

# interface

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Technology



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University of California, Irvine

Calit2 UC Irvine  
TechPortal

Crossing  
the Chasm

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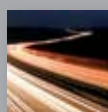
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Calit2 UC Irvine

TechPortal

# INCUBATING INNOVATION

by Anna Lynn Spitzer

**L**ike a spinning tornado, the global economy has inhaled everything in its path over the last couple of years. Real estate, the stock market, jobs and retail sales – not to mention consumer and business confidence – have been sucked into the whirling vortex.

It wouldn't seem the most promising time to launch a new business.

History, however, provides evidence to the contrary. FedEx, General Electric, Microsoft, LexusNexus and CNN, among others, were founded during recessions. The key to successful startups, experts say, is recognizing and filling a need in the market.

Another factor is proving significant as well: incubation.

Business incubators are sponsored by academic institutions, governments, nonprofit agencies or private developers. They offer affordable space, support services, technical assistance and networking opportunities to new businesses struggling to gain a toehold in the commercial marketplace.

*(continued, page 2)*



*"The Calit2 TechPortal will keep the pipeline of useful innovations moving to the public."*

The number of business incubators has swelled since the first one opened its doors in 1959 in Batavia, N.Y. The National Business Incubation Association estimates that as of October 2006, there were about 7,000 business incubators worldwide. In the past 20 years, the number of incubators in North America has doubled to more than 1,400.

Even more impressive, more than 87 percent of incubator-nurtured firms are still in operation.

#### **Speeding Technology Transfer**

Over the last few years, the University of California has begun establishing technology incubators on its campuses to cultivate new businesses created by UC entrepreneurs. The latest of these new incubators opens this spring in the Calit2 Building at UC Irvine, marking the third UC incubator housed in Gov. Gray Davis Institutes for Science and Innovation (ISI).

The four ISIs – spread across nine UC campuses – were created in 2000 by then-governor Gray Davis specifically to spur innovation in the Golden State and accelerate technology transfer. The new incubator – dubbed TechPortal – will help fulfill the ISI mission: speeding the transfer of academic research and ideas into the marketplace, and stimulating the California economy.

Calit2's TechPortal, modeled after successful incubators at UC San Francisco and UCLA, will serve as a gateway to commercial viability for UCI inventions and spinoff companies. TechPortal offers fledgling companies

affordable space, access to facilities and services, and mentoring, expertise and programs to help them succeed.

The UC system, with its 10 campuses, currently produces approximately 45 startups each year, around 8 percent of the U.S. total. By comparison, MIT produces in the neighborhood of 30 new firms each year from its one campus.

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**"This will be the place for entrepreneurs to go for exciting interactions and for moving their ideas from bench to business."**

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"Incubating new businesses is part of the mission of the Institutes for Science and Innovation," says Jacob Levin, assistant vice chancellor for research development and a key incubator architect. "The Calit2 incubator will help fulfill UC's mission to translate innovation and discoveries to the marketplace."

Vice Chancellor for Research Sue Bryant sees a wealth of potential in the endeavor. "This incubator will go a long way toward more successfully transforming promising research into marketable products," she says. "It will keep the pipeline of useful innovations moving to the public."

#### **Growing Demand**

Levin believes Calit2 offers the perfect combination of lab space, experts, programs and facilities. Its wet lab space and dry lab space provide options for a wide range of startup companies.



UCSF's ISI, the California Institute for Quantitative Bioscience, opened its QB3 Garage in 2006. It has since nurtured 12 companies, four of which have secured venture funding, and a fifth that was acquired for \$25 million. Ten of the 12 companies are still in operation.

The Garage currently houses five companies; associate director Douglas Crawford says he gets two to four inquiries each week, and four companies typically are waiting to move in. Demand is so strong, in fact, that the Garage recently entered into an agreement with neighboring biotechnology company FibroGen, Inc., which committed 15,000 square feet of its 239,000-square-foot building to the incubator effort. More than half the space in this QB3 Garage annex is already rented.

At UCLA's California Nanosystems Institute, the 2,000-square-foot incubator that opened last year can accommodate up to 10 companies. Currently, six are being incubated and four more are making final move-in preparations.

UCLA's steady increase in the number of companies it spins off – 22 in the last year alone – led to the decision to open an incubator. "We have greatly increased the number of startup companies over the past four years, so we decided we needed an incubator," says Kathryn Atchison, UCLA vice provost of intellectual property and industrial relations. "NBIA (National Business Incubation Association) data shows that incubated companies are more likely to survive and flourish."

#### **Irvine Launch**

The Calit2 TechPortal can house up to eight companies in its 1,460 square feet of space; currently, several prospective businesses are in discussions with incubator administrators. To join the incubator, a company must meet certain criteria: it has to be either based on or licensing UCI technology, already incorporated and able to commit to six months of rent.

*(continued, page 4)*

# From **LAB** to Marketplace

Many well-known products and businesses started life as research projects in university laboratories. Among the most recognized are:

PRODUCT/ COMPANY	DESCRIPTION	UNIVERSITY
<b>Google</b>	Web Search	Stanford
<b>Lycos</b>	Web Portal	Carnegie Mellon
<b>Gatorade</b>	Sports Drink	University of Florida
<b>Chiron</b>	Blood Screening	UC Berkeley, UC San Francisco
<b>ALEKS</b>	A.I. Tutoring System	UC Irvine
<b>Genentech</b>	Biotechnology	UC San Francisco
<b>Taxol</b>	Chemotherapy	Florida State
<b>Gleevac</b>	Targeted Cancer Drug	Oregon Health and Sciences University
<b>Ultreo</b>	Ultrasound Toothbrush	University of Washington
<b>Smart Balance</b>	Butter Substitute	Brandeis University
<b>FluMist</b>	Nasal Flu Vaccine	University of Michigan
<b>Nicotine Patch</b>	Smoking Cessation Aid	UCLA
<b>Cochlear Implant</b>	Implantable Hearing Aid	UC San Francisco
<b>Farecast.com</b>	Airfare Prediction Site	University of Washington
<b>KineMed</b>	Medical Imaging	UC Berkeley
<b>Nanosys</b>	Nanotechnology	Cal Tech
<b>TomoTherapy Inc.</b>	Radiotherapy/Tomography	University of Wisconsin
<b>CerePedics, LLC</b>	Bone Graft Products	UC San Francisco
<b>Restasis</b>	Dry Eye Treatment	University of Georgia
<b>Allegra</b>	Allergy Relief	Georgetown University

*“Most university technology is pretty early-stage and needs time to be developed, from research to prototype to product.”*



An oversight committee comprised of Calit2 faculty division council members, UCI senior administrators, local business leaders and members of business development organizations will evaluate all applications for admission (see pg. 8).

Selections will be based on a company's commercialization potential; interactions with UCI faculty, staff or technology; and soundness of business plan, among other criteria.

Incubator entrepreneurs partake of a host of benefits that facilitate their journey to commercialization.

Affordable space, for example, which is available on a short-term lease. "One of the advantages of a business incubator is that businesses can rent just 150 square feet of space, for a reasonable price, so that keeps their costs way down," Levin says. In the commercial real estate market, "that's very, very hard to do."

Often, that affordable space makes or breaks a business, according to QB3's Crawford. "Our incubator has really been a transformative and enabling experience for the companies," he says. "Those who have moved into our space here have told us that it was either this space or not starting the company at all."

#### **Innovation Situation**

Entrepreneurs also benefit from a wide range of programs and services, all provided in a central location.

At UCI, the Merage School of Business, the Don Beall Center for Innovation and Entrepreneurship, the Office of Technology Alliances, OCTANe (which recently merged with the Orange County Venture Group, creating the largest innovation-oriented organization in the county) and the Irvine Incubation Network will offer classes, workshops, lectures, networking opportunities and one-on-one advice to

guide the new enterprises as they build connections, develop business plans and market their technology to investors.

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***“The research comes easily to academics but the business aspect is sometimes harder and less interesting.”***

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Additionally, all UCI lab facilities are easily accessible and available for recharge. The Zeiss Center of Excellence, the Calit2 BiON facility, the Integrated Nanosystems Research Facility (INRF), the Materials Characterization Center (MC2) and the HIPerWall, in addition to other labs and clean rooms on campus, offer incubated businesses convenient access to the latest equipment and technology resources.

Calit2's location is advantageous to budding entrepreneurs, too. It is convenient to biological sciences, engineering, ICS and physical sciences core facilities, as well as the Center for Computer Gaming and Virtual Worlds, and the currently-in-development Rapid Manufacturing Center. A new coffee kiosk, Java City, provides an ideal spot for networking, informal business meetings and interactions.

"You're right here, in the midst of everything you need to use," says Levin. "If you need a microscope or you require nanofabrication, you pay just for what you need. If you're in rented space in the Spectrum or in a technology park, you have to purchase all your own equipment, even if you're only using it once a month."

Add to that the campus's wealth of faculty expertise, and the nascent companies have – in a one-stop shop – the capabilities and resources necessary to manage the host of design, regulatory, manufacturing, marketing and fundraising issues that lay ahead.

"I think it's really a benefit to be part of this innovative environment that the campus and Calit2 provide," Levin says.

*(continued, page 6)*

# TechPortal: a HELPING HAND



The Calit2 TechPortal offers a number of programs and networking opportunities to new businesses as they embark on the process of commercialization.

## **Entrepreneurs Forum@UCI**

The Entrepreneurs Forum at UC Irvine provides an intimate and informative setting for faculty, researchers, students and staff who are interested in the entrepreneurial process. Meets monthly during the regular academic year in Calit2 seminar room 3008. Contact: Tanya Zabalegui, [tanyaz@uci.edu](mailto:tanyaz@uci.edu).

## **LaunchPad**

LaunchPad is a program provided to incubator occupants by OCTANe, a Southern California organization that works to accelerate startups through a comprehensive program that quickly identifies and connects people, capital and technology. LaunchPad, which provides individualized and value-added support to early stage biomedical, technology and cleantech companies, keeps office hours at the Calit2 Building at UCI 2-5 p.m. every Tuesday in Room 4106. Researchers, faculty, staff and students are welcome to stop by or make an appointment for complimentary consulting on how to transfer their technology into the marketplace. Contact: Luis Vasquez, [luis.vasquez@octaneoc.org](mailto:luis.vasquez@octaneoc.org).

## **Matrix Mixer**

Monthly event in the Calit2 Building atrium that gives graduate students and researchers from the institute and the business, law, life sciences, engineering and computer science schools an opportunity to mingle with others who share their passion for entrepreneurship. Contact: Charles Baecker, [cbaecker@uci.edu](mailto:cbaecker@uci.edu).

## **Business Plan Competition at The Paul Merage School of Business**

Offered to all UCI students, staff and researchers, this competition offers the opportunity to form a team, create a business plan and potentially fund a business idea – all within seven months. Contact: Charles Baecker, [cbaecker@uci.edu](mailto:cbaecker@uci.edu).

## **Igniting Technology at Calit2**

Igniting Technology, a semiannual panel presentation, is sponsored by intellectual property law firm Knobbe Martens Olson & Bear LLP in partnership with the UCI division of Calit2. The moderated presentations are offered in May and November. They feature four or five presenters, including researchers, industry partners, entrepreneurs and

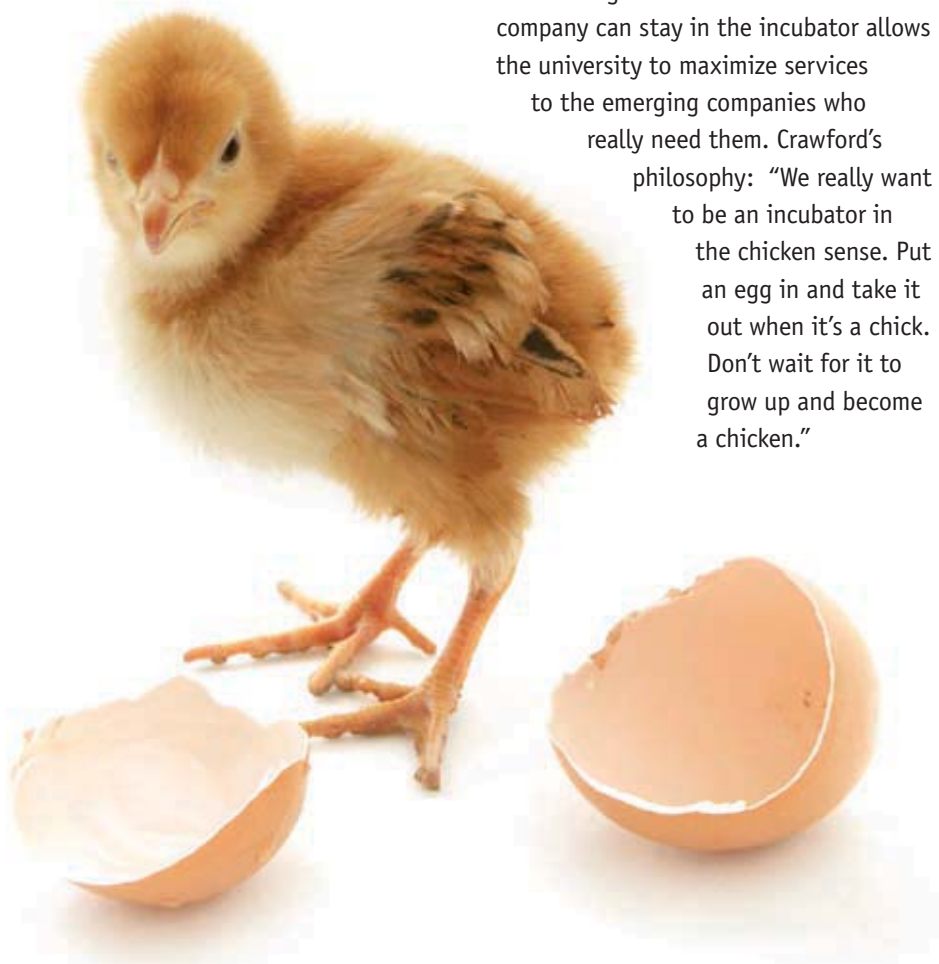
venture capitalists, followed by a moderated question-and-answer session with the audience. Each event examines a critical issue that can be improved through technologies in development at UCI. The evening concludes with a networking session that includes dinner and exhibit tables. Contact: Shellie Nazarenus, [snaz@calit2.uci.edu](mailto:snaz@calit2.uci.edu).

## **Entrepreneurship Seminar Series**

The Entrepreneurship Seminar Series provides a real-world introduction to the theory and practice of entrepreneurship. Through a series of presentations by prestigious entrepreneurs and industry leaders, participants will explore the various organizational, strategic and financial challenges facing entrepreneurs. Topics include startup strategies, business idea evaluation, business plan writing, and introduction to venture capital. All guest lectures take place in the McDonnell Douglas Engineering Auditorium in The Henry Samueli School of Engineering at UCI. Contact: Goran Matijasevic, [goran@uci.edu](mailto:goran@uci.edu).



*"We really want to be an incubator in the chicken sense. Put an egg in and take it out when it's a chick. Don't wait for it to grow up and become a chicken."*



"To have access to all the entrepreneurial resources in one place is going to maximize chances of success."

Calit2 Irvine Director G.P. Li agrees. "We think of our new TechPortal as an innovation corridor," he says. "It has the infrastructure to support new businesses and is the gateway to other shared resources on campus."

Companies benefit, too, from the close proximity to other startups in the same stage of development. "They get the intellectual vitality of the community, which is very important, especially for small companies," Crawford says.

#### **From Bench to Business**

Its creators envision the Calit2 TechPortal as an innovation nexus for developing and transferring technologies into the marketplace. Says Levin: "This will be the place for entrepreneurs to go for exciting interactions and for moving their ideas from bench to business."

Companies will remain in the incubator for up to two years before moving on to larger headquarters.

Limiting the amount of time a company can stay in the incubator allows the university to maximize services

to the emerging companies who really need them. Crawford's philosophy: "We really want

to be an incubator in the chicken sense. Put an egg in and take it out when it's a chick. Don't wait for it to grow up and become a chicken."

The economic downturn has provided a "perfect storm" scenario for the business incubator model to flourish, but Levin believes the concept transcends transitory financial woes. "Incubators are an important model for the future," he states. With large companies under increasing scrutiny to improve the bottom line, corporate research and development has gone the way of the dinosaur. "These transformative, groundbreaking kinds of ideas are going to happen in the protected environment of the university," he predicts.

Startup costs can be formidable, however, says UCLA's Atchison, and the incubators can help. "Most university technology is pretty early-stage and needs time to be developed, from research to prototype to product. The incubator helps to defray the costs of that R&D."

#### **Win-Win Proposition**

A thriving incubator benefits its host university as well as the startup companies it nurtures. Goran Matijasevic, director of research development for The Henry Samueli School of Engineering and a designer of UCI's incubator, says that while universities churn out sophisticated research, they often fall short at "crossing the chasm" – taking that research from bench top to prototype. "The incubator provides the company perspective – what is required to develop the research and how it can be taken to the next level."

Associate Vice Chancellor for Research Mark Warner concurs. "The research comes easily to academics but the business aspect is sometimes harder and less interesting," he says. "The incubator offers important expertise – mentoring and other services that can help young companies evolve into successful businesses."

Increased facility usage helps support university labs and testing centers, and can lead to the development of additional research facilities to meet the needs of the incubating companies.

And when successful spinoffs are



ready to hire staff, they often look to the university's interns and graduates. Case in point: Newport Beach-based RF Nano, whose first three employees were UCI grad students.

Lastly, the successful incubator can enhance the university's visibility in the community.

### **Growing the Economy**

Launching viable businesses that can contribute to the state's economy, however, remains the program's bedrock.

They may start out small, but these companies might someday employ hundreds of people and provide millions of dollars in tax revenue, playing an increasingly important role in the state's and country's economic viability.

"Incubated companies bring new jobs and funding that support the economy," Atchison says.

NBIA statistics provide concrete evidence. The organization estimates that in 2005 alone, North American incubators assisted more than 27,000 startup companies, which provided full-time employment for more than 100,000 workers and generated annual revenue of more than \$17 billion.

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**"The best way for basic research to benefit the citizenry is by converting our creative processes into products that companies produce."**


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"In the long term, we are helping to redress the growth and economic crisis in California," adds Crawford, who views the

incubators as a moral imperative of the university's responsibility to the state.

He would like to see an incubator on each of the 10 UC campuses. "The best way for basic research to benefit the citizenry is by converting our creative processes into products that companies produce. If we don't help make that bridge between the university and startups or existing companies, we're violating our social contract."

For Levin, incubators are instrumental to the university's mission to develop innovations and deliver them to the public. "It's an outgrowth of the basic research that goes on here; that research needs to be translated into something to have value," he says.

"I actually think the business incubators are going to become a part of every successful 21st-century university." 

## I G N I T I N G   T E C H N O L O G Y

**On Thursday, May 20, 2010,** Calit2 will unveil TechPortal, a new technology business incubator located in the institute's building at UC Irvine. TechPortal is a one-stop shop for fledgling companies; the nearly 1,500-square-foot incubator offers affordable space, access to facilities and services, business programs, expertise and mentoring for up to eight companies at a time. TechPortal will accelerate the transfer of research and ideas into the marketplace by serving as a gateway to commercial viability for startup companies.

### **Presenters:**

- **Douglas Crawford**  
QB3 Garage associate director & Mission Bay Capital managing director
- **Michael Guilian**  
Knobbe Martens partner & program moderator
- **Stephen Jenks**  
UCI engineering professor & Hiperwall Inc. co-founder
- **Matthew Jenusaitis**  
OCTANe CEO
- **Jacob Levin**  
UCI assistant vice chancellor for research development

**Join us the evening of May 20 as our Igniting Technology program showcases Calit2's TechPortal.**

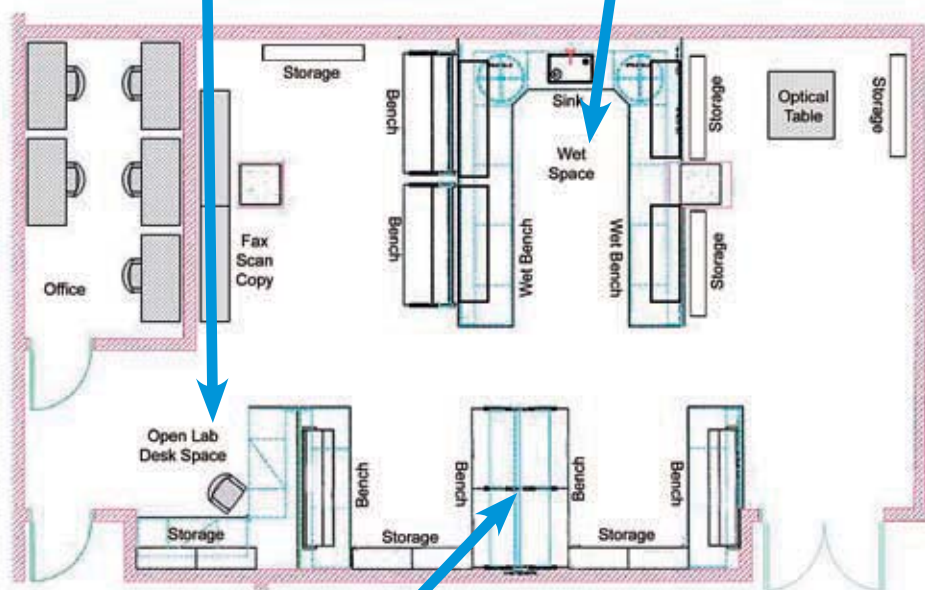
Don't miss this chance to be among the first to learn more about the exciting opportunities for researchers, entrepreneurs and investors!

**Registration is required; visit [www.calit2.uci.edu](http://www.calit2.uci.edu) for complete details.**

Igniting Technology is sponsored by Knobbe Martens Olson & Bear LLP in partnership with the University of California, Irvine division of the California Institute for Telecommunications and Information Technology.



# Just the Facts



- Approximately 1,500 total square feet
- Full occupancy: 8 companies
- Each tenant will lease roughly 150 square feet of flexible lab space at market rates.
- Month-to-month leases, with a minimum commitment of 6 months and a maximum occupancy of 2 years.
- Tenants have access to a common area, and to UCI services and facilities on a recharge basis.
- Only companies based on UCI technology or founded by UCI faculty, staff or students are eligible for tenancy.
- An oversight committee will evaluate all applications for admission.
- Companies will be selected based on their potential for commercialization, extent of interactions with UCI researchers or university technology, and soundness of business plan.
- UCI Office of Technology Alliances will review prospective companies to ensure that IP and conflict-of-interest issues are closely managed.
- All TechPortal companies will carry their own insurance, with terms pursuant to UC policy.
- The oversight committee will meet at least quarterly to evaluate success of the incubator as a whole and address any tenant issues.
- TechPortal will be managed by Calit2, with the UCI Calit2 director serving as incubator manager, and Calit2 staff assisting in day-to-day operations.



## TechPortal Oversight Committee

**G.P. Li**  
Calit2 Irvine director – Committee Chair

**Charlie Baecker**  
director of the Don Beall Center for Innovation and Entrepreneurship

**Bruce Hallet**  
UCI alumnus and member of the UCI Chief Executive Roundtable

**Ronnie Hanecak**  
assistant vice chancellor for UCI's Office of Technology Alliances

**Matthew Jenusaitis**  
CEO of OCTANe

**Jacob Levin**  
assistant vice chancellor for campus research development

**Goran Matijasevic**  
director of research development for engineering

**Richard Matthew**  
professor and Calit2 division council representative

**TBA**  
professor and Calit2 division council representative

**Robert Romney**  
UCI alumnus and member of the UCI Chief Executive Roundtable

**Mark Warner**  
associate vice chancellor for campus research administration

# The Road WELL-TRAVELED

by Anna Lynn Spitzer

**T**he road to successful commercialization has more than one on-ramp. TechPortal is Calit2's first official incubator but for years, the institute has nurtured young companies in a number of different, but equally effective, ways.

**Virtual incubation** gave birth in 2004 to CODA Genomics, which was spun out from UCI synthetic biology research. Microbiology and molecular genetics professor G. Wesley Hatfield and computer science professor Rick Lathrop set up shop together in Calit2's first-floor wet lab; their collaboration led to the development of CODA's synthetic gene-assembly kits. The company, which later changed its name to Verdezyne, initially operated without manufacturing facilities, research staff or equipment by "renting" university facilities, equipment and instrumentation through recharge agreements. CODA moved into its own headquarters in Laguna Hills in 2006, before moving again, into an even larger facility in Carlsbad, Calif.

Incubation can also take the form of **sponsored grants** like the Small Business Technology Transfer (STTR) Program, administered by the U.S. Small Business Administration Office of Technology. STTR grants are made to small technology businesses with the stipulation that they partner with a research university or other nonprofit organization. Calit2 has participated in many of these small business ventures, including an ongoing collaboration with Maxwell Sensors, which is developing radio frequency identification sensor tags.

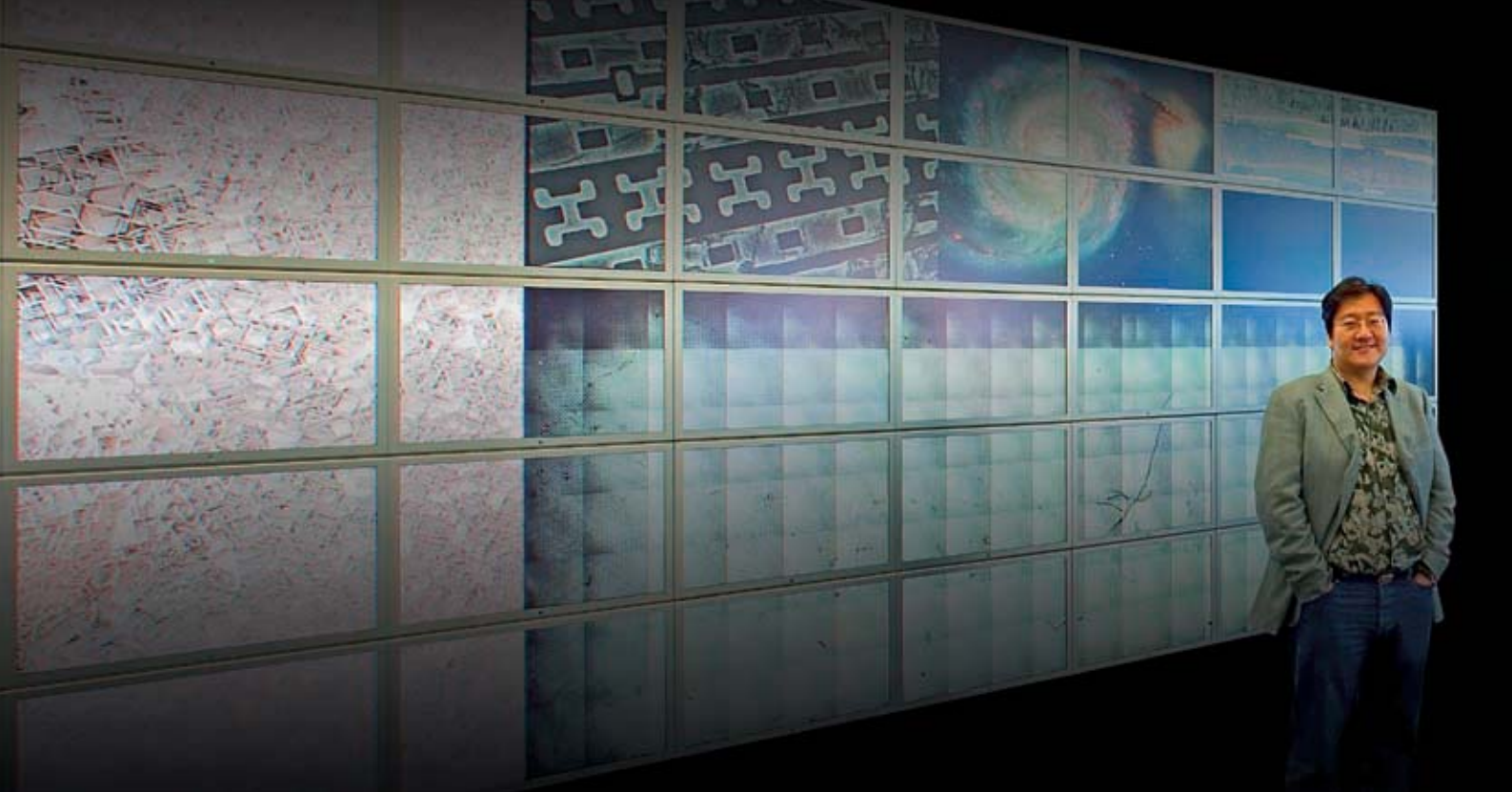
Then there is Calit2 academic-turned-commercial sensation Hiperwall Inc. The business was spun off from NSF-funded visualization research, and was incubated **in-house** in the institute's Visualization Lab alongside its namesake, the original HIPerWall. The young company has acquired several distribution partners, leading to the installation of Hiperwall systems around the world in a wide variety of public and commercial venues.

The road to commercialization is paved with grand ideas and sealed with a little nurturing ...

*(continued, page 10)*







## Wall of Possibilities

As the moving walkway whisks them through the terminal at Belgium's Brussels National Airport, travelers wave and gesture at brightly colored renderings of themselves on a 48-foot-wide display wall. The images wave and gesture back from the bank of monitors mounted next to the human conveyor system.

The moving diorama is not meant for entertainment alone. Instead, infrared sensors are measuring the travelers' body temperatures to detect illness, and are streaming the information to the airport's Hiperwall-based system, where the data is transformed into a compelling, interactive display.

The visitors probably don't know that the software driving the engaging exhibit is the result of academic research conducted thousands of miles away, at UC Irvine.

### From Research to Result

Hiperwall Inc., launched in 2008, is a spinoff company that grew out of NSF-funded visualization research conducted in the Calit2 Building. The company produces a software system that converts a set of standard computer monitors into an ultra-high-resolution display wall. The displays, which can range from 4 monitors to 80 or more, are capable of showing simultaneously

high-resolution images, HD video, HD streaming content and PC applications in a variety of sizes and presentations.

The original HIPerWall (Highly Interactive Parallelized Display Wall) project is a room-sized, 50-monitor, grid-based display that transforms massive data sets into stunning visualizations at a 200-million-pixel resolution. That is 100 times the resolution of state-of-the-art high-definition television.

It can display one extremely large image in great detail or many smaller images, as well as streaming video and 3D models that can be moved, resized, layered and otherwise manipulated from a control node.

Since it debuted in 2005, HIPerWall has facilitated collaborative research on topics ranging from neurobiology to climate simulations to emergency management.

Once operational, the dramatic display quickly became a must-see destination for visitors to the Calit2 Building.

"From day one, everyone who saw HIPerWall asked, 'How do we get one?'" says Steve Jenks, assistant professor of electrical engineering and computer science, and Hiperwall Inc. co-founder. Jenks, who developed much of the

software that controls the advanced distributed-computing and rendering techniques, says that at the time, adapting the system for outside users was a complex process that required a lot of custom coding. "We had a team to do the coding for interested UCI researchers but we really didn't want to become tech support for everyone else."

### Timing is Everything

At around the same time, UCI computer science alumnus Jeff Greenberg contacted his alma mater to volunteer his services. "I just wanted to get involved with the university again," says Greenberg, who, coincidentally, had years of technology-company startup experience under his belt. Instead of being asked to help with fundraising or membership drives as he expected, he was introduced to the Office of Technology Alliances, which, he learned, was on a quest to transform university technology into viable companies.

That introduction eventually led Greenberg to form Tech Coast Works, an incubator entity through which he would help UCI researchers commercialize their inventions.

His first stop: HIPerWall. "Jeff saw our technology and thought it was worth productizing," Jenks says.





*From left: Kim, Jenks and Greenberg incubated Hiperwall Inc. in the Calit2 Visualization Lab alongside research namesake HiperWall.*

Greenberg worked with Jenks and postdoctoral researcher Sung-Jin Kim, Hiperwall Inc. co-founder, on making the software more user-friendly. He guided them through the maze of required paperwork: disclosures, licenses and other agreements, and also negotiated a distribution deal with consumer electronics giant Samsung.

#### **User-Friendly Solution**

Hiperwall Inc. (the spelling was changed to differentiate it from the original HiperWall) produces a software system that uses “sender” technology and an easy-to-use interface to transfer data from any laptop or desktop PC directly to Hiperwall monitors, which can be installed in any configuration.

“We can take the output from any PC and put it up on the wall,” Jenks says. “The user just installs a little program to make it work, and that made it commercially viable. You plug your PC right into the network and you’re done.”

The system is hardware-agnostic – it can be used with LCD, plasma, CRT or rear-projection displays and an ordinary Ethernet network – giving it hundreds of possible applications: command-and-control rooms at government, military, utility and transportation installations; trading floors; medical/scientific

imaging; education; aerial imaging and fleet management. Currently, it is installed in more than 100 locations around the world. Revenue is expected to top \$1 million this year.

LaSierra University in Riverside, Calif. recently installed a 13-monitor Hiperwall system in a multi-purpose classroom. The result, says associate dean Nate Brandstater, is increased student collaboration and an enthusiastic classroom atmosphere. “Students are evolving from being passive spectators in class to being active learners to being quasi-instructors,” he says. “They are having a genuine dialogue ... in which the material and solutions they are generating are becoming the focus of the classroom discussions.”

Other customers include the Western States Information Network, part of a nationwide complex that monitors the law-enforcement activities of multiple agencies, and Stanford University Medical School.

The largest Hiperwall installation to date is a two-story, 80-screen version in the offices of an overseas intelligence agency.

#### **Incubation Inroads**

From conception to first revenue, Hiperwall was commercialized in just

one year. “We incubated the company at Calit2 and that helped tremendously,” says Greenberg, who is now Hiperwall Inc.’s CEO and an entrepreneur-in-residence at The Paul Merage School of Business. “We had access to resources: a lab big enough to house a Hiperwall, and network and staff resources.”

The company continues to grow, setting up limited distribution partnerships with vendors who resell the software to their customers, including Ingram Micro Inc., the world’s largest technology distributor.

The partnership between inventors and incubators is keeping the wheels of innovation turning, says Greenberg. “An inventor or innovator comes up with technologies and makes really cool things work. An entrepreneur knows how to build a business out of an idea.”

Jenks and Kim successfully molded an academic proof-of-concept into a commercial-grade product.

“They made it stable, simple and gave it features that customers need,” Greenberg says. “And I have taken that product and figured out how to make a business out of it.”

Jenks enthusiastically concurs. “Having somebody who knew the ropes made it 10 times easier than it would have been otherwise.”

# Maximizing Business

Twelve years ago, Winston Ho found himself at a crossroads.

Armed with a master's degree in biochemistry and a doctorate in biophysics, he was toiling in the research and development department at an optical communications company that manufactured holographic display and fiber network systems. But Ho foresaw the growing market for biomedical devices and was intrigued by the opportunity to return to his educational roots.

So he wrote some proposals, scoured Southern California for expert collaborators, and in 1998, founded Maxwell Sensors in his garage.

The company, whose name derives from "MAXimize WELLness," has grown to 18 employees, and now designs advanced biomolecular testing systems from its Santa Fe Springs, Calif. headquarters.

## Ideal Partnership

One of Ho's earliest partners was Calit2's G.P. Li, the director of UC Irvine's Integrated Nanosystems Research Facility (INRF). "I always look for experts in Southern California and I approach them to collaborate," Ho says. He thought Li, who specialized in high-speed semiconductor technology and micro-electro-mechanical systems (MEMS), had just the expertise he needed to help get his

ideas off the ground.

Using INRF as a foundry of sorts, the two developed a tool for point-of-care diagnostics. While that particular product is not currently in production, it underlies a technology the company uses to this day in an advanced diagnostics laboratory system.

## Grant-Funded Incubation

Most of Maxwell Sensors' funding comes from federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants, administered by the U.S. Small Business Administration. The company specializes in researching and developing new biomedical device ideas, then uses venture funding to spin off companies to manufacture specific products.

And because the STTR program requires small businesses to partner with research universities, Ho and Li, along with INRF's Mark Bachman, have continued to build on their beneficial collaboration.

The team recently received an STTR Phase II grant to continue developing their latest innovation: radio frequency identification sensor tags (RFID-ST) containing temperature gauges, which can be used for transporting blood supplies, transplantable organs, food, and other temperature-sensitive substances.


The technology produces a safer and more cost-efficient product than currently

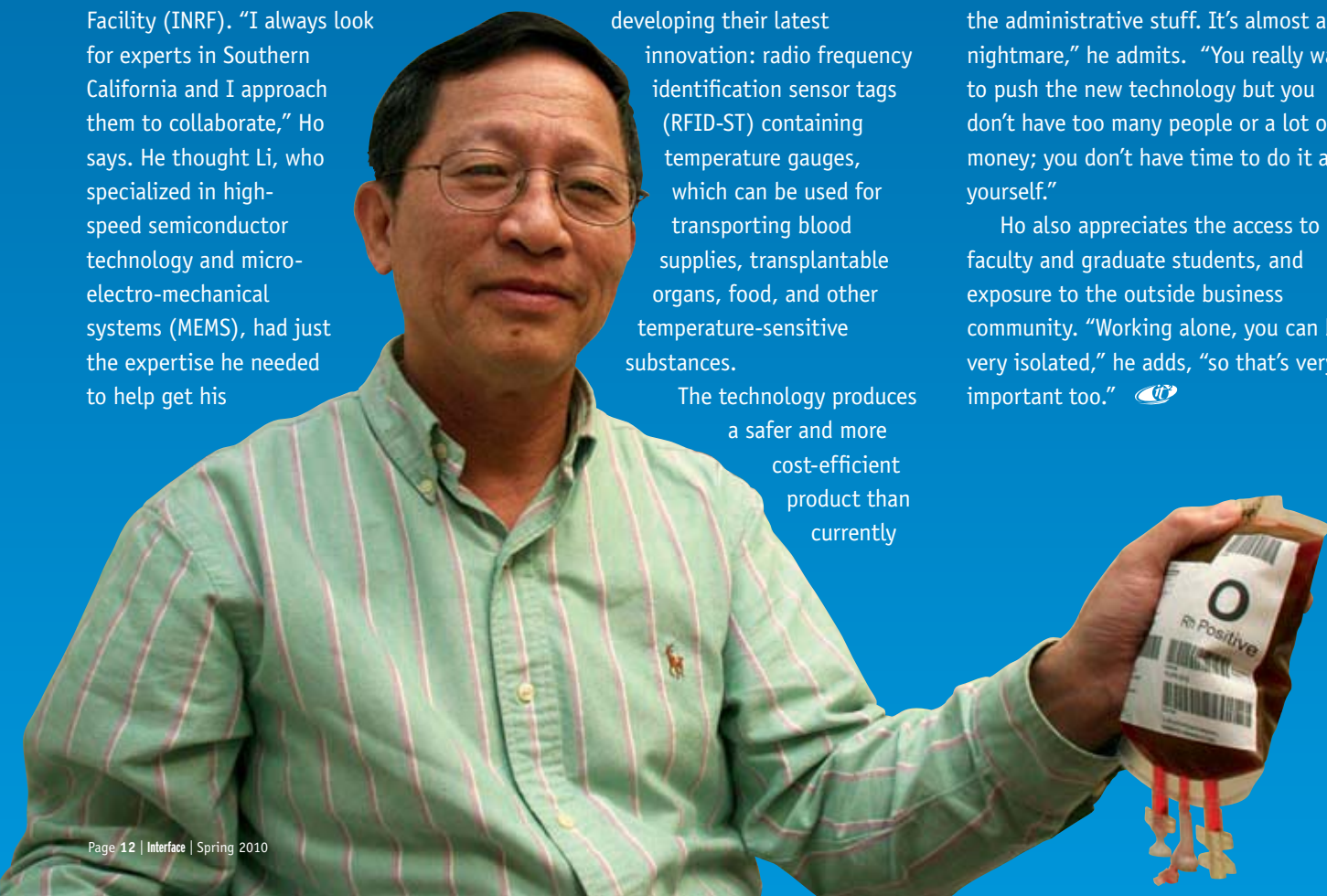
exists. The tiny chip can display product information and temperature profiles on blood-bag products, replacing the numerous bar codes presently used on the bags. "This can improve transfusion safety by virtually eliminating the possibility of mix-ups," Ho says. In fact, the RFID capability allows users to view product information profiles on a large number of individual items without having to open the shipping containers.

Li considers the grant-based university-business partnership an additional form of incubation. "These STTR grants are one more way universities can help new companies thrive," he says. "Universities offer facilities and expertise that new businesses couldn't otherwise afford."

## University Advantages

Ho thinks business incubation – in any form – benefits small companies like his. He is interested in learning more about Calit2's TechPortal as a potential home for future Maxwell Sensors spinoff companies. "Technical people like technology, but we don't like the administrative stuff. It's almost a nightmare," he admits. "You really want to push the new technology but you don't have too many people or a lot of money; you don't have time to do it all yourself."

Ho also appreciates the access to faculty and graduate students, and exposure to the outside business community. "Working alone, you can be very isolated," he adds, "so that's very important too." 



# Ask the **TIPSTER**

*OCTANe, a Southern California business development organization, strives to create, grow, support, staff and fund the area's biomedical and information technology companies. A long-time UCI partner, OCTANe works with the university to maximize the economic impact of cutting-edge research by helping turn innovative ideas into successful companies. We asked OCTANe's LaunchPad vice president, Luis Vasquez, to share his insight into the challenges a spinoff company might face and how Calit2's TechPortal could help. Vasquez has open office hours 2–5 p.m. every Tuesday in the Calit2 Building, Suite 4100.*

## **What challenges do new businesses face?**

We are at an interesting time when it comes to starting a new technology-based business. In some ways, it has never been easier and in other ways, it has never been harder. In the last 15 years, the tools necessary to start a technology business have become relatively inexpensive. Computer servers, hosting fees, software development and bandwidth are all much less expensive. The advent of cloud-based computing and storage has reduced these costs even further. In 2010, even office space is cheap. And with remote-collaboration tools that make virtual offices common for startups, you might not even need an office.

So if all these tools are so cheap, why is it so hard to commercialize technology and grow a new business? The answer is that customers, potential investors and potential partners all expect businesses to be much further developed before making a purchase, investment or deal. Good business ideas have very little market value. Everyone wants to see customer traction and proven results.

The challenge for university-developed technology commercialization is that traditional funding may pay for

research and some development but often falls short (or is not intended) for funding product commercialization.

## **How can a university-backed tech incubator help?**

Despite all the challenges, new technology – more than ever – is necessary to build a strong technology business ecosystem. Cutting-edge technology will continue to flow out of world-class research institutions like UC Irvine. A university-backed technology incubator will provide support to take these cutting-edge technologies and help develop commercial-ready businesses.

## **What does the partnership between an incubator and OCTANe LaunchPad provide?**

LaunchPad is OCTANe's process for evaluating, advising and preparing startup companies to obtain their seed or series A investments. According to almost every entrepreneur who goes through the initial evaluation process, it is the best and most comprehensive feedback they've ever received. Feedback is just the beginning, however. LaunchPad also provides advisors and deep improvements in key functional areas that will prepare companies for the fundraising process. In doing so, the entire business plan is often modified and adjusted to increase the probability of success.

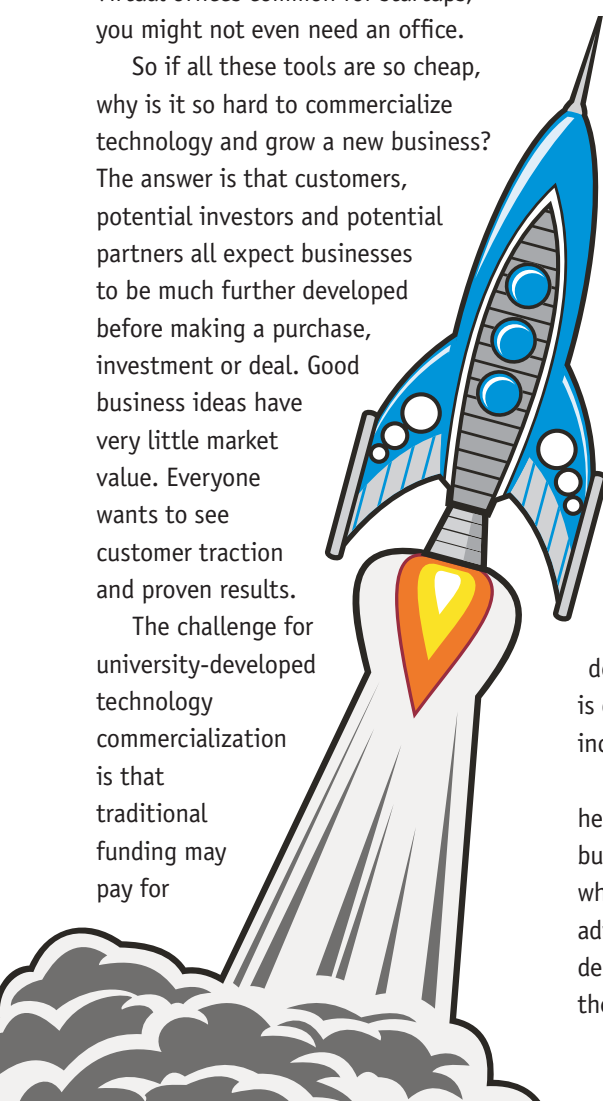
The OCTANe LaunchPad process can help incubator companies identify which business areas they need to improve while they are concurrently taking advantage of the technology, research, design and testing tools provided by the incubator.

## **OCTANe LaunchPad has helped 32 companies, including some UCI spinoffs, raise more than \$72 million. What were some of your UCI success stories?**

The UCI-related companies that we have helped launch include Modulated Imaging, which is a spinout of the Beckman Laser Institute. Modulated Imaging went through LaunchPad evaluation and presented at the 2008 California Medical Device Forum before successfully winning a \$700K grant. Carbon Micro Battery received LaunchPad advice before attaining its seed and again before its Series A financing, \$3.2 million total. Antigen Discovery Inc. (formerly ImmPORT) went through a LaunchPad evaluation and was introduced to an industry executive who helped the company secure a \$1.1 million grant funded by the Bill & Melinda Gates Foundation.

## **Will a university-backed incubator increase the odds that venture capitalists will be interested in these companies?**

Yes. Any efforts that can help technology products get closer to achieving customer traction while improving the business plan and company strategy will increase the odds of venture investment. It is important to realize, however, that it is still very difficult to achieve venture capital investment. The entire industry is shrinking and early stage investing faces new risks that weren't as prominent several years ago. Still, an incubator will help more companies get to the point where they are ready to seek VC investment. That will absolutely increase the number of successful technology transfers. 





# REVOLUTION

a social

by Lori Brandt

"If Facebook were a country, it would be the world's fourth largest," announces a popular video circulating on YouTube. Titled "Social Media Revolution," it touts statistics to showcase the growing impact of social media.

More and more people are using the vast collection of Web sites and applications to interact and share information online.

"Facebook has 400 million active users," the video continues. "YouTube is the second largest search engine in the world. Twitter members send 50 million tweets a day. Around 80 percent of companies are using LinkedIn as their primary tool to find employees. Wikipedia has over 13 million articles."

Is the social media revolution real, or just hyperbole?

UC Irvine professors  
from four disciplines  
– humanities,  
business,

social sciences and computer science – weigh in on this hot topic. They are (pictured from left) Carter Butts, associate professor of sociology and director of the Networks, Computation and Social Dynamics Lab; Donald Patterson, assistant professor of informatics and director of LUCI (Laboratory for Ubiquitous Computing and Interaction); Alladi Venkatesh, professor of management and associate director of CRITO (The Center for Research





on Information Technology and Organizations); and David Goldberg, professor of comparative literature and director of the UC Humanities Research Institute.

### **Q. Where is social media having the most impact?**

**Goldberg:** Social media has transformed how people work, play, learn, receive news and information, and engage in politics and civics.

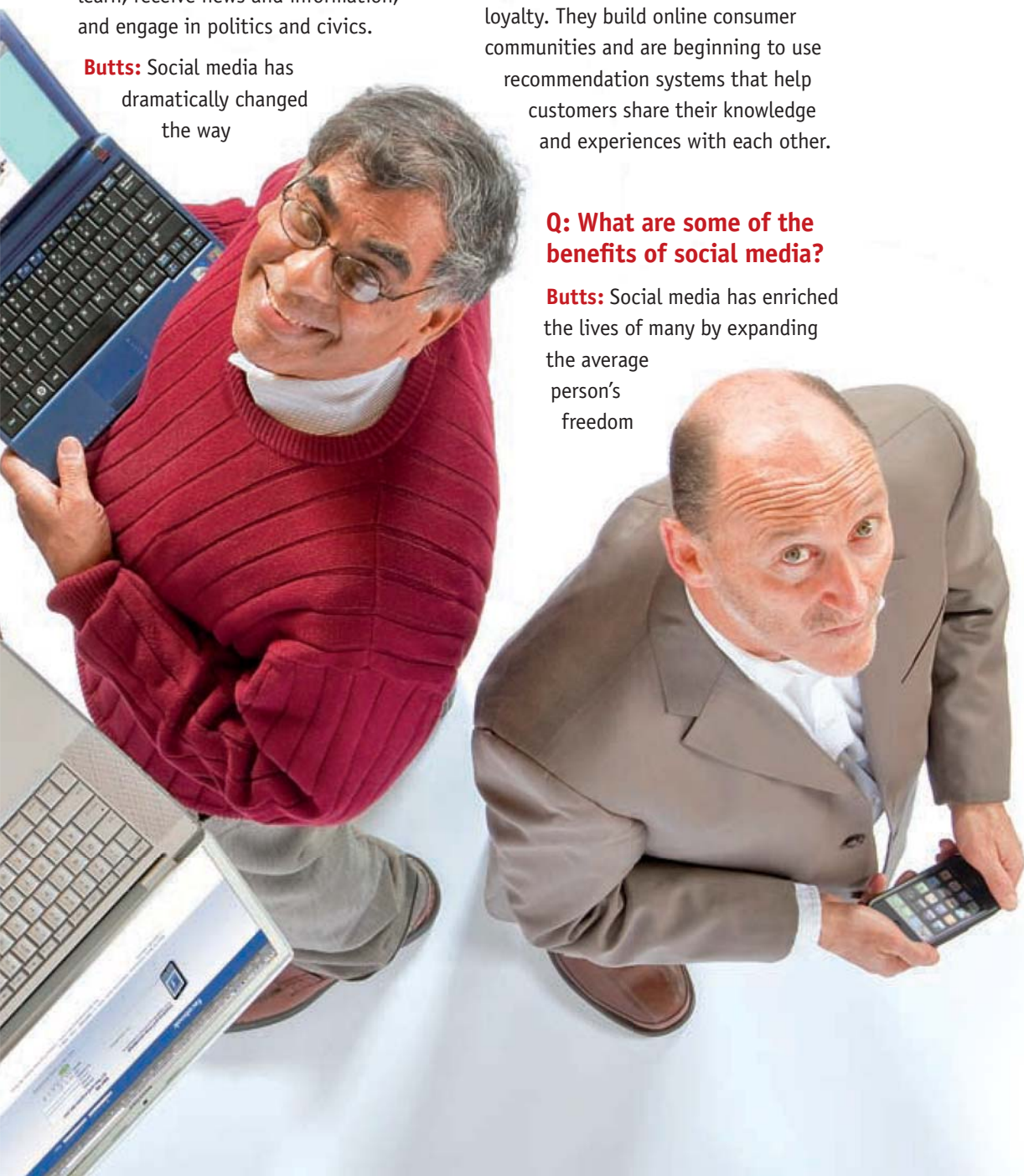
**Butts:** Social media has dramatically changed the way

people who are geographically and socially dispersed come together and mobilize in response to major events. We see it happening in areas ranging from politics to emergency response.

**Venkatesh:** In the business world, many companies are using social media for true customer engagement. They use it to keep current and future customers informed about their product or service and to build trust and brand loyalty. They build online consumer communities and are beginning to use recommendation systems that help customers share their knowledge and experiences with each other.

### **Q: What are some of the benefits of social media?**

**Butts:** Social media has enriched the lives of many by expanding the average person's freedom



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**"I think the assumption  
that everyone on your  
social network is a  
"friend" will be tested."**

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to communicate and organize with others. It has greatly reduced the costs of social organization, allowing groups to more quickly and effectively mobilize following disasters, such as the recent earthquakes in Haiti and Chile, and it helped local residents stay abreast of developments during recovery.

**Venkatesh:** Today's global marketplace requires a communication method that is fast, easy to manage, interconnected, yet private. In-person meetings and conferences are costly, so an online social network can provide an effective alternative. When created by an organization for internal use, an online social network can become an integral resource for collecting and disseminating shared knowledge.

**Goldberg:** In the humanities, a researcher or scholar has better access to collections in archives held in libraries or museums around the world. A medieval manuscript, for example, can be digitized and then shared and compared to materials

thousands of miles away. Researchers can engage in online discussions. Using a Wiki, they can compose a piece of work together, with four, five or 10 other people instantaneously reading, editing and sharing a common document. This quickens the tempo of output.

**Q. What are some of the negative implications?**

**Patterson:** As social networks begin to encompass all of life, they bring with them many of the same problems that we have in real, or non-digital, life. I think the assumption that everyone

on your social network is a "friend" will be tested. We'll need to learn how to deal with the people who won't stop talking, stand too close, creep us out, but whom we can't just wholesale disconnect from because of social and professional obligations.

**Butts:** Any time a dramatic shift in socially relevant technology occurs, cultural and organizational practices are likely to lag behind the new reality. This raises issues ranging from the amusing to the serious. At the one end of the scale, questions arise such as how to politely reject an unwanted but well-meaning friend request. More serious challenges are posed by norms of disclosure. Information comfortably offered in a traditional social exchange could potentially cause issues when offered



online if and when seen by family members, prospective employers or government officials. Another challenge is the level of literacy – cultural, financial, political and technical – that is needed to be an effective decision-maker in the new media environment. There is a gap between what our educational system provides and what the average American needs in order to make well-informed choices.

### Q: Do you think social media will completely replace traditional forms of communication?

**Patterson:** Thinking of social media as something that is going to replace other kinds of media is not the right way to think of it. Social media will be used alongside other forms of communication. It will be a place people go to for some kinds of communication, but probably not professional ones. It is too easy to miss things in the deluge of Twitter and Facebook, and professional communications are the type that must be attended to. Handwritten letters will still have a place when a personal touch is necessary, but they will be reserved for the most important and/or intimate occasions.

**Goldberg:** It may be that we are writing more, even if in different forms and through different media. But the instantaneity of social media makes the traditional mode of buying a card, lining up for stamps and posting the letter much less appealing. I suppose writing a letter on paper could become nostalgic and return as a fashion. I am still surprised by how colleagues at meetings come mixed with pen, paper and laptop, some doing one or the other, some switching between the two, many multi-tasking.

**Venkatesh:** Certainly in the younger generation, handwriting has already

become obsolete. In a recent study I conducted on undergraduate students, they rarely use e-mail for social exchanges. Text messaging is the norm.

### Q: Are people at a disadvantage if they don't use social media? What about the digital divide and the generation gap?

**Butts:** Inequality is a basic property of all modern societies and social media does not erase that reality. However, social media greatly levels the playing field. The cost, personnel requirements and expertise of mobilizing in an online group are far lower than in an offline context, and barriers to participating at the individual level are even lower.

**Goldberg:** The digital divide is already taking a different form. Almost all college kids have their own computers, and anyone in the U.S. who needs access to a computer can find it in a public library. There are ethno-racial divisions between the kinds of social media preferred: Black and Latino youth tend to use MySpace; White and Asian youth prefer Facebook. The generation gap is closing some, too, as we saw the older generation engage during the past Presidential election – the Obama campaign was exemplary – but it is hardly limited to Democrats or Progressives. Tea Partiers, for example, who tend to be older, are taking courses in Twitter use.

**Patterson:** The younger generation has always been on social media and hasn't needed email. Once they enter the workforce, however, that will change. Cheap mobile phones will largely eliminate the have and have-not divide, and the old reasons for excluding groups will dominate, such as racism, classism, power structures, etc.



### Q: What is next with social media and where do you predict it will take us?

**Venkatesh:** In the area of education, we are far behind. The challenge is both technical and content-related. Professors and teachers are not trained and do not have time to re-equip themselves. This does present an

opportunity. As we go forward, all educational institutions should begin incorporating educational material into social media technology.

**Butts:** If I had to point to a gap in the current social media technologies, it's in the area of impression management. People like to present themselves based on the social context – personal or professional. The current social media status cues are tone deaf in this regard and offer no support in varying one's presentation based on the context. The next "killer app" could be a platform that lets you wear one face for family, another for your old high school friends and another for your boss.

**Patterson:** We will start to see broad analysis being applied to the digital breadcrumbs that are left behind from social media. Social media streams will be used as sensors for understanding what is going on in the world. Things like a decrease in tweets will be attributed to power outages, sicknesses and disasters. Social media is currently having its moment in the sun. In a few years it will be so ingrained in our lives, we won't even notice it. 



# Building

# community

by Shellie Nazarenius

From the onset, those who called Calit2 home knew that when their project's funding ended, so too did their residency. Space in the building is assigned by project, not by department, and groups aligned with Calit2's research interests are given top consideration. After opening the doors five years ago, it was time to bid adieu to some and welcome in others.

**On the first floor**, the computational biology research group moved out of the wet lab and was replaced by a team of **nanoeengineering researchers** led by professor Peter Burke. The group is developing a next-generation lab-on-a-chip device to study cellular metabolism and programmed cell death, two important fundamental processes linked to many conditions and diseases including

aging, diabetes and cancer. The research bridges nanotechnology and cell biology at the molecular level. They are teaming with professor Doug Wallace, who directs the UCI Center for Molecular and Mitochondrial Medicine and Genetics. If the project is successful, the nanochip will enable researchers to probe the fundamental connection between electricity and biochemistry in individual sub-cellular organelles.

To accomplish their goals,

the research team needed a complete suite of molecular biology tools together with advanced, state-of-the-art nanofabrication facilities and expertise.

"Thanks to Calit2, we now have in one common setting access to state-of-the-art lab space to work on wet-lab projects such as cell culturing and DNA sequencing, as well as nanoprobe to interrogate the electrical properties of these membranes," said Tae-Sun Lim, the lead graduate student researcher working with Burke.

The group started moving equipment into the lab earlier this year and began their collaboration in March when the project received funding from the National Institutes of Health.

Space, and a lot of it, drew the **OutRun project** from UCI's Center for Computer Games & Virtual Worlds into **the second-floor**, 4,000-square-foot Wireless Sensor Lab.





The mixed-reality game platform blends the physical world with a virtual environment by combining a classic arcade driving game with a real-world vehicle. Postdoctoral researcher Garnet Hertz is developing the cabinet-car with support from Walt Scacchi, director of research for the game center.

"It's an example of a concept car of the future that draws on technologies from a diverse collection of organizations and designers," Scacchi explained.

As the user drives the OutRun vehicle, its screen displays a version of the actual physical environment rendered in the style of an early-80s, 8-bit video game. The car, which is expected to be completed by early next fall, allows the user to "play" an augmented reality game while traveling in the real world.

Added Hertz, "The OutRun project is envisioned as one of several large-format mixed-reality systems we will develop in our new Calit2 lab space."

Last October, the **Technology, Engineering and Computing (TEC) Business Center** set up shop in a **third-floor suite**. The center represents a new administrative partnership among Calit2 and the schools of engineering, and information and computer sciences. The center provides pre- and post-award contract and grant financial services support for researchers. Four financial analysts from each school comprise the center's staff, which is managed by engineering school finance director Katherine Gallardo. In the TEC Business Center service model, every principal investigator is assigned an analyst to handle all of his/her needs.

"The sheer volume of information that we need to have access to and the differences in procedures from one unit to the next can make it challenging at times for the TEC staff. However, those dynamics are transparent to the faculty



and researchers and often make it easier for them because they have a single analyst to work with on all of their awards," Gallardo explained.


The center was formed in the midst of campuswide budgetary reductions and consolidation efforts. In an announcement released by Rafael Bras, dean of engineering, the administrative reorganization was necessary "to establish a more efficient and cost-effective means to conduct business."

Added Gallardo: "We are thrilled that Calit2 was able to provide space for this groundbreaking endeavor. The administrative partnership between the two schools and Calit2 is truly unique, and we hope that all units will benefit from the collaboration, providing a solid foundation of support for research activities."

When funding came to a close for Project ResCUE last fall, **the building's top floor** became home to UCI's **Center for Research on Information Technology & Organizations (CRITO)**. The organized research unit is one of the world's leading think tanks on the impact of information technology on organizations and society. Researchers focus on the management of information systems, the IT-enabled enterprise, community-based technologies and IT industry studies.

CRITO has been conducting academic and applied research for more than two decades. The center's investigators come from various disciplines on campus and work closely with Calit2.

"We are delighted to be located in the Calit2 building," said Vijay Gurbaxani, CRITO director. "Our vision is to conduct multidisciplinary research on important issues at the intersection of IT and business and society. While IT does allow researchers to collaborate across boundaries and geographies, our presence (in the building) enables us to learn firsthand about the exciting technology research underway at Calit2 and to develop new partnerships with world-class academics."

Twice a month in Calit2's seminar room 3008, the center holds a popular lunchtime speaker series, "CRITO Hour." The free, informative program includes lunch and starts with a brief presentation followed by questions and discussion. Check the events calendar at [www.calit2.uci.edu](http://www.calit2.uci.edu) to learn about future talks. 





Antarctica, here we come!

# ECOEFFICIENCY

by Anna Lynn Spitzer

**U**C Irvine graduate student Jesse Baker had just returned from a grueling 9-month journey to Venezuela.

It was his fourth trip in five years to Latin America to research the area's environmental policies for his doctoral dissertation in the Department of Planning, Policy, and Design.

This often harrowing sojourn had included several violent rallies, a concert disrupted by shotgun-toting gangsters, and his abduction by a group of machete-wielding rebels who stole everything but his shorts and shoes.

"I was just exhausted," he recalls of that May in 2008. So he was less than enthusiastic about attending a lecture

at Calit2 sponsored by CUSA, the Center for Unconventional Security Affairs, at which explorer Robert Swan would discuss a fact-finding trip to Antarctica to raise awareness about climate change and renewable energy. But since CUSA director Richard Matthew was Baker's graduate advisor, and since the center had provided him with funding over the years, he convinced himself to make an appearance.

It was a propitious decision.

"As I was driving there, I was thinking, 'I don't want to be doing this. Antarctica has nothing to do with what I'm studying,'" he says. "But within five minutes after Swan began talking, I thought, 'I want to go on that trip; I've got to go on that trip.'"

Baker did go to Antarctica in March 2009, along with Swan and 68 other intrepid travelers from 28 countries, including China, Japan, Pakistan, South Africa, Canada and Argentina. The journey was replete with spectacular scenery, awe-inspiring sunsets and ocean colors he "didn't even know existed." Whales splashed, penguins nibbled at his boots, leopard seals lazed on the rocks and an albatross flew past his window.

The magnificent backdrop, however, was superseded by the relationships he formed with his fellow travelers during the 12-day trip, Baker says.

Business executives,

students, activists and teachers from all over the world worked, ate, debated and relaxed together. "What was really fantastic was that



Stunning ocean colors



there was no divide between people. We really communicated on a level where we could understand each other and see all the different perspectives concerning sustainability."

He prefers the term "ecoefficiency," calling it less ambiguous, and describing it as the confluence of "economy, equity and ecology, and the ways in which we consume products."

Baker, a logger's son who grew up in Oregon, remembers noting at a young age the connection between resources and the economy. "I read the paper every day and those issues were there: companies shutting down mills and shipping whole logs to Japan, while my dad couldn't get a job."

**"I want to bring people outside of their comfort zone, to different places where we get our resources so they can see what the impacts are."**

An activist of sorts – he spent several years working for public interest research groups and fundraised for Save the Children and Greenpeace, and against slavery in Sudan – his Antarctic experience prompted Baker to start a nonprofit organization. *Ecofficiency.org* addresses social and environmental issues on a grass-roots level.

The organization encourages consumers to make small changes in the ways they purchase and use products, hoping they will relay the message to larger institutions. "If you want business or government to change, people have to change," he states.

He started with his own family, which now donates to nonprofit organizations in lieu of buying expensive Christmas gifts.



Russian research vessel "Akademik IOFFE"

business groups, teaching them simple ways to preserve the environment. They also consult individually with local companies, helping them find cost-efficient ways to provide products and services that are "responsibly derived."

Education lies at the heart of his endeavors. "There's this idea out there that you can change the world with your pocketbook but boycotts are not very productive," he says. "Wouldn't it be better to say, 'hey, we love your company; wouldn't it be great if you recycled more or minimized your water usage?'"

The nonprofit also produces concerts and events that combine education with entertainment, including a 'Hope for Haiti' concert and art auction. Baker continually strives to connect the dots – to help individuals understand their connection to the larger world.


CUSA director and Calit2 division council member Matthew has high praise for his student. "Jesse exemplifies the type of researcher CUSA supports: a pragmatic and resourceful individual, willing to work under tough and uncertain conditions in the most remote parts of the planet, deeply dedicated to investigating the ways in which environmental change affects the most vulnerable people on the planet, and committed to finding practical ways to improve sustainability and resilience."

His evolution from exhausted graduate student to Antarctic explorer to environmental advocate led Baker to see that his experiences in Antarctica actually do connect to his own research in Latin America. "I look at both as mitigating the impacts of our consumer behavior. In Venezuela, I was looking

The *Ecofficiency.org* staff makes presentations to schools and

at social impacts of consumer behavior; in Antarctica, it was environmental impacts of consumer behavior. And both overlap, from the local to the global."

Future plans for Baker, who defended his doctoral dissertation in March, include further nurturing *Ecofficiency.org*, writing a book, conducting speaking tours and perhaps leading international expeditions like the one he traveled on with Swan.

"I want to bring people outside of their comfort zone, to different places where we get our resources so they can see what the impacts are," he states. "Then those people can come back and share their experiences with their communities and communicate how we're all connected to the environment." 



Spectacular scenery



Penguins galore

## Wheelchair Robotics

**David Reinkensmeyer** (mechanical and aerospace engineering) earned \$200,000 from the National Institute on Disability Rehabilitation and Research, in the U.S. Department of Education, for designing and testing a motorized wheelchair that provides robotic assistance to the user. The Calit2 Network Laboratory has served as the testing site for the project, which was awarded last October and will continue for two years.

## Data Communications

**Athina Markopoulou** (electrical engineering and computer science) won funding from the National Science Foundation that supported several graduate students and postdoctoral scholars to attend the SIGCOMM 2009 conference in Barcelona last August. SIGCOMM is the premier annual conference for the ACM Special Interest Group in Data Communications.

## Energy Efficiency

Calit2 affiliates are leaders on two different sub-awards made under the Department of Energy's program to support "frontier research" in the energy sciences. **Matthew Law** and **John Hemminger** (chemistry) lead one sub-award, a project to develop materials that convert sunlight to electricity with high efficiency. The award, from Los Alamos National Laboratory, supports the Center for Advanced Solar Photophysics, which is expected to provide UCI with \$2 million over five years. The center's goal is to explore and exploit the unique physics of nanostructured materials to boost the efficiency of solar energy conversion through novel light-matter interactions. **Reginald Penner** (chemistry) is the lead investigator on a sub-award for more

than \$1 million from the University of Maryland: "Precision Multifunctional Nanostructures for Electrical Energy Storage." In this project, heterogeneous nanostructures of carbon and other materials will be investigated as likely candidates for achieving fast-charge transport, high-storage density and stability over many charging cycles.

## Environmental Awareness

The National Science Foundation funded Calit2's **Bill Tomlinson** (informatics) \$280,000 for his work on "Narrative-Centered Computing for Childhood Environmental Awareness." The research implements computation and advanced graphics to extend the spatial and temporal limits of human familiarity, with the goal of enabling children to grasp long-term environmental problems. Multiple story lines, each anchored in a particular space and time, are interlocked, allowing causes and effects to be portrayed in larger patterns. By developing a novel approach to embedding complex distributed phenomena in an interactive narrative format, the research will contribute to the development of human-centered computing as well as the development of environmental awareness.

## High-Speed Converters

Calit2 earned another UC Discovery Grant, this one matched by ClariPhy Communications, an Irvine integrated circuit company. The project will fill out the design of CMOS Analog/Digital Converters (ADCs) that use very low power while working at 10 GB/s. The ever-higher speeds and bandwidth being imposed on existing transmission channels require more sophisticated ADCs at each end of a communication link, but most high-



speed ADC technologies dissipate very high amounts of power. PI **Michael Green** (electrical engineering and computer science) has design plans to overcome that limitation. This \$50,000 award is Green's second Discovery Grant collaboration with ClariPhy.

### Plug Load Center

Calit2 has launched a new program to promote energy efficiency in electronic devices as well as other appliances – the part of energy consumption usually called the “plug load.” Compared to most other appliances, electronic devices pose a different challenge for energy scholars and regulators: device designs change rapidly, the user base is more diverse, and the energy consumption of the sector is growing fast. The California Energy Commission awarded \$133,000 to Calit2 for a planning effort, led by **G.P. Li** (electrical engineering and computer science). The work includes a review of the market structure, analyses of existing regulatory issues and physical planning for a facility within the Calit2 Building. A roundtable workshop for industry, government, environmental groups and academia was held at Calit2 on April 1 to develop partnerships and formulate priorities.

### Microsystem Analysis

The Calit2 Building will soon have another major piece of equipment – a microsystem analyzer, which allows inspection of microscale systems' vibration in response to dynamic loads. It can scan a wide range of vibration frequencies with very high resolution. The proposal effort, which resulted in an NSF award for \$449,000, was led by

**Lorenzo Valdevit** (mechanical and aerospace engineering). The equipment will be located in the first-floor materials characterization lab and available to campus researchers on a recharge basis.

### Microscopy Study

**Jian-Guo Zheng** (materials characterization) was awarded a contract for \$60,000 from RF Nano, a local company that was spun off from UCI research. Zheng's project will use Calit2's advanced microscopy equipment to study the catalytic effects of iron nanoparticles on the synthesis of carbon nanotubes.


### Emergency Technologies

Last November, the Department of Homeland Security sponsored the “Incident Management, Resource Management, and Supply Chain Management” workshop in the Calit2 Building. A series of panel discussions analyzed timely issues, including government and industrial perspectives on emergency management and response technologies, the impact of virtual worlds on homeland security, the role of cloud computing and use of sensors in emergency management, and challenges of

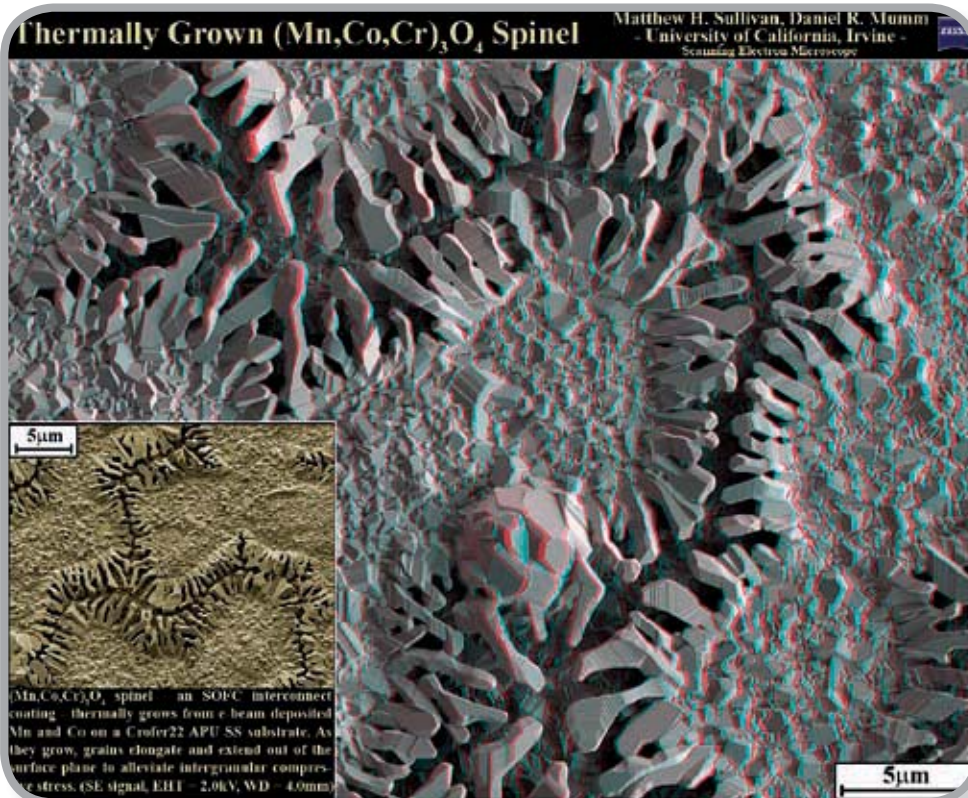
pharmaceutical and healthcare supply chains. The \$58,000 award to Calit2 was another in a series of awards and supplements from the National Science Foundation and DHS on the use of IT in emergency management, led by **Sharad Mehrotra** (computer science).

### Managing Power

Calit2 affiliate **Ahmed Eltawil** (electrical engineering and computer science) is developing technology for mobile devices that can analyze wireless conditions, recognize when lower power consumption is adequate and automatically reduce power accordingly. This allows the batteries to hold their charge longer without sacrificing reliability. Eltawil recently won a prestigious \$400,000 NSF CAREER award that will allow him to further develop his “Cognitive Power Management for Memory Dominated Mobile Devices” proposal. Current mobile devices deplete their batteries so quickly because the enormous number of memory cells packed densely onto their integrated circuits require a high-supply voltage to function reliably. He is concentrating his efforts on device memory because

it is becoming such a major component of the integrated circuit; up to 70 percent of a chip can be devoted to memory. “You can reduce power in the logic section but you're not going to get as much bang for your buck,” says Eltawil. 





### Best of Show

The 3D craze is sweeping the game and movie industries, but who knew that it would also be a big hit with the microscopy crowd! A UCI engineering graduate student working in Calit2's Zeiss Center has produced a 3D image that earned him overall best-of-show honors at an annual industry conference. Matthew Sullivan received the Roland B. Snow Award for microscopy late last fall at the Materials and Technology Society Annual Conference and Exhibition in Pittsburgh,

Pa. Sullivan's micrograph depicts manganese cobalt chrome oxide, a solid oxide fuel cell (SOFC) interconnect coating. Sullivan deposited manganese and cobalt on stainless steel using an electron beam, then heat-treated the sample to grow the crystals. The final representation was achieved by merging together two images that were taken at slightly different angles. A copy of the award-winning micrograph is on display in the Zeiss Center, complete with a pair of 3D glasses for prime viewing.

### Mixing IT from the Start

Many a bright idea has come to fruition while sharing a cold pint. For the third consecutive year, the Calit2 atrium is serving as a happy hour gathering spot for UCI graduate students and Calit2 researchers who share a passion for entrepreneurship. Food and drink serve as an enticement but ultimately the "Matrix Mixer" is for attendees to share their passion for starting new technology businesses and meet like-minded colleagues. The mixer is

organized by the business school's Don Beall Center for Innovation & Entrepreneurship, which provides education, inspiration and opportunity for campus technology innovators. The monthly evening networking session is meant to connect people from different disciplines, particularly business, law, computer science, engineering and life sciences. The mixers often include a VIP who has had experience in launching and/or funding a startup company, giving the students a chance to get first-hand advice.







## Network Generation

Safe, secure, reliable and robust were buzz words covered in detail at last November's Igniting Technology event, which focused on wired and wireless networks. "Network Generation" was the 10th program in the panel presentation series sponsored by Knobbe Martens Olson & Bear LLP. A capacity crowd filled the auditorium to learn more about how UCI researchers, Orange County industry leaders and investors are transforming the network infrastructure to meet global demands. The evening included a lively question-and-answer session with the audience and research demonstrations. KMOB, an intellectual property law firm headquartered in Irvine, has partnered with Calit2 since fall 2005 to offer the semiannual series.

## Critical Time, Powerful Tool

A UCI research team was able to offer its valuable expertise at a time of serious need. Calit2 faculty affiliate Chen Li and his students have been creating ways to make search engines more powerful. After the devastating earthquake in Haiti this year, the group created a Web site with a collective search engine to help families locate their loved ones. The Haiti Family Reunification site (<http://fr.ics.uci.edu/haiti>) gathers data from ever-changing databases at other Web sources such as the Red Cross, CNN iReport and Google's People Finder, and then compiles it at one user-friendly location. In addition, Li's team has developed technology that offers "type-ahead, fuzzy" search capabilities. Even if a person's name is spelled incorrectly, the reunification site will yield possible matches. Li's research in database and information systems is supported by grants from the National Science Foundation, gift funds from Google and Microsoft, and Calit2.



## For the Love of Learning

You're never too old to learn something new. That's the attitude of members of the Osher Lifelong Learning Institute (OLLI). For the fourth consecutive year, Calit2 offered a series of classes for the mostly retired audience. About 30 students met on Wednesday afternoons in October to learn about technologies for energy independence. In the first session (pictured), UCI researchers explained how they are developing low-cost solar cells from nanomaterials to capture sunlight and turn it into electrical energy. The second class focused on research efforts to maximize output on fuels cells. New technologies for making coal cleaner and recycling nuclear waste were presented in the third meeting. Calit2 will work with OLLI, which is managed by UCI Extension, to offer a program again next fall.





## Like a Good Neighbor

Senior executives from three Orange County technology companies visited Calit2 in December under the auspices of a UCI pilot program dubbed "Project Neighbor." The half-day program introduces companies and researchers in similar sectors to their respective interests and projects. In the eMedia Studio, representatives from Microsemi, Mindspeed and WiSpry were introduced to the various capabilities of the Active Space technology. Vice Chancellor for Research Sue Bryant and Microsemi CEO Jim Peterson, who is a member of UCI's Chief Executive Roundtable, were instrumental in initiating the project. "Project Neighbor is similar to an experience I had as a child when I found out that my next-door neighbor had a pool table and a swimming pool," Peterson explained. "To me that was large! Now I find out that my current neighbor has technology and business skills ... just as large!"



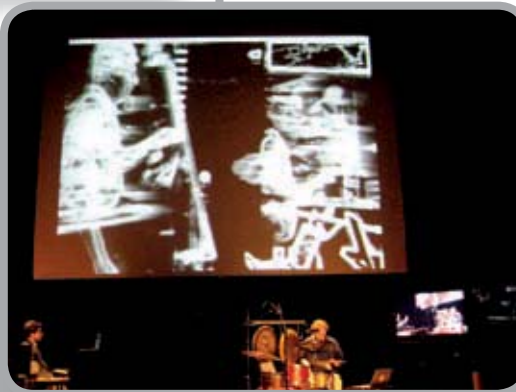
## New Tools of the Trade

Researchers in the Zeiss Center of Excellence are benefiting from a series of equipment upgrades. Both of the lab's scanning electron microscopes, as well as all of the supplemental equipment, have been replaced with new and improved models. The Zeiss Center is a shared resource of Calit2 and instrument makers Carl Zeiss SMT, Thermo Fisher Scientific, Oxford Instruments and South Bay Technology. The center, which opened in 2005, offers a win-win scenario for all. Faculty and students benefit from continuously upgraded equipment to keep them at the forefront of advanced materials research, while the corporate participants profit by using the lab to demonstrate and further enhance the instruments' capabilities.



## Live and in Concert

A musical concert in December not only premiered new works but pushed the limits of artistic networking technologies. "Latent Potentials" featured performers at different locations performing together in one live concert. Musicians



at UCI's Winifred Smith Hall and UCSD's Performative Computing Lab were linked through low-latency, CD-quality audio and high-definition video. Video from both locations was processed through the Active Space media performance system in Calit2's eMedia Studio and transmitted to both performance sites simultaneously via a link on the 10-gigabit, private OptIPuter network. The system, developed by Calit2 researcher John Crawford, provided a visual interpretation of the music and movement that appeared on screens in each venue. At the same time, a second high-definition link transmitted more realistic videos that brought the artists from both locations together virtually, facilitating a cohesive performance. "The concert was one of the more ambitious telepresence performance events that UCI has been involved with, and in my assessment it also ranks as one of the most successful," Crawford said.

## Connecting Cultures

China's Anhui province lies about 6,500 miles across the Pacific Ocean from Irvine. But when 22 university presidents and educational leaders from the province visited Calit2 in March, they saw how easily technology can bridge the distance between the two continents. The Chinese delegation is affiliated with the U.S. China Business Institute. Based in Beijing and Pasadena, Calif., the organization provides education and communication services in an effort to enhance mutual understanding and improve bonds between the two countries. After meeting with institute director G.P. Li, who gave the group an overview of Calit2 and discussed global business and academic partnering opportunities, the visitors toured the Visualization Lab, saw telemedicine project Telios, and experimented with BATs – Bionic and Assistive Technologies that turn everyday items like hats and shoes into custom devices that can solve real-world medical problems.



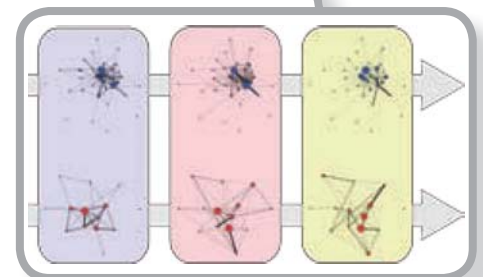
## New Standard to Coax Energy Savings

A guest speaker from Broadcom enlightened Calit2 researchers earlier this year about the proposed Energy-Efficient Ethernet (802.3az) standard. Nick Ilyadis, vice president and Enterprise CTO, described the company's industry-leading efforts to produce performance features in a cost-effective, energy-saving framework. Governments have begun mandating energy efficiency in different types of IT components, including those in networking systems like Ethernet switches. Ilyadis explained that even when traffic is not in transit, high-speed Ethernet systems continually send pulses of energy down the wire to keep both sides of the link synchronized. On average, however, computers only utilize the link about 1 percent of the time, leaving a lot of energy wasted when no information is being transmitted. The 802.3az standard, which is expected to be finalized soon, will automatically reduce power consumption during periods of low link utilization, thus saving energy, money and the environment. "At the end of the day," Ilyadis said, "lower energy usage means lower operating costs."



## An Unexpected Pattern

The exponential growth in social networking has given researchers an interesting new context for studying human interaction and behavior. This plethora of Internet-based social media requires a robust network, something Calit2 affiliate and social scientist Carter Butts wants to better understand. He and a student researcher studied how behaviors cause fluctuations in blog networks. The team used the 2004 presidential election period to analyze blog-to-blog citation networks in more than 1,800 English-language blogs. The somewhat surprising results showed that blog networks were impacted not only by specific events in the election cycle but by natural rhythms as well. Researchers discovered a routine fluctuation from day to night, and a weekly cycle, during which more network changes occurred on certain days of the week, regardless of whether specific events had occurred in that timeframe. "It appears there are certain times of day or days of the week that may be ideal for using social networks to spread information or to slow the process down," Butts said. The study was published late last year in the *Journal of Social Structure*.



## A Newsworthy Visit

One day after launching their online news site, members of the Orange County Local News Network ([www.oclnn.com](http://www.oclnn.com)) paid a visit to Calit2 to learn more about the institute's work. Barbara Bry, associate producer and executive editor, and Mike Reicher, business and technology editor, spent a couple of hours in February touring labs and talking with researchers. The group was pleasantly surprised to see their news site HIPerWall-sized in the visualization lab. In addition to a four-person startup editorial staff, the OCLNN will rely on contributions from freelance writers and partner news organizations. The site has featured articles about two Calit2 projects: the OutRun mixed-reality concept car, and Telios, a telepresence interactive operating system. As the site continues to build out, it hopes to find UCI experts who can contribute op-ed columns or blog about their interests. "We see Irvine as being a valuable source for intellectual expertise," Bry said.



## Preparing for a Sustainable Future

**CUSA** | Center for Unconventional Security Affairs

According to the U.S. Environmental Protection Agency, the concept of sustainability has evolved during the past 30 years to reflect perspectives of both the public and private sectors, each of which recognizes the need to support a growing economy while reducing the social and economic costs of that growth. During the winter and spring quarters, Calit2 co-sponsored a seminar series with UCI's Center for Unconventional Security Affairs to foster dialogue among social and natural science scholars, technology researchers and business leaders on the challenges of sustainability in the 21st century. The weekly evening series featured guest speakers who shared their perspectives. While topics spanned sustainable design, food security, trade, green IT, ethics, climate change, policy, and conflict and growth, the singular message was the importance of understanding the choices and challenges the global community currently faces.

## Art and Technology Intersect

The UCI campus has been a leader in pushing the technology envelope from an artistic perspective. In February, established artists, theorists and technologists from the U.S., Canada and Britain spent two days at Calit2 exploring the impact of emerging digital technologies and mediated physical environments for dance, theatre, music and visual arts at the BodyTech Symposium. "Rather than restricting human-computer interaction to a screen on a desktop with keyboard and mouse, this research envisions real-world performative environments that foster real-time interactions between people and computing technology, incorporating digital media with movement, voice and other forms of dynamic expression," explained John Crawford, one of the symposium's organizers. Crawford manages the Calit2 eMedia Studio, where several media/technology

demonstrations took place as part of the workshop. Organizers hope the event generates further collaborations and technology research development.





## Frontiers in Renewable Energy

IT-powered energy alternatives comprise one of the four focus areas Calit2 will be advancing in the next decade. The institute is collaborating with other campus units, including the National Fuel Cell Research Center and the Advanced Power and Energy Program, to promote the Distinguished Energy Lecture series, which kicked off last fall in the Calit2 auditorium. U.S. Department of Energy's Dan Arvizu, director of the National Renewable Energy Laboratory in Golden, Colo., presented research frontiers in renewable energy. He provided the audience with a status report on the portfolio of renewable energy and energy-efficiency technology pathways available today, and shared what's on the horizon for the future. "The world must transform its current energy systems on a global scale," Arvizu implored. "In order to help achieve this transformation, we must first define our desired energy 'end state' of the future."



## Demonstrations and Discussions

Once again, Calit2 bustled with visitors from a variety of sectors. Last fall, the institute hosted discussions and lab tours for various companies, universities and non-profit groups. A sampling includes a visit earlier this year from a leader in display technologies. Irvine-based VIZIO sent a team to learn more about visualization research, and the vice president for engineering was immediately drawn to the capabilities of the HIPerWall. On the academic side, members of the United Kingdom's East Midlands Universities Association visited UCI

last fall, stopping at Calit2's Zeiss Center of Excellence to learn about the unique partnership. The association's mission is to promote the potential global economic impact the 10-member consortium may have in forming outside business and academic collaborations. Regional economic stewardship is also a key element for members of the Leadership Southern California Fellowship program. The 2010 fellows made a return visit to Calit2 last winter to learn more about university research projects, such as the Telios telemedicine project, that are ready to be tested and deployed in community settings.

The California Institute for Telecommunications and Information Technology is a two-campus multidisciplinary research institute. In collaboration with its sister institute at UC San Diego, Calit2@UCI develops innovative projects that integrate university expertise with industry experience. The result: IT-based solutions that benefit society and ignite economic development.

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# MOVING BEYOND

This year, Calit2 enters its second decade. So where does the institute see itself headed in the next 10 years? To answer that question, the UCI and UCSD divisions have been working together since last fall on “The Path Forward,” a strategic planning process that focuses on the digital transformation of health, energy, environment and culture. Technical working groups, with members from Irvine and San Diego, are identifying collective strengths and potential collaborative research

opportunities. A preliminary report was shared in early March with the entire Calit2 community via a virtual All-Hands Meeting, which employed a high-definition telepresence link that allowed participants in both building auditoriums to provide real-time feedback. The second half of the planning process will focus on four enabling technologies – wireless, photonics, cyberspace and nanoMEMs – that have been identified as significant strengths for the institute. 