940 and was a commercial instrument rated pilot. He owned his Cesna 182 for 30 years. Luck flew while he was obtaining an engineering degree from USC and when starting his own company Sound CDM Engineering. He is survived by his children.

Brig. Gen. Wayne E. Schramm (MAMO, ’67, 75), died Saturday, July 23. He served in the U.S. Air Force from 1958 to 1989, many of those years at the Pentagon. During his career, he received the Bronze Star, the Distinguished Service Medal and many others. He is survived by his wife Jean; brother, Dr. Vern Schramm; two daughters, Susan (Oscar Wilson) and Judy (Wayne) Anderson; and eight grandchildren.

Tien-Chung “T.C.” Cheng, 66, an internationally known authority on power systems who was part of the Viterbi School’s “Smart Grid” research initiative, passed away in his sleep July 12 at his San Marino home. Born in Shanghui, China, the 36-views faculty member was named the Ming Hsueh Department’s Lloyd F. Hunt Professor in 1984. The author of over 100 peer-reviewed publications, he co-founded three companies and held numerous patents in power engineering. He is survived by his wife Lois and son Jason.

Lt. Col. Stephen J. Demora, Jr. (MSSM, ’68), of Alabama, passed away July 7. He retired from the U.S. Army Aviation and Missile Command as an operations research analyst with 37 years of service, including assignments in Vietnam, Bosnia, and Germany. Survivors include his wife of 41 years, Janice; daughters, Judith Kleiner and husband Matthew and Jennifer Demora; grandchildren, Elliott, Noah and Lauren Kleiner; and sister, Helen Donnis and brother-in-law, Gene Donnis of Columbus, S.C.

Walter “Jim” Portenier, (BSAE, ’59), 83, passed away on June 29 in Naples, FL, where he has resided since 2004. An Army veteran of World War II, he joined the Aerospace Corp. at E. Segundo in 1961, retiring there in 1985. He was a Fellow of the American Institute of Aeronautics and Astronautics for over 50 years. He is survived by his loving wife of 18 years, Patty Caldwell, his daughters, Andrea and Renee, five grandchildren and a niece and nephew.

Eugene Barker Huggart, Jr. (BMCE, ’50), 76, passed away after a long illness with Parkinson’s Disease on June 21 in Tustin, CA. He entered in the Army during the Korean war and was assigned to the CIC (Counter Intelligence Corps) and was stationed in Iceland. After graduating from USC he attended Harvard University graduating in 1961 with and MBA, Gene’s professional life was spent as a项目 manager in real estate. He is survived by his wife of 40 years, Shirley, son, Eugene H. Huggart III, daughter-in-law, Lisa, grandchildren, Jessica and Leith.

Robby and Neil Siegel
Tell me about how you came to the U.S.

I was born in the Ukraine—raised by a single mom—and being Jewish, the natural choice was to emigrate from the Soviet Union. Jews couldn’t get an education in the Soviet Union; there were strict quotas on admission of Jews to institutions of higher learning. We came to this country when I was 12, settled in New York City, where the best and the brightest studied math and science at Stuyvesant High School.

What do you remember from the former Soviet Union?

It’s all gone now. Gone from the mists of history. I remember being a Young Pioneer. They did a good job of brainwashing kids—it was a special honor to be a Young Pioneer. There’s a ceremony at the naval academy, the young naval guys tie the red scarves around you—this is a sign you’re contributing to society, helping others. It’s girl scouts with mandatory membership.

Does any of this inform your current work?

In the United States, everyone is obsessed with personal responsibility. That’s the big theme: Everyone’s responsible for himself/herself. In the Soviet Union, when I was growing up, you were responsible to others; you were responsible to your community. The theme of responsibility to others, the United States could benefit greatly from that. No man is an island. In the complex systems, complex networks, I study, everything is intricately linked. Your behavior affects the behavior of others, who, in turn, affect your behavior. There’s no such thing as you by yourself make your own life. Everything affects everything else.

How did you get into social networks?

I studied physics (complex systems). I knew I was going to get a Ph.D. in physics at 14. To me, that’s just what smart people did. They figured out the secrets of the universe. Then in 1994-95, the web happened. I remember just getting lost in it—following one hyperlink to another—there weren’t even search engines yet. I made the decision right then I wanted to go into the web field. In 2005, I was an amateur photographer—I was very passionate about it, participating in on-line forums, especially child photography—and somebody sent me a link to a Flickr stream. Once again, I was just lost in Flickr—but I wasn’t just following hyperlinks between pages, I was following links between people. I was exploring one photographer’s stream, seeing who commented, what they said, going from one stream to the next.

What are you working on now?

Right now, we are working with Twitter, using their follower graph. For every person who tweets something, we have that data set. The tweets contain URLs that we use as markers to track how information spreads through the network. Who are people following? Who are those people following? Who are the influential people in the network? It’s like a huge bowl of spaghetti. You can’t visualize it. So we use algorithms like Bonacich Centrality.

Social media has played a big role in the social unrest from London to Cairo. What lessons can be learned here?

A lesson about such a move can be learned from the Bay Area Rapid Transit system, BART, which shut down phone and data service on its trains and stations to thwart flash mob protests over police actions. The protests still materialized, and the ensuing chaos, closed down several BART stations at peak commute time, gave people even more things to be unhappy about. It will take BART years to repair its image. BART officials could get a few pointers from the Los Angeles Police Department... After a recent Hollywood “near riot,” they assigned social media-savvy police officers to monitor Twitter streams. Did any of this inform your current work?

In terms of your research, if there was an emergency and the government wanted to tweet specific instructions, could your models predict how quickly that message might spread?

Or hopefully my models could help them see who they should be sending those messages to in the first place—who should be asked to retweet the message so that it reaches the largest number of people.