



COSMOS UC San Diego

California State Summer School for Mathematics and Science

Alumni Newsletter Fall 2013

COSMOS Alumni:

This is your newsletter, so let us know what you want to see! Send us your updates, your accomplishments, your photos, anything you'd like to share with your fellow alumni!

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Send us your photos or story for the next issue!

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COSMOS 2013

Interest in attending the COSMOS program continues to grow every year, and this year was no exception. 545 applications were completed for 164 student openings. Faculty have difficulty choosing between all the highly qualified applicants-what an amazing group of students! The accepted students tend to be older (more 11th graders), mostly from California (three out-of-state attending), equal in gender (M/F) and 43% are receiving financial assistance. The most requested first choice clusters were Clusters 1, 2, 7 and 8.

Important Upcoming Dates

COSMOS UCSD 2014 Online Application

Tuesday, January 21 - Friday, February 21

COSMOS 2014 Summer Program

UCSD, UCSD, UCSC—July 7-August 2
UCI—June 29-July 25

COSMOS Alumni In The News!

Send your news and updates to cosmos@ucsd.edu



Dr. Charles Tu, COSMOS Director

Dr. Tu has been extra busy lately! He recently stepped down as the Associate Dean of Engineering at the Jacobs School of Engineering at UCSD, has been on sabbatical this fall in Taiwan and will return to teaching electrical engineering in Winter Quarter, 2014. Following are excerpts from an article written by Daniel Kane, Jacobs School Communications, describing another recent prestigious honor: Electrical Engineering Professor Charles W. Tu has been awarded an honorary doctorate of engineering at Linköping University. At the UC San Diego Jacobs School of Engineering, Tu serves as Associate Dean and as a Distinguished Professor in the Department of Electrical and Computer Engineering. Over the past two decades, Tu has worked closely with researchers at Linköping University, Sweden (LiU). The research has focused on developing new electronic/photonic/spintronic materials. The work has resulted in over 150 joint publications and conference contributions with LiU's professors Weimin Chen and Irina Buyanova. This collaboration first got started when Professor Chen was working at UC Berkeley. Since Chen's return to LiU in 1993, the cooperation has flourished and has covered a very wide range of materials research. Tu is well known for advancing the field of molecular beam epitaxy (MBE), a method of depositing artificial crystals atomic layer by atomic layer that is used to build novel semiconductor hetero- and nano-structures for electronic, opto-electronic, and photovoltaic devices. He was ranked among the Most Cited Physicist by the Institute of Scientific Information (1997). Tu is a Fellow of the IEEE, the American Physical Society, and the AVS Science and Technology Society. He was Engineering Educator of the Year in San Diego County in 2006, the recipient of Taiwan's Pan Wen-Yuan Foundation Outstanding Research Award in 2009, and the recipient of the North American MBE Innovator Award in 2011. Charles Tu joined the UC San Diego faculty in 1988, and was appointed Associate Dean of the Jacobs School in 2004, after serving from 1999 to 2003 as chair of the ECE department. He was a distinguished member of AT&T Bell Laboratories technical staff from 1980 to 1988. He earned his Ph.D. in Engineering and Applied Science from Yale University in 1978.



Recruitment Fall 2013

Fall is COSMOS outreach time! This year, we have attended several outreach events in the San Diego area. We thank all the COSMOS alumni who volunteer their time at these events. It wouldn't be the same without you! Our additional recruitment efforts this year are focused on videos on the COSMOS YouTube channel rather than individual school visits. The link to our YouTube channel is on the COSMOS website home page, and is <http://www.youtube.com/user/cosmosucsd>. Check us out to see interviews with alumni, our latest videos, and interviews with current UCSD students who are COSMOS alums. This year prospective students can view a general information video as well as a video specifically focused on completing the application. COSMOS 2014 Program flyers and 2014 Teacher Fellow flyers are also available on the COSMOS website to share. Spread the word—you are our best ambassadors!



Becky Hames, COSMOS Assistant Director and Kevin Yturralde (COSMOS 2013) at the “Cal-SOAP College Fair”, October 30, 2013



Joey Uy and Diego Espinoza (COSMOS 2013) at the “Cal-SOAP College Fair”, October 30, 2013



Hope Czbas (COSMOS 2010) at “Dare to Dream”, UCSD November 2, 2013

UCSD Shake Table, Robot win Popular Science Best of What's New Awards

The biggest outdoor shake table in the world and a robot designed to move along utility lines have received “Best of What's New” awards from *Popular Science*, the world's largest science and technology magazine. The large, high performance outdoor shake table, a popular Cluster 4 field trip, can handle structures weighing up to 2200 tons without height restrictions. The table's powerful hydraulic actuators—piston-like devices—can move at up to six feet per second, creating realistic simulations of the most devastating earthquakes ever recorded. SkySweeper, designed in the Coordinated Robotics Lab is a robot made of off-the-shelf electronics and plastic parts printed with an inexpensive 3D printer. The prototype could be scaled up for less than \$1,000, making it significantly more affordable than the two industrial robots currently used to inspect power lines. “The Best of What's New” award is the magazine's top honor, and the 100 awardees are selected from a pool of thousands,” according to Cliff Ransom, Executive Editor of *Popular Science*. “Each winner is handpicked and revolutionary in its own way. Whether they're poised to change the world or simply your living room, the “Best of What's New” awardees challenge us to see the future in a new light.”

Achieve UC 2013



UC San Diego Chancellor Pradeep Khosla visited two San Diego high schools to tell students not to rule out college because of financial concerns and to remind them that University of California schools can help with scholarships and other assistance. Kimberly Woo, COSMOS Assistant, presented the COSMOS program to students during the event. The Chancellor's visit to Clairemont and Mission Bay high schools were part of a coordinated system wide initiative that sent UC leaders and admissions counselors to campuses around the state. This is the second annual “Achieve UC” event held to encourage students from diverse, lower-income backgrounds to consider UC schools. “How many think you cannot afford to go to UC or UC San Diego?” Khosla asked about 500 students gathered in the auditorium at Mission Bay High School. Hundreds of students raised their hands. “None of you should be thinking that,” he told the group. “You cannot afford not to go to college.” Khosla said UC San Diego annually grants about \$350 million in financial assistance to about 24,000 students. Khosla said he hopes to help more students from local schools attend UC San Diego by expanding his Chancellor's Associates Scholars Program. “We should be sending every qualified kid to college, period, regardless of which family they come from,” Khosla said. (Excerpted from the San Diego Union Tribune).

Engineers at UCSD have developed an iPad app that helps students learn spatial visualization, an essential skill for doing well in science, math and engineering. They have been testing the app during the 2013 COSMOS program in Clusters 2 and 4, as well as on undergraduate students at the Jacobs School of Engineering. Researchers are set to conduct more testing at UCSD and in local high schools this coming year. Their goal is to make the app publicly available by next summer. "As an engineer I visualize things before I build them," said Nate Delson, Lecturer in Mechanical Engineering at UCSD and Cluster 2 lead faculty. "I visualize them in 3D, I visualize them in 2D, and I imagine what they're going to look like and how they will work before I build them. This process is called spatial visualization. Many kids learn spatial visualization skills by playing with construction toys such as Legos growing up. But some do not and it's these

iPad App Teaches Students Key Skills for Success in Math, Science and Engineering

students that can struggle with technical subjects in college." The app was inspired by the research of Sheryl A. Sorby, a professor at Ohio State University. Sorby realized that many women, herself included, did not initially have strong spatial visualization skills. She developed a course on spatial visualization and showed that students who took her course not only became better at visualizing objects in 3D, but also got better grades in math, physics, engineering, and computer science. Students were also less likely to drop out of these majors. "We wanted to broaden the reach of spatial visualization courses by using 3D computer graphics and touchscreen technology," Delson said. "With our iPad app, users can rotate 3D objects with their fingertip to learn how they look from different perspectives."



Cymer—a Popular Cluster 5 Field Trip Destination

In October 2012, Dutch company ASML paid approximately \$2.6 billion to acquire Cymer. With the latest light-source technology from Cymer, chips can be produced even smaller, meaning electronic devices will continue to get smaller, faster and cheaper. The Cymer/UCSD relationship is strong. Cymer has funded scholarships at the Jacobs School of Engineering and endowed a faculty chair. They actively recruit UCSD graduates with approximately 60 of Cymer's over 1,000 employees being alumni. COSMOS Cluster 5 students enjoy a field trip to Cymer's facilities every summer and it is often one of our top rated field trips.



Clark Guest, Lead Faculty, Cluster 5, Retiring from UCSD, COSMOS

Clark Guest, Associate Professor in Electrical and Computer Engineering at the Jacobs School of Engineering, UCSD, will be retiring in June 2014. Dr. Guest joined COSMOS as an instructor in Cluster 5 in 2008. Although Cluster 5 has had a few name changes during that time, "A Journey to Nano-Photonics", "Bright Ideas: Light at Work" and "From Lasers to LCD's: Light at Work", Dr. Guest has shared his interest and enthusiasm for lasers and lights with COSMOS students. Thanks, Dr. Guest and best wishes for your retirement!

Morse High School COSMopolitans

In June, 2013, Shirley Miranda, Teacher Fellow for Cluster 1 and an instructor at Morse High School in San Diego, had a pizza get-together for the Morse COSMOS alums and the Summer 2013 COSMopolitans. Not everyone was able to make it, but it was a good turnout and good information was exchanged. It definitely helped build excitement and rekindle memories for the COSMOS alums!



COSMOS Alums returned as judges for COSMOSlympics! If you are a COSMOS alum, consider joining us next year as a judge. COSMOLympics will be on Friday, July 11, 2014, so mark your calendars. Information will be on the COSMOS Alumni facebook page as the date gets closer.

COSMOS Alums Guest Judge for COSMOLympics



Faculty Update: Robert “Skip” Pomeroy, Cluster 6

Dr. Robert “Skip” Pomeroy, has been the lead instructor for COSMOS Cluster 6, “Biodiesel from Renewable Sources”, for the 2012 and 2013 summer programs. This Cluster topic is timely, and below he gives us a little insight into his interests—he is one busy person!

What courses do you teach at UCSD? Are you involved with any other academic or student organizations on campus other than COSMOS?

I teach the upper division analytical chemistry courses and the water and soil portion of the environmental chemistry sequence. I am a member of two research centers within UCSD. Cal-CAB, the California Center for Algal Biotechnology (algae.ucsd.edu) and the other is CAICE, the Center for Aerosols Impact on Climate and the Environment (caice.ucsd.edu). I serve as the faculty advisor for BAAN, the Biofuels Action and Awareness Network (biodiesel.edu).

You are active with outreach opportunities in the Sweetwater School District, particularly Castle Park High School. Can you tell us a little more about that?

I graduated from Castle Park High School in 1976. I then attended UCSD as an undergraduate and earned a PhD from U of Arizona in Analytical Chemistry. I returned to do my postdoc at Scripps Institution of Oceanography. I then worked at a couple of private companies and universities and got the opportunity to return to UCSD in 2007. Upon my return, I have focused my outreach efforts on the South Bay area of San Diego, and in particular Castle Park, for obvious reasons. I essentially engage the students at Castle Park in a COSMOS like program except that it occurs on their site and is an after school program with the interactions spread over the school year instead of a 4 week intensive residential program like COSMOS. Like COSMOS, we make the year end presentation of their work at the San Diego Science Festival held every March at Petco Park.

What are your current research topics and initiatives?

I work in three areas in which my analytical chemistry training applies. I work in CAICE, making environmental chemistry measurements trying to discover the molecules at the sea surface interface that influence particle formation that in turn influences cloud formation which impacts climate. I work in Cal CAB doing analytical chemistry on biofuels, testing quality and measuring the efficiency of

fuel production. My group is also interested in increasing the overall efficiency, but finding value added products from the materials left over from the fuel production process. Lastly, I do some analytical work in the area of DNA forensic analysis looking at alternative technologies for the examination of chemical/biological trace evidence.

Can you talk a little about your unique lab facilities and the research that goes on there?

In CAICE there is a really cool, big science facility at Scripps Institution of Oceanography that the center uses to create an atmospherically controlled breaking wave lab. Using the 30m wave flume in the hydrology lab, center researchers are able to monitor the aerosol particles released via sea spray under a variety of conditions. We have learned that the biology of the ocean impacts the number and types of particles released. For Cal CAB, the association with the biological field station (the greenhouse facility) where we grow algae is another unique laboratory asset. The center is able to test different strains of algae under different environmental conditions. This yields the center enough biomass on a scale that we can make better assessments of the energetics involved in growing algae as a substitute of petroleum based fuels. Lastly, working with colleagues from the Broward County DNA lab, we are developing DNA evidence technologies based on RT-PCR with the hope of increasing speed, portability and phenotypic information about people that have left evidence behind.

Why did you choose to get involved with COSMOS?

I heard of COSMOS soon after I started working with BAAN and many people suggested that the biofuels activity might be a COSMOS cluster. I think COSMOS is an excellent way to interact with and educate the next generation of STEM students. I wanted to take the opportunity to expose them to a chemical cluster as chemistry is often a key course in deciding whether a student stays in STEM or transfers to another major.

Do you keep in contact with any of your cluster alumni?

Some have done Science Fairs and some have expressed interest working with BAAN on the weekends (the locals). We are a fairly new cluster so we haven't had really too many interactions, but I assume that will change with time.



Do you have a favorite COSMOS memory or impression?

I have been pretty impressed with the joy with which the last two clusters have worked in the lab. No real problems to speak of. Everyone was really happy, got along well, and seemed to enjoy the science as well as one another.

How do you feel COSMOS prepares students for UCSD, or for college in general?

I think the residential aspect along with treating them like college students with respect to responsibilities and expectation, are the strengths of this program. The students come to realize the freedom that comes with being away from home carries the responsibility of taking care of their studies. Balancing study and having fun requires a level of discipline that now they have to impose upon themselves.

Do you have any advice for COSMOS alumni that are still in high school?

Applying to college? I am always surprised at the academic risk aversion I see in some students. Challenge yourself in high school by taking classes that will help you grow but that you think you might not be that good at. Take the teacher with the reputation for being harder, especially if you hear that the students learn a lot. When applying to college, choose a college with the greatest breadth of expertise. This will allow you to be exposed to more subjects and a diversity of people and ideas. The future is about working in groups, across disciplines on really complex problems. Look for universities that are engaged in that kind of activity.



COSMOS Alum Rasheed Al Kotob, UCSD Student Fall 2013

Rasheed attended COSMOS in 2011, Cluster 5, Bright Ideas: Light at Work. In Fall 2013, he entered UCSD Jacobs School of Engineering as a Nanoengineering major. Rasheed graciously responded to our questions, and has an interview video on the COSMOS YouTube channel.

Why did you choose UCSD?

COSMOS played a huge role in my decision to enroll at UCSD. It allowed me to explore the campus and get familiar with UCSD. I loved the experience, I liked the positive atmosphere on campus, and I was impressed by UCSD's stature as an educational institution.

Why did you choose your particular major?

I found NanoEngineering particularly appealing because it is a fairly new field, and there is so much potential growth and open possibility to expand. In other words, it is the future. My favorite course is Chemistry, primarily because it is closely related to my major and it is a perfect segue into the practical application of chemistry; I mean, who doesn't enjoy playing with dangerous chemicals in a lab setting?

How did COSMOS help prepare you for your undergraduate career?

COSMOS was not only a great resume builder, it was a wonderful social experience, a great networking opportunity, and a very insightful academic program which gave me an accurate feel for what college life would be like. It definitely made my college transition a lot smoother, especially since I attended UCSD.

Do you have any advice for your fellow COSMOS alumni who are still in high school?

Take advantage of every opportunity you have to get involved in extra-curricular activities. Explore, learn about yourself, and grow, and do not procrastinate on your college applications. Do your research about where you want to attend college, because not only will that place define you, you will define it, and therefore it is important that you find a place that you will be comfortable at, and want to devote your energy to. (UCSD is great, just saying).



COSMOS Alumni Gabriela Bernaldino and Rocio Pena

Gabriela Bernaldino, (COSMOS 2008, C6-Exploration of Waves and Stars) and Rocio Pena, (COSMOS 2009, Cluster 2-Engineering Design and Control of Kinetic Sculptures), are pictured at the UCSD Summer Research Conference, August 2013. The conference show-

cased undergraduate students attending faculty-mentored summer research programs. Gabriela was mentored by Dr. Lelli Van den Einde and her presentation was entitled, "An Investigation on the Design and Modeling of the Olivenhain Dam and Reservoir for Seismic Performance". Dr. Van den Einde is COSMOS Lead Faculty for Cluster 4: When Disaster Strikes: Earthquake Engineering and a Lecturer in Structural Engineering at JSOE, UCSD. Rocio Pena was mentored by Dr. Olivia Graeve, and her presentation was entitled, "Alumina and Silica Nanofluid Characterization for Heat Transfer Applications: A Dynamic Light Scattering Study". Dr. Graeve is an Associate Professor in the Aerospace/Mechanical Engineering Department at JSOE, UCSD. An interview with Gabriela will be on the COSMOS YouTube channel: <http://www.youtube.com/user/cosmosucsd>.

Chancellor's Dinner



Quan Ly, Cluster 2, COSMOS 2011 and Brandon Khuu, Cluster 2, COSMOS 2010, attended the UCSD Chancellor's Dinner in June 2013. Pictured are Quan Ly and Charles Tu, Director, COSMOS UCSD

COSMOS Alum Israel Barbosa, UCSD Undergraduate



From left: Assistant Vice Chancellor, Mae Brown; Luis Vargas; Israel Barbosa, Spencer Christensen, Charles Means, Dana Murillo, Ed Wallace, Sony; Kelli Dorey; Ann Klein and Interim Vice Chancellor of Student Affairs, Alan Houston. Photo by Erika Johnson, UCSD Communications

Israel Barbosa, (COSMOS 2011, C6: Exploring the COSMOS) was one of five UCSD undergraduate students, along with two junior faculty members, awarded a technology package from Sony Electronics, Inc., as part of a nationwide scholarship program during a reception on Nov. 1. This is the fifth year Sony has awarded equipment packages. Selected students are part of the UCSD Guardian Scholars Program, which supports former foster youth during their time on campus. Ed Wallace, Vice President of Community Relations for Sony, presented this year's awards and congratulated each of the recipients. "Our scholarship program aims to recognize two key groups in higher education—top students who have overcome phenomenal odds to get to where they are and talented tenured-track junior faculty who are in need of tools to help them in their research and instruction". The student Sony technology packages consisted of a Laptop with a backpack, camera and an MP3 Player. Israel is a freshman at UCSD, majoring in nanoengineering. He has a passion for discovering solutions that will advance clean energy and conserve our natural resources. Barbosa is involved in sports on campus and is currently catcher for the UCSD Club Baseball team.

Keep in touch! Look for our next issue in Spring 2014!
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