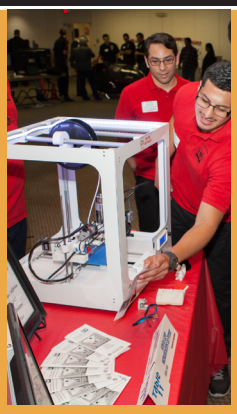
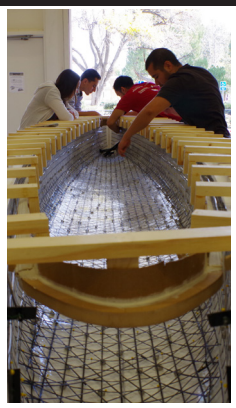
CSUN
CALIFORNIA STATE UNIVERSITY NORTHRIDGE

Spectra
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

2015–16







## Inside this issue...



# The Beat Goes On in Redesigned Programming Class

Music was in the air on May 1, at a unique workshop for faculty who teach introductory programming. Titled "Teaching Programming with World Music: Modules, Tools, and Ideas for Student Retention," the workshop was an outgrowth of the TIDES (Teaching to Improve Diversity in STEM) grant that CSUN received in June 2014. Twelve faculty members, representing computer science, electrical and computer engineering and mathematics, participated in the daylong event, learning about the grant and the curriculum modules it had produced to date. The three-year, $300,000 grant, funded by the Leona M. and Harry B. Helmsley Charitable Trust and administered by the American Association of Colleges and Universities (AAC&U), is supporting a collaboration between the Department of Computer Science and Department of Music to redesign COMP 110, Introduction to Algorithms and Programming, to incorporate applications relating to world music. The aim of the project is to make the course, which is required for five different majors in three colleges, more culturally relevant to the CSUN student body and also attract more diversity to computer science.

The redesign began with a drum machine application to teach students the concept of a loop as they use it to generate different rhythms. Since then, the project team— principal investigator Ani Nahapetian, associate professor of computer science, and co-PIs Gloria Melara, professor of computer science, and Ric Alviso, chair of the music department—has produced nine additional modules, including Scale of Words, Guess the Note, Random Music, Guess the Genre, Strings to Beats, Lyrics Processing, Text to Melody, Beat Creator and Sound Recorder, designed to give students practice with console I/O, branching, random number generation, loops and arrays, string processing, file I/O and object-oriented programming. For hearing-impaired students, the team has created a visual interface. The modules are freely available on the project website (www.ecs.csun.edu/tides), under the "Modules" tab.

> *The music is loud, the energy level is high, and there is a joy present in the classroom because the students have created the music themselves," Nahapetian says. "It's similar to the joy of playing an instrument rather than just listening to it being played.*

"I've learned so much about music," says Nahapetian. "I had been a consumer of music, as had Professor Melara, but as you program an application, you always also learn about the application for which you're programming."

The first offering of the modified course took place last spring and the second last fall, both taught by Melara. The course sections with the new modules have been in great demand—more than the department can accommodate—and fill up very fast, thanks to word-of-mouth among students. While working with the modules and using a new approach to teaching programming has been something of a learning experience for Melara, the class is definitely a lot more fun for students.

"The music is loud, the energy level is high, and there is a joy present in the classroom because the students have created the music themselves," Nahapetian says. "It's similar to the joy of playing an instrument rather than just listening to it being played."

Future plans include evaluating the project more thoroughly, expanding the concept to more classes, majors and institutions, and encouraging faculty to come up with their own creative application areas that will translate well to a diverse student population.❖


# A Message from the Dean

**Welcome to the 2015- 16 edition of *Spectra*!**

I am very pleased to share this edition of *Spectra,* which highlights the terrific work and accomplishments of our students and faculty. We are truly fortunate to have recruited another great group of faculty last year, with nine new colleagues joining our programs. Their energy and enthusiasm and their commitment to working closely with our students to improve student success and learning bodes well for the future.

From award-winning projects to cutting-edge innovative research, a rich array of programs has punctuated the past year. The lead article, titled "The Beat Goes On in Redesigned Programming Class," describes an innovative and collaborative endeavor between computer science and music, led by professors Ani Nahapetian, Gloria Melara and Ric Alviso. It is funded by a prestigious grant from the AAC&U and the Helmsley Trust and is already having a positive impact on student learning and retention. Our faculty has also led the way in collaborating with the K-14 community to attract students to STEM disciplines through impressive programs such as the Verdugo Creative Technologies Consortium, funded by the California Career Pathways Trust. Through this multi-institutional, grant-funded program, led by Professor Jimmy Gandhi from our engineering management program, hundreds of high school students are learning about high-wage, high-growth careers in fields such as digital arts, manufacturing, innovation and entrepreneurship. And finally, the college's collaborative AIMS$^2$ program, now entering its final year, was recognized in 2015 as a Bright Spot in Hispanic Education by the White House Initiative for Educational Excellence for Hispanics—one of 230 "bright spots" across the country that are exemplars of programs that are lowering barriers and effectively addressing the needs of underrepresented minorities in STEM disciplines, and in engineering and computer science in particular.

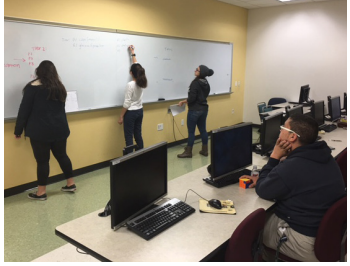
This has been a tremendous year for several of our student teams as well, including the 2015 Intelligent Ground Vehicle champion "El Toro," led by Professor C.T. Lin from mechanical engineering and carried out by his interdisciplinary student team, and the "Hybrid Layered 3D Printer," led by Professor Bingbing Li and executed by students from our manufacturing systems engineering program, which walked away with the honors at the 2015 Small Manufacturers' Institute design competition, to name just a couple. Indeed, when we had the honor of hosting CSU Chancellor Tim White and Executive Vice Chancellor Loren Blanchard during their recent visit to CSUN, our students did a magnificent job of showcasing the innovative work that they do through many of these award-winning projects. The college's seventh annual senior design project showcase, scheduled for April 2016, will feature over 30 exciting student projects, building on the traditions of success that we have cultivated over the years. Furthermore, our undergraduate programs in computer information technology and engineering management are gearing up for ABET accreditation in the coming year, to add to the high-quality accredited programs that we already offer.

As I was closing this piece, I was reflecting on what a great year we have had and realized that this also marks a decade since I joined CSUN. We have come a long way over the years, thanks to the exceptional work by our faculty and staff in serving our students. I am confident that we will continue to make enormous strides in the years ahead.

S. K. Ramesh

Dean S. K. Ramesh

# CCPT grant starts off on the right foot



High School students in a Saturday CCPT class.

In 2014, a consortium led by Glendale Unified School District, including CSUN, the Burbank Unified School District, Glendale Community College and the Verdugo Workforce Investment Board, was awarded a three-year, $6 million California Career Pathways Trust (CCPT) grant. The purpose of the grant is to develop a K-16 educational pipeline in four clearly defined skill-based career pathways. At CSUN, work on two of the pathways—innovation and entrepreneurship, and digital manufacturing—is based in CECS. (The other two—animation and Web design—reside in the Mike Curb College of Arts, Media and Communication.) Shereazad Jimmy Gandhi, assistant professor of engineering management and director of the Ernie Schaffer Center for Innovation and Entrepreneurship, is spearheading the innovation and entrepreneurship pathway; Peter Bishay and Vidya Nandikolla, both assistant professors of mechanical engineering, are heading the digital manufacturing pathway effort on campus as well as the outreach efforts to other high schools in the area.

Year 1 of the project, which ended last June, was devoted to curriculum development and saw collaborative faculty teams developing the high school course materials for the pathways. The first module was implemented last fall, and modules 2 and 3 are being implemented this spring. Participating high school students are coming to CSUN on Saturday mornings for instruction by CSUN faculty—an arrangement that reflects the availability of labs and specialized equipment, such as 3D printers, on campus.

So far, student feedback indicates that the project is on the right track. "We administered surveys at the end of the first module, and the students really appreciated the hands-on approach," Gandhi says. "They liked that it was not just solving problems from the back of a textbook."

Because consortium members are creating new curriculum, teacher professional development is a key part of the grant. CSUN is responsible for that component, so as a next step, faculty team members will hold a training academy for high school teachers on campus this coming summer. ❖

# Lorentz again scores big at Computer Olympiad

Richard Lorentz, CSUN's very own Olympic champion, brought home two more gold medals last June, to add to the significant collection of medals he already has amassed.

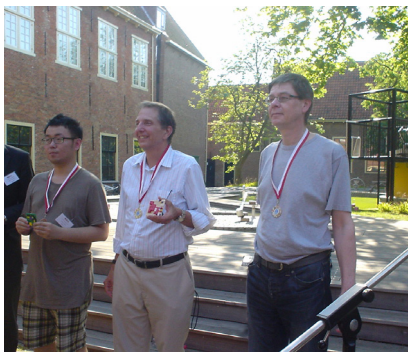
Despite his 12 medals, however, Lorentz is not an elite athlete. He's an elite gamer, and his playing field is a computer screen. A regular competitor in the Computer Olympiad, which is sponsored by the International Computer Games Association, he specializes in the game Amazons, for which he has won the gold at the Computer Olympiad for six years running (2015 was the second year in a row that his program went undefeated). Lorentz has also medaled in a game called Havannah, and in the 2015 Olympiad, held in Leiden, the Netherlands, a game called Breakthrough debuted, and he won the gold for that as well.

"The Olympiad is about computer scientists testing the limits of games," he says.

Lorentz, a professor of computer science, has made a practice of testing his own limits against some of the best players in the world. In Europe and Asia, he explains, there is a much bigger culture of game playing than there is in the United States. People invent new games because they are interested, and once the games take hold, computer scientists get interested in figuring out ways to have computers play them as well.

Gaming of this sort falls under the umbrella of artificial intelligence, which, Lorentz explains, is the study of getting computers to do intelligent things. "The reason computers are good at these games is not because they are mimicking human intelligence, but because we have developed algorithms specific to the games," he says.

Lorentz, who includes students in his gaming projects, is already preparing for the 2016 Computer Olympiad, which will again be held in Leiden, from June 27 to July 3. Recent work he has done with one of his graduate students has him eager to return, to witness the improvement in his playing and share ideas with his fellow competitors. ❖



Awards ceremony for the Amazons tournament, at the 2015 Computer Olympiad in Leiden, The Netherlands. From left, bronze medalist Zhao Junyao, gold medalist Richard Lorentz, and silver medalist Johan de Koning.

# There's something for everyone in AIMS² research projects

HSI STEM Grant Program

In 2011, the College of Engineering and Computer Science, in collaboration with Glendale Community College and the College of the Canyons, was awarded a $5.5 million U.S. Department of Education HSI-STEM grant. The purpose of the grant was to implement a multifaceted program designed to improve retention and increase graduation rates for Hispanic, underrepresented and low-income students majoring in engineering and computer science. To date, the program, called AIMS² (Attract, Inspire, Mentor and Support Students), has helped meet the academic needs of more than 200 students. Participants receive academic support services, are mentored by faculty and are supported with stipends to motivate and inspire them to succeed. In September, the program was recognized as a "bright spot in Hispanic education" by the White House Initiative for Educational Excellence for Hispanics.

Student research, identified as a high-impact practice by the Association of American Colleges and Universities, has been a cornerstone of AIMS² from the program's inception. Every summer, AIMS² students from the community colleges and CSUN take part in research with their faculty mentors. (Other program components include proactive academic advisement and tracking, organized tutoring, peer and faculty mentoring, project-based learning, career advising and eventual transition to the workforce or advanced studies.)

On the afternoon of November 12, the college hosted the first-ever AIMS² student research symposium, giving participants an opportunity to present their research to their peers and the broader AIMS² community. Close to 40 students took part, and all five CECS departments were represented. The audience numbered between 60 and 70, including students, faculty and members of the AIMS² external advisory committee. What follows are highlights of the research that the 2015 AIMS² students undertook.

## AIMS² FACULTY MENTORS

**ANWAR ALROOMI**
CECM

**BEHZAD BAVARIAN**
MSEM

**VIBHAV DURGESH**
ME

**SAMI MAALOUF**
CECM

**GLORIA MELARA**
CS

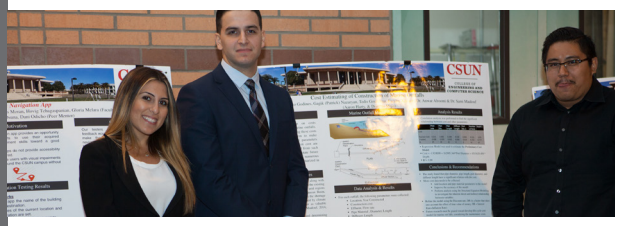
**VIDYA NANDIKOLLA**
ME

**BRUNO OSORNO**
ECE

**LISA REINER**
MSEM

## Anwar Alroomi and Sami Maalouf, Civil Engineering and Construction Management

## Cost Estimating Model of Construction of Marine Outfalls




A marine outfall is a pipeline or tunnel that discharges to the ocean such effluents as waste water, storm water, sewer overflows and cooling water, as well as brine from water desalination plants. There are some 330 marine outfalls around the world, and many were built decades before meticulous documentation became a common construction practice. There is considerable demand for marine outfalls today, and although they are very expensive to build, there are few studies estimating their cost because that is difficult to determine, particularly for outfalls built in the 1950s and 1960s. Last summer, six AIMS² students, working with Anwar Alroomi and Sami Maalouf, collected data about marine outfalls worldwide as the foundation for creating a cost model. They contacted governments and, where possible, contractors and designers to gather information on the outfalls as a prelude to determining which factors, such as diameter, location, whether or not there are diffusers, etc. are the key ones affecting the cost of construction. The data collection is ongoing, and four students are now continuing the project, working on the literature review and mathematical model.

"The benefit of the model is that if an agency wants to construct a new marine outfall, they'll know which information is significant and will affect cost, so they can easily estimate the cost of the marine outfall," explains Alroomi. "Determining the cost is really essential."

## Gloria Melara, Computer Science
# CSUN Campus Navigation Mobile Prototype

Noting that visually impaired students found it difficult to navigate between buildings when they were new to CSUN, AIMS$^2$ students proposed to create a mobile app to enable these students to get around more independently. So last summer, a team of AIMS$^2$ students, under the mentorship of Gloria Melara, designed and implemented the CSUN Campus Navigation app. Using GPS, the app directs users by voice to wherever they need to go on campus. After initial tests of the app, the target users were happy to have a tool that would enable them to be more independent. They suggested some additional vital features, however, so another team of AIMS$^2$ students is continuing to work on the app during the academic year.

# HSI Web Portal

Under the mentorship of Gloria Melara, AIMS$^2$ students have created and maintained a website for the U.S. Department of Education to support the HSI-STEM program. Students have worked on the project for two summers, as well as during the academic year. The web portal was initiated by one of the HSI-STEM principal investigators, who wanted a mechanism for the PIs for the different projects to share best practices. CECS dean S. K. Ramesh offered to host the site at CSUN, and it proved an ideal project for AIMS$^2$ students in computer science. In addition to serving as a repository for proposals and best practices, the site includes searching capabilities and real-time communication among the grantees, who are responsible for populating the site with content. The project has been going on for a couple of years, so there has been turnover as students have graduated. "It's like a normal project in industry," Melara says. "Some professionals leave, and others join it. The project documentation has been good, and the students have used it to continue on from the previous semester."

## Bruno Osorno, Electrical and Computer Engineering
# Design and Implementation of Dual-Axis Solar Tracking System

Six students took part in a project to develop a mobile solar charging station with a dual-axis tracking system to follow the sun. For four of them, all AIMS$^2$ students who had transferred to CSUN from community colleges, it was their senior design project. (It was the second year that Bruno Osorno had incorporated the AIMS$^2$ project into students' senior design capstone experience.) The other two were not AIMS$^2$ students but were interested in the project and served as "shadow" students to gain experience with projects. The solar tracking system has to contend with current, wind, irradiation and voltage sensors interfacing with an LCD touch screen. In addition, a microprocessor (Arduino) was programmed to track the position of the sun at any given time. The project was a success, and Osorno intends to use it again as a senior design project.

## AIMS$^2$ RESEARCH ASSISTANTS

**Cost Estimating Model of Construction of Marine Outfalls**
Fladio Godines
Tadis Gourehzar
Gagik Nazaryan
Cynthia Sarkissian

**CSUN Campus Navigation Mobile Prototype**
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Ernie Ledezma
Shiyin Li, GCC
Jesus Moran Perez
Dani Odicho
Paulo Osuna
Jean Villanueva, GCC

**HSI Web Portal**
Paulo Osuna
Edwin Salazar
Tatevik Sardaryan

**Design and Implementation of Dual-Axis Solar Tracking System**
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Diego Campos
Francis A. Cuevas
Catherine Hartnek
Sarkis Semerjian
Ninsina Yadkar

**Biosensor Using Graphene-Based Materials**
Edith Elyasi
Vaheh Elyasi

## AIMS² RESEARCH ASSISTANTS

**Active Materials and Morphing Structures**
Anna Chilingarian

**Additive Manufacturing Process for Metallic Components**
Navjeevan Sandhu

**Mechanical Loading of Anatomic Human Foot using Finite Element Analysis**
Daniel Hooper
Scott Judge

**Designing Hydrogen Bubble Flow Visualization for Aerodynamics Experiments**
Elifalet Garcia

**Experimental Study of Thin and Thick Airfoils at Low Reynolds Numbers**
Elifalet Garcia

**Learning by building: design and construction of an autonomous drone**
Cesar Dominguez
Vaheh Elyasi
Edith Elyasi
Andrew Fechtner
Daniel Hunt
Raul Montoya
Francisco Romero
Anthony Rosales
Delbert Stewart
Zachary Stiegler

Behzad Bavarian and Lisa Reiner,
Manufacturing Systems Engineering and Management

## Biosensor Using Graphene-Based Materials

Monitoring glucose is critical for diabetics, but doing so requires patients to prick their fingers multiple times a day to obtain a drop of blood. The aim of this project, different aspects of which have been under way for four years, was to make sensors sensitive enough to measure glucose in saliva or tears, where it appears in a much lower concentration than in blood. The material of choice was graphene, a special type of carbonous material that is very strong and highly conductive and has a large surface-to-volume ratio, which enhances the surface loading of the desired biomolecules. The graphene was used to manufacture electrodes, replacing more expensive materials like platinum and gold. The two AIMS² students working on this project examined the electrode microstructure and conducted multiple electrochemical tests to evaluate the electrodes. They found that the graphene-based electrodes showed increased active surface area and good charge transfer, which will significantly improve the material's ability to function as a sensor.

## Active Materials and Morphing Structures

When birds fly in different weather conditions, their bodies change shape accordingly. For aircraft encountering different conditions, however, the only current option is mechanical action—moving the ailerons on the wings. There have been no dramatic changes to the technology used to design and build aircraft for the last 25 to 30 years, but smart materials capable of morphing promise to change that in the future, improving energy efficiency and reducing noise levels. Composite materials, electroactive polymers and shape memory polymers are all possible candidates for morphing aircraft designs, and the Department of Defense, NASA, Boeing and Airbus are all very interested in the potential of these materials. Their hope is that a morphing shape will be implemented in aircraft structures in the next 15 to 20 years. In this study, one AIMS² student studied piezoelectric actuators that respond to applied voltage by bending or distorting and applied these to the wings of micro air vehicles.

## Additive Manufacturing Process for Metallic Components

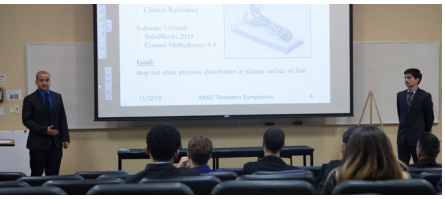
Additive manufacturing, which takes a CAD file and sends it to a 3D printer to generate the part a designer wants, is a new, fast, efficient way to make sophisticated parts. The advantage of the technology is that unlike conventional techniques such as casting or forging, there is no waste and no extra work to form the desired shape, which can assume any geometry. 3D printers with laser capability incorporated are able to process metallic materials, such as titanium, for aircraft applications. The AIMS² student working on this project took part in an internship at a Camarillo company called CalRAM, where he gained experience with cutting-edge electron beam melting (EBM) technology. The equipment can create solid metal components directly from a CAD model, ideal for molding tools and prototypes. "The students are majoring in manufacturing engineering, so it is important for them to be exposed to that, which is the future of manufacturing," says Bavarian. "Right now all government agencies are promoting the U.S. as superior to the rest of the world in these types of manufacturing processes. It's a way to maintain competitiveness in manufacturing."

Vibhav Durgesh, Mechanical Engineering

## Designing Hydrogen Bubble Flow Visualization for Aerodynamics Experiments

### Experimental Study of Thin and Thick Airfoils at Low Reynolds Numbers

Google "drone crashes," and you'll get a plethora of hits—videos, databases, news stories and more. It seems the popular unmanned aerial vehicles, commercial and amateur alike, have an unfortunate tendency to crash, especially if the wind changes direction suddenly, and Vibhav Durgesh wants to figure out why. Very little research has been conducted with these aircraft, but the key may lie in the Reynolds number of the airfoils, or wings, which basically measures how fast the air flows over the wings when the drone is flying. The higher the Reynolds number, the faster the airflow. A commercial airliner, for example, has a significantly higher Reynolds number than, say, a drone, and is considerably more stable. To determine the aerodynamic characteristic of lift in thick and thin airfoils and at different angles of attack, Durgesh enlisted the help of an especially dedicated AIMS$^2$ student to design and then run a series of 36 experiments using CSUN's low-speed flow visualization water tunnel. Each repetition required the student to remain in the lab for 20 hours at a time. The results were presented at the American Institute of Aeronautics and Astronautics SciTech 2016 conference in San Diego in January and attracted a great deal of interest from the audience. "It started as a very small project and grew to be big and had a lot of impact," Durgesh says.



Vidya Nandikolla, Mechanical Engineering

## Mechanical Loading of Anatomic Human Foot Using Finite Element Analysis

Two AIMS$^2$ students developed a biomedical model of the human foot using CT scans and relating the anatomical domains of bones and soft tissue. They then analyzed the mechanical behavior of different types of feet—specifically, the biomechanical stress distribution. As the foot is the lowest extremity of the body, the contact surface area holds the weight of the entire body during walking, running, climbing etc. Studying the forces acting on the foot helps advance the understanding and impact of different types of foot injuries.

Gloria Melara, Computer Science, and Vidya Nandikolla, Mechanical Engineering

## Learning by Building: Design and Construction of an Autonomous Drone

Two computer science students, two electrical engineering students, and six mechanical engineering students joined forces under the direction of Gloria Melara and Vidya Nandikolla to build a drone from the ground up. The goal of the project was to emphasize engineering design, innovation, communication, small group collaboration and critical thinking skills, while seamlessly integrating concepts from the different engineering disciplines into a real-world robotics system. "You can buy a drone off the shelf, but we didn't want the students to do that," Nandikolla explains. "They were required to research the integration of the electromechanical components—motors, microprocessor, batteries, controllers, etc.—and they had to match each component so everything would fit together. Most important, the design requirements had budget constraints." The student team developed the drone's design in house, researched the electromechanical components, flight control system, mechanical structure, microcontroller programming and motor speed controls. By the end of the summer, they had put together a drone that flew and navigated to a certain location. Work on refining the drone has continued into the academic year. ❖


## AIMS$^2$ featured at CAHSI Summit

The AIMS$^2$ program had a prominent place on the agenda at the annual summit of the Computing Alliance of Hispanic-Serving Institutions (CAHSI), held September 10-12 in San Juan, Puerto Rico. CAHSI is a consortium of Hispanic-serving institutions committed to consolidating the strengths, resources and efforts of organizations that share the core value of increasing the number of Hispanics who pursue and complete baccalaureate and advanced degrees in computing. In addition to CECS dean S. K. Ramesh, who gave a workshop on the results and lessons learned from the AIMS$^2$ collaboration, Gloria Melara, professor of computer science, and Vidya Nandikolla, assistant professor of mechanical engineering, attended the meeting, along with Jan Swinton, an AIMS$^2$ project collaborator from Glendale Community College. A group of students who had worked on the U.S. Department of Education HSI-STEM web portal for grantees took part in an all-day poster session, where they demonstrated the site.

"We were invited because of the work we are doing," says Ramesh. "All the attendees talked about what we can do to attract more students and support them, and the students who accompanied us were able to show how the project work they had done had helped them academically and professionally."

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The Aerospace Corporation



# IAB Highlight

## **Michael McAlpine:** Building value, building

### Michael McALPINE

Vice President, Project Executive, CM
Construction Management Division, Western Territory
STV, Inc.

Early in the morning on January 17, 1994, a massive earthquake struck the Los Angeles area, causing $400 million in damage to the CSUN campus. In the aftermath of what came to be called the Northridge quake, Michael McAlpine was assigned by his then-employer, AECOM, to provide construction management services to help rebuild or retrofit several major CSUN buildings. As he grew increasingly familiar with the campus, he also became involved in the effort to launch a construction management program in the College of Engineering and Computer Science.

Today, McAlpine, now a vice president and project executive for the Construction Management Division –Western Territory of STV, Inc., is a longtime friend of the college, wearing two hats: one as a member of the CECS Industry Advisory Board and the other as chair of the advisory board for construction management.

*On the college's IAB, he offers both a management and construction management perspective, noting that management skills can be applied to many other industries because the same principles apply.*

"I think what I bring to the board is my relationships with clients and other firms in the industry, to help students find jobs and internships and give them an industry perspective," he says. "I also work with faculty—whether it's providing guest speakers in classes or getting them to conferences, where they meet people who can share the latest practices or technologies that they can then take back to their students."

McAlpine has been in the construction management industry for over 28 years, but his career trajectory has veered off from what he had in mind when he started out. A native of Visalia, California, he always wanted to be an architect and earned an architecture degree from Cal Poly Pomona. But when the 1991-93 recession hit, architectural firms were closing or

# relationships through the IAB

laying off staff, so at a friend's suggestion, he went to work for a general contractor to gain experience in the field. After 5.5 years, he joined AECOM as a program and construction manager, and in the 12 years he was there, he worked his way up to associate vice president. He joined STV in 2009 as a vice president.

"I wasn't a bad designer, but I think my real talent is managing," he says. "I found my niche in construction management."

Among the high-profile projects he has overseen are the Pasadena Convention Center and the new Anaheim Regional Transportation Intermodal Center (ARTIC), which was designed for LEED Platinum certification and has been receiving international recognition and winning numerous awards. He is also in charge of a $200 million renovation of the Anaheim Convention Center.

"I'm kind of like the conductor of a band or orchestra," he says. "My job is to take an idea and manage it through the design, procurement and construction process and then hand over the keys to the client."

McAlpine's commitment to CECS is both professional and personal. He notes that the construction industry is reaching the point where in the next ten years there won't be enough workers to build what the country needs. He anticipates a shortage of engineers, construction workers, etc., and qualified personnel will have to be imported because of the rate the industry is growing. That's why he's so committed to the construction management program at CSUN. He also enjoys sharing his perspective with students, with the hope that his experience will help them grasp the many opportunities available to them. He notes that most don't have a big-picture idea of what they're majoring in—they get bits and pieces about project management, cost management and schedule management but don't know how to pull all that together and understand how their education is applicable in the industry.

"What we try to do on the construction management advisory board is to support and educate students so they make good career decisions and help them get jobs that add value to the industry," he says.

The board also organizes field trips to project sites and regular guest speakers and helps students land internships. In addition, it provides financial support to the college for student scholarships, to send faculty to conferences and to ensure the latest software and hardware is available. Each year, the board organizes a golf tournament in support of the construction management program that raises between $70,000 and $80,000, though McAlpine would like to see the level of support boosted to $100,000.

2015 Construction Management Golf Classic at North Ranch Country Club in Westlake.

On the college's IAB, he offers both a management and construction management perspective, noting that management skills can be applied to many other industries because the same principles apply.

That is especially true of his approach to communication. The key ingredient for a successful career like his, he believes, is trust, and he tries to instill that idea in the construction management board, with the hope that it will trickle down to the students.

"If you're able to establish trust among the players you interact with every day, you will be successful," he says. "If you manage from the level of trust, everyone who brings expertise to the table will focus on solving problems and working together as a team. I tell students that if they're able to cooperate, have a good attitude, establish trust and be ethical, they will go far." ❖

# New faculty bring expertise,

*They come from across town and from around the world. They represent all five CECS departments and distinct areas of expertise: smart materials and structures, fracture mechanics, human-computer interaction technologies, thermofluid sciences, thermodynamics, analog circuits, non-destructive testing, conceptual risk analysis frameworks, biomedical engineering and structural and earthquake engineering (and more). While their fields and backgrounds may be diverse, they share a common commitment to teaching and research and to making a difference—at CSUN and in the world. Meet the new faculty of 2015-16.*

## PETER BISHAY

Assistant Professor
Mechanical Engineering

**Peter Bishay** enjoyed physics and math so much in high school that a career in engineering pretty much seemed inevitable.

"I really like the statement that mathematics is the language God used to create the whole world," he says. "All phenomena around us are governed by equations whether we know them or not. And in engineering, we're trying to mimic those phenomena to create new things."

Bishay entered Cairo University in his native Egypt, earning bachelor's and master's degrees in aerospace engineering in 2007 and 2010, respectively. He started his Ph.D. at Rutgers University, where he took graduate courses, taught as a summer instructor and conducted research for a year. He then transferred to UC Irvine to focus on the field of computational solid mechanics and smart materials and structures. He completed his doctorate in mechanical and aerospace engineering in 2014.

Teaching, like engineering, was always in the cards for Bishay. From his first year in college, he knew he wanted to enter academia. As an undergraduate, he helped his friends review for tests, and at UCI, he taught several undergraduate and graduate courses and received awards for his work as a teaching assistant.

Following his Ph.D., he worked as an assistant professor at St. Martin's University in Washington State for a year. There, he taught undergraduate and graduate courses, conducted research and collaborated with companies such as Intel and Giro. When a job opened up at CSUN, he jumped at the chance to return to a Mediterranean climate while joining the faculty of a university with a strong emphasis on teaching and research.

"It's very important to me that every student understands and gets something new from my lectures," he says. "Not all big universities provide a high quality of teaching, but CSUN does."

To start, he will be teaching a mechanical design with composites graduate course, along with a new senior design project in his department. Bishay also has big plans for involving significant numbers of students in his far-ranging research. His main fields are computational solid mechanics, smart materials and structures, aerospace structures and engineering education, so he has plenty to keep his students engaged and busy.

"I have a lot of research ideas," he says. "I'm very excited to start working at CSUN."

## DAVID BOYAJIAN

Assistant Professor
Civil Engineering

After a long, circuitous journey, **David Boyajian** is finally home. The Los Angeles native, who earned his bachelor's and master's degrees in civil engineering at Cal State LA, left California in 1996 to pursue doctoral studies at West Virginia University. But, he notes, "I always felt I would come back someday."

What he didn't know was that it would take him 19 years. After completing his Ph.D. in 2002, as well as most of the coursework for a second master's degree in mathematics, he remained at West Virginia University for a year as a postdoctoral fellow, then accepted an appointment with the University of North Carolina at Charlotte in the Department of Civil Engineering. Following that, he assumed a position at Taylor University in Indiana. Before leaving California, Boyajian also gained invaluable industry experience working for the city of Los Angeles and for an architectural firm in West Los Angeles.

Boyajian didn't always know he was destined to be an engineer, but he enjoyed mathematics at an early age, and seeing math and physics applications is what led him to engineering. He is the only one in his family to have earned advanced degrees, which has given him a unique perspective common to many CSUN students and which he plans to leverage to help his students succeed as well. "I know

# diverse perspectives

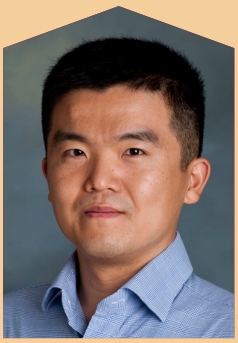
what it's like to be the first and only person in your family to have gone to college," he says. "To have a professor coming from such a background, who understands the struggles students face, can make a big difference in their lives and futures."

For his dissertation, Boyajian's research involved developing a novel fracture mechanics specimen—the single contoured cantilever beam (SCCB)—to enable investigations into brittle media interfaces like that of composite materials bonded to concrete substrates. He is excited about conducting research at CSUN with both undergraduate and master's students. In 2015-16 he is teaching courses in statics and dynamics, along with the capstone senior design course.

"This is a 19-year dream being fulfilled," he says, "and being a CSU alum, I'm looking forward to seeing my students succeed. It's all about giving back. I was in their shoes so many years ago, and now I have an opportunity to work with them and make their futures a little brighter too."

## LI LIU

Assistant Professor
Computer Science



**Li Liu**'s passion is making technology accessible to different groups, especially those who have historically been marginalized because of disability. It's that passion that led him to CSUN and a faculty position as assistant professor of computer science. "It is the best program on the West Coast for people with disabilities," he says.

Computing was a family affair when Liu was growing up. His mother worked as a computer engineer for a research facility, which inspired him to dive into the field. He cut his teeth on a 386 computer and earned his bachelor of engineering degree in computer science from Shandong University in 2006, with an emphasis in software engineering. He was named an outstanding graduate and went on to earn his doctorate at the University of Alabama—a connection that also grew out of family ties. When his father's company was looking for 3D modeling software more than a decade ago, the University of Alabama sent people to demonstrate an advanced system they had developed for NASA. His father suggested that he consider the university for his graduate work, so he applied and was admitted. He received his Ph.D. in 2010 and was named the Upsilon-Pi-Epsilon Outstanding Graduate of 2010.

His first job after graduate school was in industry, developing software to support the research of neurologists. He then returned to his alma mater in China as a professor, where he led a group of students in research on human-computer interaction. Later, he joined Utah Valley University as an assistant professor in digital media. Motivated by the many people in China who have lost upper limbs, he began to conduct further research on human-computer interaction technologies, particularly for people with disabilities. He researched and evaluated a system that employed a camera so people could use their tongues to interact with the computer, an approach that overcomes the limitations of voice recognition technologies, which work best if there is no ambient noise.

At CSUN, Liu will be teaching a course in operating systems and is looking forward to continuing his research and helping more users gain access to computing. "CSUN is a good environment," he says, "and it will facilitate my research."

## SHADI MAHJOOB

Assistant Professor
Mechanical Engineering

As a mechanical engineer, **Shadi Mahjoob** is an expert in thermofluids and has worked in a wide range of mechanical engineering areas: electronics cooling, bioheat transfer, multi-phase flow in micro-channels, thermal management in large and small-scale devices, and rotational machinery. And as one of the college's newest assistant professors, she is looking forward to teaching and working with students, faculty and industry to advance knowledge in her field.

But her professional experience has made her just as passionate about something else: attracting women and underrepresented students to engineering. Mahjoob, who grew up in Iran, was the daughter of a teacher who always encouraged her love of mathematics. In high school, she met female engineers, who nurtured her own interest in the field, so she went on to earn her bachelor's and master's degrees in aerospace engineering at Amirkabir University of Technology (Tehran Polytechnic), one of Iran's top three universities.

"Although I came from a well-educated family, when I went to university 22 years ago, I was the first female in engineering from my whole family and neighborhood," she says. "The number of female engineers was very low, so they usually faced many more career challenges and had a hard time proving that they had the same knowledge and skills as their male peers. Now we're seeing more female engineers, but the number of female students worldwide is still not comparable."

For her Ph.D., Mahjoob came to UC Riverside, to work with Kambiz Vafai, distinguished professor of mechanical engineering and an expert in heat transfer through porous media. After earning her doctorate in mechanical engineering, she spent a year as a postdoctoral researcher at Darmstadt University of Technology under a DFG (German Research Foundation) grant.

Although Mahjoob always knew she wanted to have an academic career, she also wanted to gain more practical experience in industry. So after her postdoc, she returned to the U.S. for a position in industry, as a principal scientist at PAX Scientific in the Bay area.

Now that she is at CSUN, she is planning to use everything she has learned to train the next generation of engineers and scientists.

"I would like to develop some new ways to encourage smart high school students, especially women and those from underrepresented groups, who have talent but who may be going into other fields, to consider engineering," she says. "When we have more talent in engineering, we can have a better future for the whole world."

*continued on page 12*

# New Faculty

*continued from page 11*

## JACK OU

Assistant Professor
Electrical and Computer Engineering

When **Jack Ou** came to the United States from Taiwan, it was to enroll as a high school student in the Manhattan School of Music in New York City. He had played violin since he was six years old and hoped to have a career in music.

About the time he was preparing to go to college, however, he felt ready for a change. He declined a scholarship to the Manhattan School of Music and went to Rutgers University instead. There a couple of friends in the engineering program introduced him to engineering, and he began taking engineering courses and interacting with the professors. Thanks to the guidance of some especially good faculty members, he ended up earning his bachelor's degree in electrical and computer engineering and remained at Rutgers for his master's and Ph.D. His field is the design and implementation of analog circuits, which consume very little power and have many applications, including wireless and biomedical devices.

After completing his doctoral studies, he went to work in industry, first at IBM and then at a startup semiconductor company.

"When you're in industry, you don't have time to think—you just get things done and move on," he observes. "I treasured the time in graduate school when I had time to think about how things work and had the freedom to explore."

So he returned to academia, teaching at Fitchberg State University in Massachusetts for two years and then at Sonoma State for four years. Both were primarily undergraduate institutions, however, with a comparatively small pool of students. So when he saw a job posting at CSUN in the field of analog circuit design—his specialty—he applied and was hired.

"I knew that kind of position doesn't come along every day," he says.

At CSUN, Ou will be teaching three courses: Electrical Engineering Fundamentals, a sophomore-level introductory circuit analysis course required of all engineering majors; Electronics 1, a sequel to the sophomore course; and a graduate course in RF electronics.

In addition to teaching, he is looking forward to engaging students in his research and to pursuing collaborations with industry.

Overall, he says, he is very excited to be part of the program at CSUN and is looking forward to a productive teaching and research career in the college.

## CHRISTOPH SCHAAL

Assistant Professor
Mechanical Engineering

**Christoph Schaal** has attended universities in his native Germany, as well as Japan and the United States, but until his first visit to CSUN, he had never seen the level of engagement he witnessed in the college's senior design projects. "The students and faculty work so closely on those projects, and the students seem to really enjoy them and put a lot of effort into them," he says. "I had never seen that on another campus, and it was a big factor in deciding that I wanted to join CSUN."

Schaal, who earned his bachelor's, master's and doctoral degrees from the University of Stuttgart, was drawn to engineering even before enrolling in college. An industry internship while he was an undergraduate convinced him that an advanced degree would suit him better than a corporate career, which is why he went on to earn a Ph.D. During his doctoral studies he spent a summer in Japan on a cooperative research project at the Tokyo Institute of Technology. "That kind of opened my eyes to see what other people do and how they do things, which encouraged me to do a postdoc in the U.S.," he says.

Equally compelling was the prevalence of research in his field, non-destructive testing, in the United States. At a conference in Los Angeles, he met a UCLA professor whose approach complemented his own, so he joined his lab for a year as a postdoctoral fellow.

Schaal's research has focused on developing automatic methods to safely detect damage in overhead power lines as well as composite structural components. In his approach, an ultrasonic wave is emitted, and when there is a defect in the structure that needs to be checked, part of the wave is reflected back. The reflection can be measured, making it possible to tell whether there is a crack.

At CSUN, he intends to continue his research, but focused on wind energy and using the technology to monitor the rotor blades of wind turbines and the mooring cables in offshore wind farms. In the classroom, where he will teach applied mechanics and structural mechanics courses, he is looking forward to applying some new methods he learned while earning a teaching certificate in Germany.

"CSUN will be a very interesting opportunity to try things out," he says.

## MARYAM TABIBZADEH

Assistant Professor
Engineering Management

Talk with **Maryam Tabibzadeh**, and it will soon become clear that she is unfettered by conventional boundaries. A specialist in risk analysis and decision making, she examines the culture of safety within organizations, a field that also integrates psychology and behavioral theory. She is similarly interested in crossing disciplines by collaborating with colleagues within CSUN, as well as at other institutions. And while she has long known she wanted to teach, she is also interested in working in industry and views a career in academia that includes collaborative projects with companies as a way to do both.

"I've always liked being able to apply what I learn to real-world examples," she says. "As a professor you can teach and also interact with industry on practical projects and do research."

Tabibzadeh earned her bachelor's and master's degrees in industrial engineering from Sharif University of Technology in Tehran, Iran, then applied to universities in the United States and Canada for her doctorate. She opted for USC because on top of its high ranking, a former classmate was there, and she had family in Southern California. Her advisor was one of the experts called in to investigate the Deepwater Horizon disaster, so for her dissertation,

she drew on extensive reports to develop a conceptual risk analysis framework focused on the human and organizational factors that contributed to the catastrophe—i.e., the importance that organizations place on safety, as opposed to what is cost- and timesaving.

"There are always tradeoffs," she says, "and how people make decisions and the actions they take impact the system—whether a rig or an industry. By developing a risk analysis framework, you can factor in technical elements and tools as well as the mentality of people and their organizations at every level. The whole idea is to look into it systematically and identify the contributing factors and lessons learned."

After earning her Ph.D., Tabibzadeh taught part time at CSUN and CSU Dominguez Hills for a year before joining the CSUN faculty full time. To start, she will mainly teach basic courses, including engineering economy, operations management and statistics. Later on, she hopes to develop new courses, such as a combination of risk analysis and decision making, for master's students and those wanting careers in industry.

Clearly her own decision-making process, which led her to accept the position at CSUN, stands to benefit her, her students and the college for years to come.

## JOHN VALDOVINOS

Assistant Professor
Electrical and Computer Engineering

Because his mother is a nurse and his father an appliance technician, **John Valdovinos** grew up in a home where tools and physiology books abounded. So when he entered USC as an undergraduate, it was a natural fit for him to major in biomedical engineering.

As a student, Valdovinos had an internship at Medtronic Diabetes in Northridge, which he describes as a great experience but ultimately not what he wanted to do. Keen to build a career that incorporated independent research, he decided to pursue a Ph.D. and become an academic.

"I'm a strong believer in not staying in the same place, in getting out of my comfort zone," he says. As a result, he moved across town to UCLA for graduate school, where he had a different kind of academic experience, working with two advisors—a mechanical engineer and interventional cardiologist—on pumps to assist the circulatory systems of pediatric patients.

After graduating, while looking for a job, he stumbled on Yale's Bonde Artificial Heart Lab, which was doing work similar to what he'd done at UCLA. He e-mailed the head of the lab and was accepted as a postdoctoral fellow. This time, he worked with a cardiothoracic surgeon on designing and wirelessly powering two different pumps for adult patients suffering from heart failure.

Throughout his education, Valdovinos especially valued hands-on experiences. "I felt I learned most through trial and error," he says. "Nothing beats getting your hands dirty and finding out what works and what doesn't." So when the opportunity arose to join the College of Engineering and Computer Science, with its emphasis on hands-on training and senior design projects, he seized the chance. He hopes to help strengthen the biomedical track within the Department of Electrical and Computer Engineering and eventually develop a course where students can design circuits and instrumentation for various types of medical devices. He also plans to continue his research on developing devices that help patients suffering from cardiovascular problems.

"I'm passionate about biomedical engineering in general and bioinstrumentation, and I'm really happy to have this opportunity," he says. "It's something I've been looking forward to for a long time and hope I can be here for a long time because it's what I've always wanted to do."

## TADEH ZIRAKIAN

Assistant Professor
Civil Engineering

Civil engineering is in **Tadeh Zirakian**'s blood. His uncle was a successful civil engineer, and he had many other relatives in the construction industry; their talk about their projects inspired him as a child.

Zirakian has also long loved teaching. At nine years old, he was teaching his neighbors in Iran the English alphabet, then Arabic language, music, chemistry and math, among other subjects.

So it was only natural that he decided to enter civil engineering when he got to college. After briefly working in industry following graduation with a bachelor's degree in civil engineering from Azad University in Iran, it was almost inevitable that he returned to graduate school, which would enable him to teach and conduct research (yet another passion).

Zirakian received his master's degree in structural engineering from Iran's Urmia University in 2005 and the following year moved to the United States. In 2009, he started his doctoral studies at the University of California, Los Angeles and went on to earn his Ph.D. in civil engineering there. He then spent a couple of years teaching at several Southern California universities, including UCLA, Cal Poly Pomona and Cal State LA. In 2014, he joined the civil engineering department at Loyola Marymount University as a visiting assistant professor and also entered a one-year Keck postdoctoral and faculty development program before joining the CSUN faculty in 2015.

The author of numerous papers published in prestigious engineering journals and presented at influential conferences, Zirakian, who is also a registered professional engineer, is determined to put his knowledge, experience and skills to good use at CSUN. He is very much looking forward to engaging the college's students and his faculty colleagues in his research in structural and earthquake engineering and is eager to collaborate across disciplines, universities, continents and industry.

"I love the diversity CSUN has to offer and plan to work with a diverse student, faculty and engineer population," he says. "I like multidisciplinary projects, and there are lots of resources at CSUN. It's a fantastic place." ❖

# CECS teams ace student competitions...again!

***CECS teams again left their mark on student competitions last spring, besting opponents from around the world in three high-profile contests.***

## Intelligent Ground Vehicle Competition (IGVC)

CECS teams had an outstanding record in the Intelligent Ground Vehicle Competition between 2011 and 2014, twice placing first and twice placing second, against an average of 40-50 teams from around the world. But the 2015 team's win truly broke new ground.

The competition calls for teams to design and build an autonomous unmanned robot that can negotiate a course with obstacles and perform certain assigned tasks. In the past, CSUN teams have focused less on a category called joint architecture for unmanned systems (JAUS) than on other categories in the competition (design, autonomous navigation). JAUS is a protocol for establishing communication between two units, whether the unit is the robot or a laptop running at the command station, for example. The handshaking protocol allows a commanding station to know the robot's current location, speed, direction, etc., and in the autonomous robot field, JAUS is becoming very important. While the mechanical engineering students who made up the 2015 team were well trained in LabVIEW programming, they determined that the JAUS programming would best be done in the C++ language. So they recruited three electrical and computer engineering students to take on that task, which made all the difference. CSUN took first place in the JAUS category (jumping from sixth the previous year), and that score, along with a strong showing in the autonomous navigation category, was enough to win them the grand prize.

C.T. Lin, professor of mechanical engineering, advised the team, and the competition took place June 5-8, at Oakland University in Rochester, Michigan, sponsored by the Association for Unmanned Vehicle Systems International (AUVSI) and TARDEC, U.S. Army's Tank Automotive Research Development and Engineering Center.

Above, at the competition, from left: Sam Gaxiola, Adrian Inghilterra, Philip Fadriquela, Erik Wagner, Misael Toledo, Jeff Sutherland, and Sidney Lim. Front row: Bryan Juarez, Sidney Lim, Michael Gaunt, Manpreet Sidhu, Karen Guerrero, Jeff Sutherland, Erik Wagner; standing, Gavin Fallen, Steven Moro, Melody Mojib, Jangjujhar Singh, Philip Fadriquela, Luis Garcia, Misael Toledo, Adrian Inghilterra, Benjamin Davis, Sam Gaxiola, Naimat Shifa, and faculty advisor C.T. Lin.



At the Aero SAE Competition, team members Abdulrahman Abdulrahman, Allen Kasapian, Aurora Varela, Christopher Thompson, Daniel Do, David Gaeta, Eric Kattan, Ian Wilmoth, James Connolly, John Bastar, Kelvin Konevsky, Kendra Todd, Kevin Hudelson, Khaled Erdaini, Luis Calderon, Naguib Said, Paulo Yu, Raymundo Jimenez, Titus Areeckal, Vladimir Arutyunov and William Caulk, with faculty advisor George Youssef.

## Aero SAE Competition

Some may call it beginners' luck, but the success of CSUN's 21-person team of mechanical engineering seniors in the Society of Automotive Engineers' Aero Design competition April 24-26 was the result of lots of analysis, hard work and ingenuity. It had been nine years since a CSUN team had entered the competition, so unlike their competitors, the 2015 entrants had no design legacy to draw from and had to start from scratch.

The Aero SAE competition calls for the student teams to design, build and fly aircraft that meet specific criteria, and the CSUN team entered the advanced division, which required them to simulate a humanitarian aid cargo drop. In addition to designing an aircraft with a high lift-to-weight ratio, they had to design it to weigh no more than eight pounds and to drop a separate three-pound expellable cargo on a ground target from 100 feet—a feature that required a camera and telemetry.

In approaching the competition, the team members, all part of a senior design class, did background research on the competition rules to determine how they could prioritize points. Because they wanted to model the project after a serious engineering endeavor, they decided to approach it from an aerospace engineering perspective and perform as an aerospace engineering company would, with the team captain serving as chief systems engineer and with group leads for controls, propulsion and structure serving as group supervisors. The team designed a wholly composite aircraft—one of only two teams out of 70 entrants to have an entirely composite structure.

In the end, their diligent work paid off when they placed first in design presentation and third overall—a showing that left many at the competition surprised that such an accomplished team seemingly came out of nowhere.

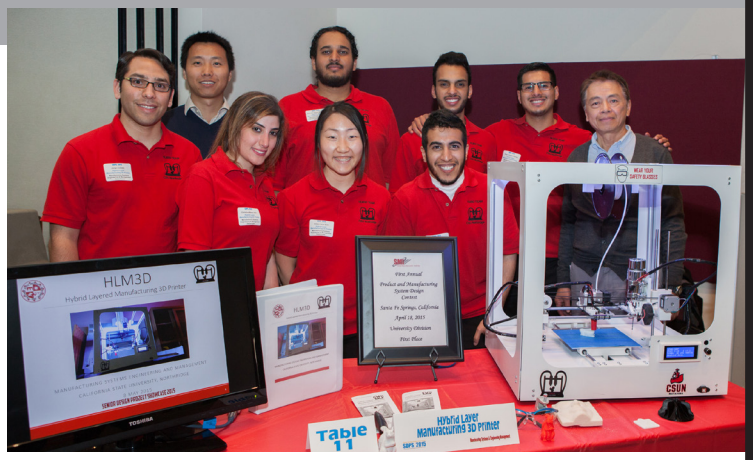
"I think it just goes to show the rigor with which we applied the engineering design process," says Vladimir Arutyunov, who captained the team. "One of the core principles of engineering is that it shouldn't matter what system you're designing—if you have a strong team and good fundamentals, you should be able to take any assignment and build it."

## MSEM SMI Competition

CSUN's winning streak actually began April 18, when a CECS team took first place in the university division of the Product and Manufacturing Systems Design Contest Challenge. MSEM teams have competed in the competition, sponsored last year by the Small Manufacturers' Institute, for 15 years. (The annual Manufacturing Challenge contest previously had been sponsored by the Society of Manufacturing Engineers.)

The winning project, a hybrid 3D printer, was developed by seven MSEM majors as their senior design project. While there are many 3D printers on the market, the students decided to add a machining feature to theirs. Ordinarily, 3D printing is additive—printers build products layer by layer based on geometry laid out in CAD software. By contrast, traditional manufacturing processes such as milling, cutting and drilling, are subtractive; products are cut from raw materials.

Because the surface of a 3D-printed product is usually rougher than that of a product created through a subtractive process, it requires finish work. Taking that into consideration, the students designed a hybrid 3D printer that included a milling tool to improve the surface quality.

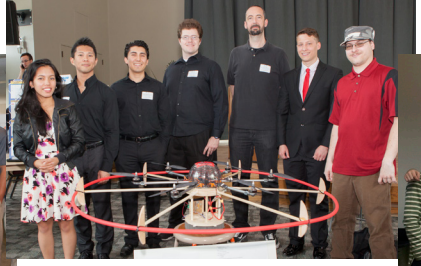



Flanked by faculty advisor Bingbing Li and MSEM department chair Kang Chang, members of the winning team pose with their hybrid 3D printer. Front row, from left: Jorge Zubiate, Christina Jolie, Aileen Shin and Naif Alabdullatef. Back row: Abdullah Bahamdin, Abdullah Alabri and Diego Vílchez.

In winning first place, the CSUN team, under the guidance of Bingbing Li, assistant professor of manufacturing systems engineering, beat out teams from 14 other universities and went home with $500 in winnings. But there was another triumph to come: three weeks later, on May 8, the project won the grand prize in the college's Senior Design Showcase, and the team was awarded a $1,000 cash prize. ❖

**SAE Aero Design Heavy Lift Aircraft**

MECHANICAL ENGINEERING (ME)
**DEPARTMENT WINNERS**
**PROJECT DISPLAY &**
**ORAL PRESENTATIONS**



**Autonomous Unmanned Aerial Vehicle**

ELECTRICAL & COMPUTER ENGINEERING (ECE)
**DEPARTMENT WINNERS**
**PROJECT DISPLAY &**
**ORAL PRESENTATIONS**

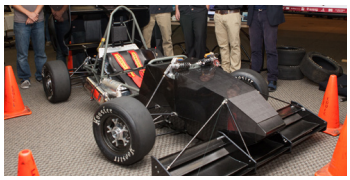

**Network of Electronic Self-Navigating Transports (NEST)**

COMPUTER SCIENCE (CS)
**DEPARTMENT WINNERS**
**ORAL PRESENTATIONS**

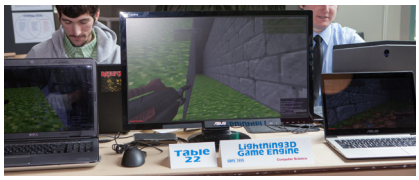
**CodeEscape**

COMPUTER SCIENCE (CS)
**DEPARTMENT WINNERS**
**PROJECT DISPLAY**

# 2015 SENIOR DESIGN PROJECT SHOWCASE







Top from left: Dean Ramesh with judges Felix Rabinovich (ATIMS), Muthu Jeganathan (JPL), Tuan Dinh (Haas Automation), John Wright (Hartzell Aerospace), Lief Morin (Key Info), Prakash Bhartia (NEO Technology Solutions), Neal Gaborno (Raytheon), Rayna Burgess (Xypro Technology), Michael Dipsia (Department of Transportation), Chris Erickson (Aerojet Rocketdyne) and Associate Dean Bob Ryan. Bottom left, Project Display judges in action: Tuan Dinh (Haas Automation), Charlie Volk (Northrop Grumman), Chris Erickson (Aerojet Rocketdyne), Felix Rabinovich (ATIMS) and Muthu Jeganathan (JPL), with students from the winning team, Hybrid Layered Manufacturing 3D Printer. Bottom right, Lief Morin (Key Info), Prakash Bhartia (NEO Technology Solutions), Naomi Palmer (JPL), John Wright (Hartzell Aerospace) and Luis Carbajo (IEEE LA Council chair) with students from the computer science team, Jail Management Single Page Application.



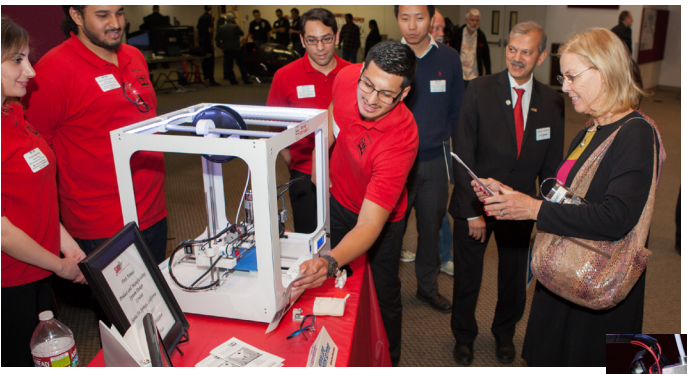

**Concrete Canoe**

CIVIL ENGINEERING & CONSTRUCTION MANAGEMENT (CECM)
**DEPARTMENT WINNERS**
**PROJECT DISPLAY**

**Towards a Splendid City**

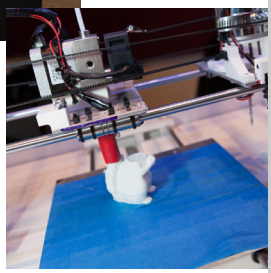
CIVIL ENGINEERING & CONSTRUCTION MANAGEMENT (CECM)
**DEPARTMENT WINNERS**
**ORAL PRESENTATIONS**

## *GRAND PRIZE WINNERS PROJECT DISPLAY*



**Hybrid Layered Manufacturing 3D Printer**

MANUFACTURING SYSTEMS ENGINEERING & MANAGEMENT (MSEM)
**GRAND PRIZE WINNERS AND DEPARTMENT WINNERS FOR PROJECT DISPLAY & ORAL PRESENTATIONS**



Photographs by Armando Tellez and Victor Kamont

**A special thank you to our judges and sponsors!**



# *CSUN students win first place in Miller Ingenuity Challenge*

Two CSUN graduate students, one earning a master's degree in manufacturing systems engineering and the other pursuing a master's degree in English literature, beat out more than 30 competitors to take first place and win $7,000 in the Miller Ingenuity Challenge, a national competition to encourage more people to pursue careers in manufacturing. The contest was launched to celebrate the opening of Miller Ingenuity's Creation Station, a Google-like think space in the middle of the company's factory. Miller Ingenuity is a Minnesota-based rail manufacturing company.

James McCloskey, the CECS graduate student, and Lily Thiemens, the English literature student, responded to the question "How might American manufacturers attract the best and brightest innovative minds to pursue careers in the manufacturing industry?" with a written document and a video that laid out a plan starting with elementary students and following through to higher education. The plan, which included video and simulation games for elementary students, after-school programs and mentorships for high school students and recruitment strategies for university students, was designed to identify top students and engage them in manufacturing. In formulating the plan, the pair drew from their own experiences in after-school programs and as video gamers.

Their win complements CSUN's own priorities. The campus is one of 150 universities nationwide that have pledged to help "fuel a renaissance" in American manufacturing as part of the White House Maker Faire Initiative launched in June 2014. CSUN is also taking a leadership role in the University Alliance Partnership to build strategic partnerships with universities around the country to strengthen advanced manufacturing. In addition, it is part of the Investing in Manufacturing Communities Partnership, launched in 2014 by the U.S. Department of Commerce to encourage communities to develop comprehensive economic development strategies that will strengthen their competitive edge for attracting global manufacturing and supply chain investments. CSUN is part of the Advanced Manufacturing Partnership of the Southern California Manufacturing Community, one of 12 communities selected out of 70 nationwide. The partnership is focused on aerospace and associated industries in the supply chain and is led by USC's Center for Economic Development. It includes local governments, businesses and educational institutions, including the five CSU campuses in the region. ❖

Lily Thiemens and James McCloskey with Steve Blue, president and CEO of Miller Ingenuity (center).

Signing of the official MoU between CSUN and THI representatives. From left, THI University president Walter Schober, CSUN professor Jimmy Gandhi and THI professor Andreas Jattke.

# International Collaborations

## Learning takes on an international flavor in joint CECS-THI course

Globalization has really taken hold in the College of Engineering and Computer Science, with international partnerships and collaborations continuing to proliferate. The most recent example took place last fall, when Shereazad Jimmy Gandhi, assistant professor of engineering management and director of the Ernie Schaffer Center for Innovation and Entrepreneurship, planned and taught a research class in supply chain management and sustainability jointly with an instructor at the Technische Hochschule Ingolstadt (the Technical University of Ingolstadt, or THI). Both classes were closely aligned so that students in California and in Germany had essentially the same experience. In November, following two months of lectures and background reading, the ten CSUN students in the class traveled to Germany for a week, where they joined up with their ten THI counterparts to visit five German companies to see firsthand how they manage their supply chains. The students met with industry professionals in the companies' supply chain and sustainability departments and took part in interactive workshops.

Perhaps the best-known company they visited was BMW, where they met with the sustainability manager in Munich. (BMW values sustainability so highly that it ranks first in the Dow Jones Sustainability Index.) The students also visited Audi, as well as three major suppliers to both car companies: Continental, Faurecia and Lebenshilfe. In addition to tires, Continental makes intelligent cruise control systems and backup cameras. Faurecia manufactures front bumpers and seating. Lebenshilfe is a nonprofit that employs people with special needs to make parts for Audi.

"It was really interesting for the students to be able to understand how supply chains work—both from the perspective of a large OEM and from the supplier perspective," says Gandhi.

The five companies then gave the students projects to work on related to issues they were having with incorporating sustainability into their global supply chains. Teams made up of two to three students each from CSUN and THI collaborated virtually on the projects using Skype and the Internet, exposing them to working on virtual teams as well.

Gandhi notes that for some of the CSUN students, the trip was their first time in Europe, and it was "a life changer." It was not, however, the first collaboration between THI and CSUN. In fall 2014, ten German students visited CSUN for a weeklong seminar in international sourcing that featured speakers and site visits to local companies. And it won't be the last collaboration between the two universities. THI students will again visit CSUN in April 2016 for another weeklong seminar, extending the partnership between the two institutions and the friendship between their faculty and students. ❖

Supavadee Aramvith (center) with Dean Ramesh (left) and Taeyou Jung (right), director of the Center of Achievement Through Adapted Physical Activity and professor in the College of Health and Human Development.

## From Bangkok to Northridge

CSUN's expertise in assistive technology continues to attract interest from abroad. Last June, Supavadee Aramvith, a faculty member in electrical engineering at Chulalongkorn University in Thailand, visited the campus to learn more about the field. Aramvith, who serves on the IEEE's Educational Activities Board along with CECS dean S.K. Ramesh, was in Los Angeles while on sabbatical. During her visit to CSUN, she met with faculty and discussed potential collaborations.

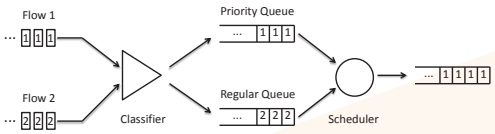
# Research Fellow

## College research fellow is keeping an eye won ISPs

On February 25, 2015, after several years of contentious debate, the FCC adopted new rules about so-called net neutrality, the Internet's guiding principle. The rules, which went into effect June 23, 2015, stipulate that broadband providers cannot block access to legal content, impede legal Internet traffic, or give preferential treatment in exchange for money or other consideration.

But CSUN's Vahab Pournaghshband isn't taking Internet service providers' compliance for granted. Instead, the CSUN assistant professor of computer science, who is passionate about net neutrality, is responding proactively. Noting that in the past, some U.S. ISPs were found to be violating net neutrality but were not forthcoming about it, he's intent on developing a novel method that will enable end users to detect violators and will work even if ISPs try to hide what they're doing.

*"If Internet companies are discriminating on content, they could slow sites with content they don't like," he says. "And that is a form of censorship."*




An illustration of strict priority queueing, one way ISPs violate net neutrality.

"We are actually talking about a global issue," he says. "It's not just a problem in the U.S. but in other countries as well."

Pournaghshband is the 2015-16 college research fellow, and he is receiving release time during the spring semester to pursue his project, titled "Detecting Net Neutrality Violators in a Dynamic Environment." Although he is not the first researcher to tackle the question of net neutrality violations, he explains that the papers published to date have assumed that the ISP is static—that an ISP that is "mistreating" data packets will continue to do so even when experiments are being run to detect the practice. But, he says, that strategy also assumes that ISPs, in turn, are not actually trying to detect the monitoring. If they want to evade detection, they might, for example, be able to fingerprint the test traffic that monitors send. They could then change their behavior and treat all traffic normally during the detection period to conceal the violation and return to mistreating packets and violating net neutrality after the test ends.

$$\exists P_{A_i} \in \tilde{P_A}, \exists P_{B_j} \in \tilde{P_B} :$$
$$d_{MB}(P_{A_i}) - d_{MB}(P_{B_j})) \geq \delta_{min} > 0$$
$$\wedge$$
$$t_T(P_{A_i}) \geq t_T(P_{B_j})$$
$$\wedge$$
$$(\tilde{P_A} - \{P_{A_i}\}, \tilde{P_B} - \{P_{B_j}\})$$

A mathematical model to describe net neutrality violators, developed by Vahab Pournaghshband.

Previous research into detecting discrimination on the Internet has focused on very specific scenarios, Pournaghshband says, which are only useful for detecting particular sorts of differentiated service. But his goal is to develop an umbrella method that will detect multiple ways that companies might mistreat data packets.

"I want to come up with a general framework so that instead of looking just into specific problems, we can find a common ground and provide one solution that can be applied to a large set of them," he says. "This is actually the first research that aims to do that."

Even though his release time for the project didn't start until the spring 2016 semester, he began working on the project last year.

"I didn't want to wait," he said. "I needed many things to be ready before I actually started."

Those things included forming a research group with a few students, including a computer science graduate student whose master's thesis is devoted to the project, as well as laying the groundwork for a simulation environment and a test bed for testing the methodology he and his group eventually develop. But he cautions that the work of developing an effective tool that will allow end users to detect net neutrality violations won't be done this year. It will require a long study and lots of collaboration to gather the extensive data needed to perform detection on a large scale. He's in this for the long haul, however, because the way he sees it, the stakes are high.

"If Internet companies are discriminating on content, they could slow sites with content they don't like," he says. "And that is a form of censorship." ❖

# College News

## Northrop Grumman funds research project with CSUN faculty

Gyros are sensors that tell pilots the degree of rotation in aircraft, and they are key components in numerous aviation instruments, whether a jumbo jet or a drone is flying. In late 2014, Northrop Grumman, which manufactures and sells gyros, contracted with Vidya Nandikolla, assistant professor of mechanical engineering, and Ruting Jia, assistant professor of electrical and computer engineering, to model an inertially stable platform, of the sort on which a camera or telescope might be mounted.

Ruting Jia

Vidya Nandikolla

Nandikolla and Jia were asked to simulate vibration for the components around the platform to see how the guiders and motors function. The purpose of the project was to gauge the performance of the company's gyros, in order to be able to demonstrate to customers which ones will work best for different applications. In conducting the cross-disciplinary research, the two faculty members worked with a graduate student who was pursuing a second master's degree in electrical engineering (he already held a master's degree in mechanical engineering). The one-year project ended in September 2015.

NASA Delegation visit.

## NASA delegation visits campus

For many years, the college's Honors Co-Op program has been opening doors for high-achieving students by placing them in internships with local companies; often those placements lead to job offers. But last April, the program also opened some doors for the college itself. CECS has been placing Honors Co-Op interns at Aerojet Rocketdyne for four years, and because of the program's success, when a delegation of small business specialists from NASA's Marshall Space Flight Center, Armstrong Flight Research Center and Washington, D.C. headquarters visited Southern California, the company invited them to stop at CSUN to tour the campus facilities and meet with CECS dean S. K. Ramesh, Ken Lord, dean of the David Nazarian College of Business and Economics, and Bruno Osorno, the professor of electrical engineering who oversees the Honors Co-Op. Ramesh and Osorno made a presentation about the Honors Co-Op model, and the guests were so impressed that as a consequence of the visit, NASA's Small Business Office placed CSUN on its nationwide list of recommended campuses for small businesses looking to recruit interns. Four representatives of Aerojet Rocketdyne accompanied the NASA visitors, including Chris Erickson, who sits on the CECS Industry Advisory Board.

## Ramesh represents CSUN and IEEE around the world

Dean S. K. Ramesh, who has taken on multiple leadership roles within the IEEE, was on the road several times in that capacity between late May and early September last year. In addition to serving on the organization's Educational Activities Board and as the 2016 president of IEEE-HKN (the electrical engineering honor society), he chaired the 2015 Pre-University Coordinating Committee. He was elected to serve as the 2016 vice president of IEEE educational activities and the IEEE board of directors during elections at the November 2015 IEEE board meeting in New Jersey.

From May 31 to June 4, Ramesh was in Ottawa, Canada, for the annual IEEE International Humanitarian Technology Conference, a meeting for those interested in exploring how technology can be used to address some of the most pressing needs in humanitarian aid and sustainable development. There he delivered a keynote talk on globalization and engineering, with an emphasis on the ways engineers work with assistive technologies.

A month later, on July 31 and August 1, he was in Bogota, Colombia, as part of the IEEE Pre-University Coordinating Committee's Teacher in Service program (TISP). Using a "train the trainer" model, TISP works with local engineers and K-12 teachers to help them incorporate engineering into the classroom through age-appropriate hands-on lessons. (The engineers serve as resources for the teachers as they implement the lessons.) Ramesh was one of the trainers, leading sessions for about 140 teachers from all over Colombia.

From September 2 to 4, he was in Lima, Peru, for a symposium for the Instituto de Calidad y Acreditación de Programas de Computación, Ingeniería y Tecnología (ICACIT), a nonprofit and non-governmental accreditation agency for computing, engineering and engineering technology programs in Latin America. Approximately five years ago, the IEEE began working with Latin American countries to help them create their own local programmatic accreditation in engineering, modeled along the lines of ABET. The ICACIT group comes together annually to examine criteria, and Ramesh led workshops on establishing learning objectives and assessing outcomes.

In October, he was in Pretoria, South Africa, where he led IEEE's first-ever Exhibits Summit focusing on science centers and museums to develop and implement interactive

From left: Mike Bruton, exhibition consultant, Mike Bruton Imagineering; Dean Ramesh; Jean Lubuma, dean of Natural and Agricultural Sciences, Rudi Horak, director of Sci-Enza and Sunil Maharaj, dean of the School of Engineering, all from the University of Pretoria; Saurabh Sinha, dean of Engineering and the Built Environment, University of Johannesburg; and Karre Laxminarayana, Shadan College of Engineering and Technology, event planning committee member.

exhibits to promote STEM education in general and topics from IEEE's fields of interest.

In his new role as the IEEE vice president for educational activities, Ramesh leads a team of over 100 volunteers and 23 staff members and oversees and coordinates a broad spectrum of programs and activities worldwide, covering pre-university education, university education and continuing education.

## Keck Foundation gift anchors new composite manufacturing lab

In the classic 1967 film *The Graduate*, perhaps the best-known line is a single word: "Plastics." It's advice a family friend gives recent college graduate Benjamin Braddock, who is uncertain about his future. "There's a great future in plastics," the friend assures him.

Flash forward nearly 50 years, and the advice could well be "Composites." Whether it's the Boeing 787 Dreamliner, the BMW i3, high-end sports cars and race cars, bicycles and even trains, trucks and ships, composite materials increasingly are being used in the transportation industry wherever weight and efficiency are of paramount importance. They are also starting to play a bigger role in biomedical applications, where they may have advantages over traditional materials and be used prosthetically to mimic biological tissues and restore function.

Because the properties of composite materials are substantially different from those of traditional materials such as metals, so are the methods for processing them. Instead of machining, for instance, they may be integrated into molds. They are also impervious to corrosion or rust.

Up to now, the study of composites at CSUN has largely been restricted to graduate-level courses. But a recent grant from the W. M. Keck Foundation will soon be changing that. Last year, the foundation gave the college $300,000 to establish the W. M. Keck Foundation Composite Manufacturing Lab, a multipurpose facility to accommodate undergraduate and graduate students' projects as well as faculty research.

"Because not all undergraduates end up in graduate school, and composite manufacturing techniques are not taught elsewhere in the undergraduate curriculum, we wanted to create an undergraduate lecture-lab course and give students hands-on experience with these materials in the lab," explains Hamid Johari, chair of the Department of Mechanical Engineering. "The idea is that they will learn basic theory in the classroom, then go into the lab and work with composite materials to learn about their properties."

The new undergraduate lecture-lab course has been approved for fall 2016, and the lab's major piece of equipment, an autoclave, has been ordered and is expected to arrive in the spring. While more equipment will be required to make the lab fully functional, the Keck Foundation's generosity has laid the groundwork for an entirely new direction for CECS undergraduates. Expect to see more composites in senior design projects—and graduates' career plans—in the very near future.

## Innovation, entrepreneurship are center's stock-in-trade

Big things are brewing at CSUN's Ernie Schaeffer Center for Innovation and Entrepreneurship. Taking its name in earnest, the center, which is playing a key role in the California Career Pathways Trust (CCPT) grant, is pursuing several innovative—and potentially influential—projects.

Recently, for example, thanks to a grant from the campus Office of Community Engagement, Shereazad Jimmy Gandhi, the assistant professor of engineering management who heads the center, began transforming his lean manufacturing course into a service-learning class. In partnership with a local nonprofit called New Horizons, which employs people with special needs to carry out simple manufacturing and assembly, students enrolled in the course have been working with the organization to explore ways to improve its processes. "My students actually go into the organization and make

new horizons
Serving Individuals with Special Needs

recommendations to them about how lean principles can be implemented," Gandhi says.

In the research arena, the center is exploring aspects of social sustainability and entrepreneurship, and Gandhi is heading an international study investigating how entrepreneurship takes place in nine countries, as well as the factors that lie behind its successes and challenges. "It's a huge project, and we just finished developing the survey," he says.

And finally, the center is incorporating the topic of entrepreneurship into the second edition of the American Society of Engineering Management (ASEM) handbook. The handbook is used by industry practitioners, and the ASEM provided grant funding for the center to add the new material. A student is working with Gandhi to carry out the update, which will be finished later in the spring.

All of these initiatives are creating important knowledge, experience and opportunity for students, faculty, industry and the community (in an innovative and entrepreneurial way, of course).

## Peggy Nelson, IEEE-HKN induction ceremony

Last May, a special ceremony was held to induct Industry Advisory Board member Peggy Nelson into the IEEE-HKN (Eta Kappa Nu) honor society. Members of this prestigious electrical engineering organization include students, alumni and other professionals who have demonstrated exceptional academic and professional accomplishments.

From left: Dean Ramesh, Peggy Nelson, electrical engineering professor Bruno Osorno and Catherine Hartnek, CSUN IEEE-HKN president (2014-15)

# An inside look at the Microwave and Antenna Engineering Laboratory

Ronald Pogorzelski

Sembian Rengarajan

The college's E. S. Gillespie Microwave and Antenna Engineering Laboratory welcomed the public July 9, for an open house that drew nearly three dozen attendees. The lab, which is used to study ways of measuring the performance of microwave antennas, is named for the late Edmond S. Gillespie, former chair of the Department of Electrical and Computer Engineering and the lab's founder.

It had been six years since the facility's last open house, and for Sembiam Rengarajan, professor of electrical engineering, and Ronald J. Pogorzelski, an adjunct faculty member in the electrical and computer engineering department, both of whom conduct extensive antenna research, it was a chance to reach out to colleagues and potential collaborators in academia and industry.

"Some companies view us as a resource for measuring their antenna products—to see how the antennas perform," says Pogorzelski. "Others might have projects for our students, like design clinics. The open house was a way for us to maintain connections to people interested in our work. It's important to stay in contact."

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# CREST Conference influence grows

In just a few years, the California Renewable Energy and Storage Technology (CREST) Conference has become a tradition at CSUN. As evidence of its growing importance in the energy field, the 2015 conference, held Saturday, February 21 in the University Student Union's Grand Salon, was sponsored by the National Science Foundation and attracted nearly 90 attendees, about half of whom were students. The local IEEE chapter provided additional support.

As it had in previous years, the conference featured a mix of perspectives, disciplines and industry sectors. The morning session, which focused on advances in renewable energy technology, began with a welcome from CECS dean S. K. Ramesh and Hamid Johari, chair of the Department of Mechanical Engineering. Peter Gevorkian, president of Vector Delta Design group, followed with a plenary address about the design of large-scale solar power generation systems. Then a panel was convened that included William Glassley of UC Davis, who spoke on combining geothermal resources with other renewable technologies and the strategic utilization of California's renewable resource base; Rafael Alcalde-Navarro of GE Energy, who is responsible for implementing hundreds of millions of dollars' worth of wind farms and who talked about power and water and the mechanics of wind project development; and Phil Father, CEO of Prairie Fire LLC, which converts biomass to energy and who spoke on conversion technologies and their future in California.

The lunchtime keynote speaker was Congressman Tony Cardenas of California's 29th Congressional District, an electrical engineer by training who talked about the challenges of getting green energy legislation passed in Congress and stressed the importance of having scientists and engineers become active in public life.

Congressman Tony Cardenas, CREST 2015 keynote speaker

During a Q&A session, he also talked about the importance of the CSU in advancing and implementing renewable technologies.

The afternoon panel was devoted to challenges in the Smart Grid, energy storage and risk analysis. It featured Hasan Ali from the University of Memphis, who discussed solutions to power quality and stability issues of wind generator systems; Keith Malone from the California Fuel Cell Partnership, who talked about preparing for the market launch of hydrogen vehicles; and Akin Olufoweshe from Chevron, who made a case for the sustainability of fossil fuels. Following the panel, Kevin Randolph of the Los Angeles Cleantech Incubator spoke about LACI initiatives from an industry perspective.

A special highlight of the afternoon was a showcase of alternative fuel vehicles—electric and fuel cell cars—which attendees could test drive on campus.

Abhijit Mukherjee, associate professor of mechanical engineering, again served as conference chair and was pleased with the discussions that the panels prompted. "To promote debate was a key objective of this conference," he says.

This year's CREST Conference is tentatively planned for the fall.

# 2015 San Fernando Valley Engineers' Council College Awardees

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### Outstanding Engineering Achievement Merit Award

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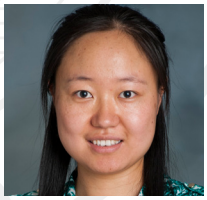


Ruting Jia

## Paper Award

Ammar Surti's paper with Ruting Jia, assistant professor of electrical and computer engineering, won third place in the graduate student paper awards at the ASEE-GSW conference, held March 25-27, 2015 at the University of Texas at San Antonio.

## Publication

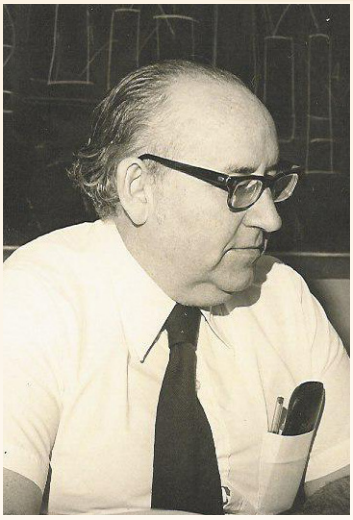
Ronald J. Pogorzelski, an adjunct faculty member in the Department of Electrical and Computer Engineering and IEEE Life Fellow, had an article titled "Analysis and Demonstration of Two Spherical Mode Expansion Resolution Algorithms" published in the March 2015 issue of *IEEE Transactions on Antennas and Propagation.*

## *In Memoriam*

### RAY DAVIDSON

*(August 3, 1928 – June 21, 2015)*

*The college extends its heartfelt condolences to Mrs. Verla Davidson and family on the passing of Raymond Davidson, emeritus professor and former chair of the Department of Electrical and Computer Engineering, last June.*



Davidson pictured here with alumni Harlis Brend, Don Bostrom and John Benya at a campus alumni event.

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