

Innovator Spotlight

Lianfang Zhang:

Engineering Big Changes with Small Technology

Arytha Biosciences has licensed technology rights from UC San Diego and is developing a tiny nanosponge that can soak up and neutralize toxins by disguising itself as a red blood cell. It works against a wide range of toxins, including those produced by Methicillin-resistant Staphylococcus aureus (MRSA) bacteria, as well as snake and spider bites. Arytha's nanosponge also shows promise as a vaccine against these deadly toxins. The idea took root when Lianfang Zhang, Ph.D., a professor at UC San Diego's Nanoengineering Department, began working on a drug delivery system using nanoparticles. Like other researchers in this field, Zhang had to find a way to protect his drug nanocarriers from the immune system. So he borrowed a tactic from the body's own red blood cells. "Red blood cells have a pattern on the surface that says to immune cells, 'We are your family members, don't attack us,'" said Huiqing (Winnie) Zhu, who is the CEO of Arytha Biosciences. "Our technology takes advantage of that. It extracts the red blood cell membrane and uses it as a piece of camouflage clothing."

Once the toxins are absorbed by the nanosponges, they are whisked away to the liver for disposal. The nanosponges, which have a half-life of 40 hours, are designed to absorb any pore-forming toxin that attacks the red blood cell membrane. "The nanosponge is a universal de-toxin, and it's totally safe," said Zhu. "The polymer will degrade into water and carbon dioxide eventually." The nanosponges have been tested on mice. When the animals were pre-



Lianfang Zhang, PhD
Professor
Department of Nanoengineering
Moore's Cancer Center

inoculated with the nanosponges, 89 percent survived what would normally be a near-lethal dose of MRSA toxins. According to the Centers for Disease Control and Prevention, more than 11,000 individuals in the U.S. die from MRSA and other staph infections each year.

The company also looked at the problem from the opposite direction – prevention instead of cure – which ultimately led to a toxin vaccine. This time, the nanosponges were studded with the MRSA toxin, triggering the mice's immune system. The sponges were able to neutralize the poison in tandem with the animal's own dendritic cells. The researchers found that their nanosponge vaccine was safe and more effective than toxoid vaccines made from heat-treated staph toxin.

Funding for the research came from the National Institutes of Health and an SBIR grant from the National Science Foundation.

Continued on page 6

OCTOBER 2014, VOL. XXII

Inside this issue:



Upcoming Events

2



News Roundup

2



Recent Issued Patents

4



"Catch the Next Wave"

3



TTO Open House

7

UC news

Napolitano removes barrier to technology investments, forms new advisory council

University of California proposes creation of new venture fund to invest in UC innovation

EVENTS

Saturday, October 4th
SABPA Pacific Forum

Monday, October 6th
Meet with... Poliwogg

Sunday, October 19th-21st
The Atlantic Meets the Pacific

Tuesday, October 21st
Excited About Your Story: Tell it Like a
TED Pro

Tuesday, October 21st-22nd
High Tech Fair

Wednesday, October 29th
Connect with CONNECT: Cross-Border
Innovation

Friday, November 7th
Founders' Fight Club

Thursday, November 20th
The Road to the Biologic Investigational
New Drug

Thursday, November 20th
Biocom Annual "Celebration of Life" Dinner

Thursday, December 4th
CONNECT'S Most Innovative New Product
Awards

Sunday, December 7th-9th
Pacific Rim Summit on Industrial
Biotechnology and Bioenergy

Tuesday, December 9th-10th
US Solar Market Insight Conference

News Roundup

UCSD Startup Solstice Biologics secures \$18 million Series A financing led by venBio and joined by Aeries Capital AG. Solstice has also acquired a license to RNAi Delivery Technology from UC San Diego. ([read more](#))

UCSD Startup Topera's FD-cleared Rhythmview 3D workstation will be discussed in 21 scientific presentations at the 34th Annual Scientific Sessions of the Heart Rhythm Society. The presentations will provide clinicians with information about the electrical sources that sustain atrial and ventricular arrhythmias. ([read more](#))

Antimicrobials Remodeled: Researchers at UC San Diego School of Medicine have re-invented a class of popular antimicrobial drugs. They have restored, expanded, and improved these drugs' effectiveness against drug-resistant pathogens in animal models. ([read more](#))

Kun Zhang's Midas Tech: Researchers led by Kun Zhang and other bioengineers at UC San Diego have created the most complete single-cell genome sequencing from E. Coli cells and individual neurons from the human brain. This breakthrough comes from a new single-cell genome sequencing technique, which confines genome amplification to fluid-filled wells with a volume of just 12 nanoliters. A video of this study is called MIDAS, or Microwell Displacement Amplification System. ([read more](#))

The United States **FDA** approves **Navidea Biopharmaceuticals' Lymphoseek** injection for expanded use in head and neck cancer sentinel lymph node biopsy. Lymphoseek becomes the first and only FDA-approved radiopharmaceutical application for sentinel lymph node detection and was first approved in March 2013 for lymphatic mapping in breast cancer and melanoma patients. ([read more](#))

UC Inventions on Display at Technology Commercialization Forum- Highlights included UCSD researcher, Dr. Xavier Soler and his work on treating chronic obstructive pulmonary disease. ([read more](#))

UC San Diego and **Comhear, Inc.**, a transformational, audio technology and wearables company, are collaborating on the newest in audio conferencing technology. Comhear has created a prototype allowing users to customize their listening environment, based on technology by researchers in the Qualcomm and Calit2 institute. ([read more](#))

UCSD Startup Emotient, the leading company in automated facial expression analysis, has won the **Most Innovative New Product (MIP)** Award from the 2013 CONNECT MIP Awards with its FACET technology. The FACET technology is able to perform real time, frame-by-frame analysis of the emotional responses of users. ([read more](#))

Personalized Cancer Treatment Approach: UC San Diego School of Medicine along with **Moore's Cancer Center** researchers have built digital cancer avatars to identify promising drugs and personalize patient treatment. These cancer avatars may help scientists distinguish suitable cancer patients for clinical trials based on their cancers. ([read more](#))

UCSD Startup Otonomy – Raised \$100 million in an initial stock offering. ([read more](#))

Meritage Pharma Announces Positive Results - announced positive Phase 2b results of oral budesonide suspension (OBS) for the treatment of adolescents and adults with eosinophilic esophagitis ([read more](#))

Catch the Next Big Wave with UCSD Technology Transfer Office Symposium



UC San Diego's premier scientists – Robert Dynes, Larry Goldstein, Nicholas Spitzer, Shu Chien, and Larry Smarr – took an international audience on a journey into the future of life science innovation.

The “Catch the Next Big Wave with UCSD Technology Transfer Office” symposium was held on June 22 to coincide with the 2014 BIO International Convention in San Diego. In her welcoming remarks to the visiting delegates, Jane Moores, Ph.D., Assistant Vice Chancellor for Technology Transfer, said that the panel presentations would show that “biomedical innovation flourishes when we bring together the best minds from across disciplines.”

The four faculty presentations were introduced by Robert C. Dynes, Ph.D., University of California President Emeritus. Dynes told the audience that he left AT&T Bell Labs for UC San Diego when he realized that “American universities would have to take primary responsibility for stewardship of the nation’s long-range vision and intellectual property.” And he said the era of research and development ended on September 11, 2001 when emergency responders perished because, without access to wireless communication devices, “they never got word that they were running out of time.” That day “opened a new era of R, D, & D – research, development, and delivery,” said Dynes. “We can no longer afford the luxury of handing off those responsibilities to somebody else. We have to move discoveries from the bench to the public domain as efficiently and effectively and quickly as possible.”

Larry Goldstein, Ph.D., Director of the UC San Diego Stem Cell Program, described how stem cell science has generated “disease-in-a-dish” tools to replicate complex disorders outside the human body and scrutinize their molecular structure. In neuronal studies of Alzheimer’s disease, “what’s remarkable is that we can see very simple early biochemical changes,” Goldstein said, “and elucidate what the biochemical steps are” in disease progression. Such findings are guiding efforts to screen drug compounds and have produced “really interesting hits that you wouldn’t have found by drug testing means pharmaceutical companies conventionally use,” he added.

Stem cell science also holds the promise of growing healthy cells to repair or replace ravaged cells. A Phase 1 clinical trial at UCSD’s Sanford Stem Cell Clinical Center, which Goldstein also directs, has shown preliminary evidence that when stem cells are implanted near spinal cord injuries, “they will grow across the injury site and establish contact above and below the injury.”

Nicholas Spitzer, Ph.D., Co-Director of the UCSD Kavli Institute for Brain and Mind, showed how emerging neurotechnology may accelerate treatments for a host of neurological disorders, from depression to Parkinson’s disease, where malfunctioning neural synapses disrupt normal brain functions. The field’s vast potential has galvanized the White House, which has invested \$100 million in the BRAIN (Brain Research Through Advancing Innovative Neurotechnology) Initiative. And in California, Gov. Jerry Brown launched a \$2 million Cal-BRAIN (California Blueprint for Research to Advance Innovations in Neuroscience) research grants program when he signed the state budget in San Diego on June 21.

Neurotechnology advances are coming about, Spitzer said, because “we put engineers and neuroscientists in the same room, lock the door, wait for the white smoke to come out, and see what can happen.” San Diego’s regional biotech hub is uniquely poised to lead the field, he said: “Innovative neurotechnology will be developed here, companies will be founded here, and students will be cross-trained in engineering and neuroscience so they can bridge the divide.”

[Continued on page 6](#)

Recent U.S. Patents Issued

Patent #	Title	School	Inventors
8,478,378	Devices, systems and methods to detect endothelialization of implantable medical devices	JACOBS SCHOOL OF ENGINEERING	Jin, Sungho
8,482,847	Systems and methods for fiber optic parametric amplification and nonlinear optical fiber for use therein	JACOBS SCHOOL OF ENGINEERING	Kuo, Ping Piu; Radic, Stojan
8,483,096	Scalable commodity data center network architecture	JACOBS SCHOOL OF ENGINEERING	Al-Fares, Mohammad; Loukisas, Alexander; Vahdat, Amin
8,497,258	Viscous budesonide for the treatment of inflammatory diseases of the gastrointestinal tract	SCHOOL OF MEDICINE	Dohil, Ranjan Aceves, Seema; Bastian, John; Hill, Malcolm; Phillips, Elaine
8,503,943	Wireless sensors and applications	JACOBS SCHOOL OF ENGINEERING	Spanhake, Shannon
8,506,944	Replenishment and enrichment of ocular surface lubrication	JACOBS SCHOOL OF ENGINEERING	Schmidt, Tannin; Sullivan, Benjamin Sullivan, Jacob
8,506,959	Prevention and treatment of synucleinopathic and amyloidogenic disease	SCHOOL OF MEDICINE	Masliah, Eliezer; Rockenstein, Edward
8,514,398	Sensing devices and techniques using 3-D arrays based on surface plasmon excitations	JACOBS SCHOOL OF ENGINEERING	Chen, Haiping Matthew; Fainman, Yeshaiahu; Pang, Lin; Sun, Pang Chen
8,515,105	System and method for sound generation	DIVISION OF ARTS AND HUMANITIES	Yadegari, Shahrokh
8,521,266	Methods for the detection and/or diagnosis of biological rhythm disorders	DIVISION OF PHYSICAL SCIENCE SCHOOL OF MEDICINE	Rappel, Wouter-Jan Narayan, Sanjiv, Sehra, Ruchir
8,524,480	Cytotoxic ribonuclease variants	JACOBS SCHOOL OF ENGINEERING	Mitchell, Julie
8,542,138	Ring oscillator delta sigma ADC modulator with replica path nonlinearity calibration	JACOBS SCHOOL OF ENGINEERING	Galton, Ian; Taylor, Gerry
8,551,467	Replenishment and enrichment of ocular surface lubrication	JACOBS SCHOOL OF ENGINEERING	Schmidt, Tannin; Sullivan, Benjamin
8,568,990	Methods for identifying compounds that modulate sensory signaling through the taste cell specific G-protein coupled receptor GPCR-B4	DIVISION OF BIOLOGICAL SCIENCES	Adler, Jon; Lindemeier, Juergen; Zuker, Charles
8,580,527	Methods for identifying compounds which modulate T2R bitter taste receptors	DIVISION OF BIOLOGICAL SCIENCES	Mueller, Ken; Zuker, Charles
8,594,777	System and method for reconstructing cardiac activation information	SCHOOL OF MEDICINE	Narayan, Sanjiv, Briggs, Carey; Sehra, Ruchir
8,606,553	Methods for identifying drug targets based on genomic sequence data	JACOBS SCHOOL OF ENGINEERING	Palsson, Bernhard
8,614,094	Compositions and methods for determining genetic polymorphisms in the TMEM216 gene	SCHOOL OF MEDICINE	Gleeson, Joseph; Silhavy, Jennifer Brancati, Francesco; Dallapiccola, Bruno; Valente, Enza Maria
8,624,012	Nucleic acids encoding T2R bitter taste receptors	DIVISION OF BIOLOGICAL SCIENCES	Mueller, Ken; Zuker, Charles

Recent U.S. Patents Issued (cont.)

Patent #	Title	School	Inventors
8,642,561	Peptides whose uptake by cells is controllable	SCHOOL OF MEDICINE	Aguilera, Todd; Jiang, Tao; Nguyen, Quyen; Olson, Emilia; Savariar Nesan, Elamprakash; Tsien, Roger; Whitney, Michael; Wong, Edmund
8,643,979	Tapered single pole magnetic heads for perpendicular magnetic recording	DIVISION OF PHYSICAL SCIENCES	Gao, Kaizhong
8,655,815	Neural processing unit	JACOBS SCHOOL OF ENGINEERING	Florea, Michael; Palmer, Douglas
8,669,074	Chimeric phosphorylation indicator	DIVISION OF PHYSICAL SCIENCES SCHOOL OF MEDICINE	Tsien, Roger, Newton, Alexandra; Ting, Alice; Violin, Jonathan; Zhang, Jin
8,679,545	Topical corticosteroids for the treatment of inflammatory diseases of the gastrointestinal tract	SCHOOL OF MEDICINE	Dohil, Ranjan; Aceves, Seema; Bastian, John
8,679,742	Method for determining the presence of an enzyme in a sample	DIVISION OF PHYSICAL SCIENCE	Heim Roger; Tsien Roger
8,685,638	Cellular microarrays for screening differentiation factors	JACOBS SCHOOL OF ENGINEERING	Bhatia, Sangeeta; Eddington, David; Flaim, Christopher
8,697,082	Prevention and treatment of synucleinopathic and amyloidogenic disease	SCHOOL OF MEDICINE	Masliah, Eliezer; Rockenstein, Edward
8,697,836	Composition and method for inducing and enhancing a telomerase reverse transcriptase-reactive cytotoxic T lymphocyte response	SCHOOL OF MEDICINE	Zanetti, Maurizio
8,709,452	Synthetic bone grafts	JACOBS SCHOOL OF ENGINEERING	Phadke, Ameya; Varghese, Shyni
8,710,030	Phosphonate compounds	SCHOOL OF MEDICINE	Beadle, James; Hostetler, Karl; Kini, Ganesh
8,728,980	Peptide microarray and method of use	DIVISION OF BIOLOGICAL SCIENCES DIVISION OF PHYSICAL SCIENCE	Xu, Zheng Wang, Wei
8,729,039	Use of inhibitory oligonucleotides to treat autoimmune disease	SCHOOL OF MEDICINE	Raz, Eyal
8,729,088	Toll-like receptor modulators and treatment of diseases	SCHOOL OF MEDICINE	Carson, Dennis; Chan, Michael; Cottam, Howard; Daniels, Gregory; Hayashi, Tomoko; Wrasidlo, Wolfgang; Wu, Christina
8,635,031	Methods for identifying drug targets based on genomic sequence data	JACOBS SCHOOL OF ENGINEERING	Palsson, Bernhard
8,636,795	Device to store and inject corneal graft	SCHOOL OF MEDICINE	Schanzlin, David; Torres, Aurora, Trozera, Thomas
8,637,565	Salinosporamides and methods for use thereof	SCRIPPS INSTITUTION OF OCEANOGRAPHY	Feling, Robert; Fenical, William; Jensen, Paul; Mincer, Tracy

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85/869,092 NANOLIPO™

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Almutairi, Adah

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Arytha Biosciences plans to remain as an incubator. New companies under its umbrella will have their own management teams and focus on different areas of applications, according to Zhu. Its first spinoff, Cellics Therapeutics will focus on the application of Arytha's nanosponge technology for the treatment of animal venoms and rare diseases that caused by virulent factors attacking red blood cells. Under the leadership of an independent management team, Cellics Therapeutics is in talks with investment bankers and private investors.

"With early stage technology, you have to do a lot of incubating," said Zhang, the inventor of the nanosponge technology and a co-founder of Arytha Biosciences. "We have done a lot of work on the nanosponge technology. Commercializing innovation doesn't happen itself. You need to have good connections, the right people and a strong team."

Dr. Liangfang Zhang, from Wuwei County, attended the prestigious Tsinghua University in Beijing at 15 and by age 20 had opened a factory to produce rubber materials that he had researched as a student. Looking to the future, he traveled to the United States to pursue an advanced engineering degrees. Dr. Liangfang Zhang received his Ph.D. in Chemical & Biomolecular Engineering from the University of Illinois at Urbana-Champaign (UIUC) in 2006 under the supervision of Prof. Steve Granick. He was a postdoctoral associate in the laboratory of Professor Robert Langer at MIT during 2006-2008. He joined the Department of Nanoengineering at the University of California, San Diego (UCSD) as an Assistant Professor in July 2008 and was promoted to an Associate Professor with tenure in March 2012. Throughout his academic ventures and scientific accomplishments, Dr. Zhang has never lost his desire to turn laboratory advances into practical breakthroughs.

(Continued from page 3)

Shu Chien, M.D., Ph.D., Director of the UCSD Institute of Engineering in Medicine, outlined a range of therapeutic breakthroughs that have been engineered with precision to solve treatment challenges and develop personalized medicine approaches. These include: delivering nanoparticles with drug payloads to specific sites without triggering immune rejection; an ultra-thin device for monitoring EEG activity in pregnant women and infants "non-invasively and very effectively"; and advanced robotic surgery that "improves the accuracy of operations to remove complex tumors without damaging surrounding nerves."

Chien addressed the societal impacts of life science innovation, particularly for reining in health care costs. Thanks in part to advances made in San Diego, the cost of sequencing a human genome has plummeted from \$95.2 million in 2001 to below \$1,000 in 2014. The ultimate goal, he said, should be "individualized preventive medicine that is less infrastructure-dependent, more patient-orientated, and more cost-effective."

Larry Smarr, Ph.D., founding Director of the California Institute for Telecommunications and Information Technology, surveyed the high-tech landscape of the "quantified self" movement. Wireless wearable health monitoring devices are giving health care consumers "the tools to become a real partner with your doctor," he said. "Something you must learn to say is, 'Give me my data.'"

Using himself as a research subject, Smarr collected and charted his personal health data, and his findings guided him to a diagnosis of his own inflammatory bowel disease. The life-altering experience has made him a global advocate for greater attention to the human microbiome and the biology of human gut bacteria. Smarr predicted that, where contemporary medicine talks of combating disease, future medicine will "get rid of the war metaphor and talk about gardening" and move its focus "from pharmaceuticals to medicinal foods."

The overall lesson of the symposium was conveyed by Chien when he said, "With all of us working together, we can not only catch the big wave, we can make the big wave."



The Biotechnology Industry Organization (BIO) International Convention drew 15,667 industry leaders, including nearly 2,500 CEOs from 50 states and countries when it was held in San Diego this past June.

UC San Diego's Technology Transfer Office, along with other leading industry and academic organizations were co-sponsors of the Team California Pavilion at this annual convention. The TTO team also helped staff the pavilion display during the convention. Pictured above is senior licensing officer, Victoria Cajipe who shared the success and impact of UCSD's technology transfer program with convention visitors.

TTO Open House & eDisclosure Demo

The TTO welcomed visitors from the campus community to its Open House on September 24, 2014. Innovators, including grad students and staff, came to see what was happening in technology transfer. Our guests toured our offices and participated in discussions about licensing, patenting, and marketing university innovations.

Working with its division partners at Research Affairs, a new electronic invention reporting system was demonstrated to attendees. eDisclosure, currently in alpha-stage development, will allow easy online reporting of new innovations to the TTO, interactive collaboration with innovators, automated alerts and notifications, along with 24/7 online access. During the alpha demo, guests were able to check out the system and provide feedback to enhance usability and functionality. eDisclosure is slated for launch in 2015.



Visitor Profile:

A benefit of hosting an Open House is the opportunity to meet and network with our customers (innovators and staff) and other campus partners. In creating a dialogue with our customers/partners, we are able to discuss how we can better work together on moving technologies into commercial markets and nurturing entrepreneurial endeavors within the campus community that will, in turn, provide economic growth and stimulus to the local region.

One of our visitors was Zheng Huang of the Advanced Professional Degree Consulting Club (APDCC) at UCSD. As vice president of her group, Zheng is charged with increasing the awareness of her group and what they offer to prospective clients. Zheng explained, "The APD Consulting Club is an organization that bridges the gap between academic research and the business world by providing graduate students and postdocs with consulting experience. Our members are UCSD graduate students and postdocs in a variety of fields (a lot of them in STEM) who are interested in consulting as a career path."

Their group assembles teams with specific expertise from a pool of APDCC members (data savvy, self-driven graduate students and postdocs) to work on consulting projects for industry clients. In a recent success, the group provided General Forensics with an APDCC consulting team who completed a project on market entry opportunities for the local company. Two ongoing projects that have retained APDCC consulting teams are with Bainbridge Capital and UCSD startup Biological Dynamics.

As of this writing, APDCC is soliciting their member experts to form a new consulting team to work with an Energy and Microgrid startup company on the cutting edge of microgrid development.

[\(http://www.apdconsultinggroup.com/consulting-opportunities/\)](http://www.apdconsultinggroup.com/consulting-opportunities/)

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Any Questions?

Call or email the UC San Diego TTO, especially before submitting an abstract, presentation, or other publication.

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