



COSMOS UC San Diego

California State Summer School for Mathematics and Science

Alumni Newsletter Spring 2014

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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UCSD COSMOS Celebrates 10 Years!

The UCSD COSMOS program is turning 10 years old this summer! Although officially in existence since 2004, the first attending students arrived in summer 2005. Five clusters were offered that summer, admitting 83 students. The Clusters were: C1-The Science of Computing; C2-Kinetic Sculpture and Clocks-the Art and Science of Mechanical and Engineering Design; C3-Living Oceans and the Impacts of Climate Change; C4-Earthquakes in Action; C5-The Molecular Biology Revolution. Interestingly, the subjects of all of these original clusters are currently offered this summer. COSMOS would like to acknowledge Cluster 2



Raymond de Callafon, 2005

faculty, Nate Delson and Raymond de Callafon for inspiring COSMOS students every summer since 2005! If you have a favorite memory, photo or message of Dr. Delson or de Callafon, or of Cluster 2, please email it to cosmos@ucsd.edu.



Nate Delson, 2005

UCSD COSMOS 2014 Update

Acceptance notifications for the UCSD COSMOS 2014 program were sent to anxious applicants on April 18th. 613 applications were completed for 184 student openings at UCSD. More than half of the accepted students are in 11th grade, overwhelmingly from California (one out-of-state and two international students accepted), slightly more female students and about one-third are receiving financial assistance. The most requested first choice clusters remain Clusters 1 (Computers in Everyday Life), 2 (Engineering Design and Control of Kinetic Sculptures), 7 (Bioengineering/Mechanical Engineering: The Amazing Red Blood Cell) and 8 (Tissue Engineering and Regenerative Medicine). New for this year is Cluster 9: Music and Technology with Dr. Mauricio de Oliveira as lead faculty and Dr. Shlomo Dubnov as cluster faculty. Dr. de Oliveira continues as lead faculty for Cluster 7 in addition to Cluster 9. Dr. Robert "Skip" Pomeroy will be lead faculty for Clusters 3 (Living Oceans and Global Climate Change) and 6 (Biodiesel from Renewable Sources). COSMOS Director and ECE professor Dr. Charles Tu will be lead faculty for Cluster 5 (From Lasers to LCD's: Light at Work).

Important Upcoming Dates

COSMOS 2014 Summer Program

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

COSMOLYMPICS

Friday, July 11—6:30-8:30pm—we need judges!

COSMOS 10 Year Celebration/Advisory

Board Visit

Tuesday, July 22— 5:00-7:30pm

COSMOS Alumni In The News!

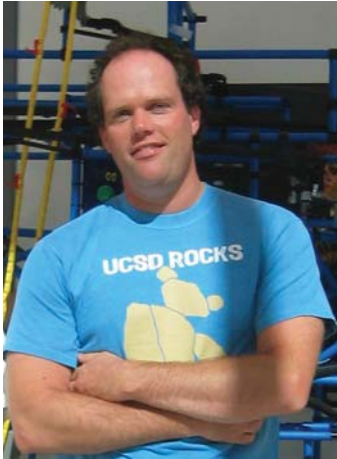
Send your news and updates to cosmos@ucsd.edu

UCSD Receives Record Applications for Fall 2014

UCSD has received a record 89,169 freshman and transfer applications for fall 2014. UCSD received 73,356 freshman applications for fall 2014, up 8.8 percent from last year. Transfer student applications also increased by 5.8 percent from 2013 with a total of 15,813 transfer students applying for admission. The mean high school GPA for freshmen is 3.79, up from 3.77 last year; and the average SAT Reasoning scores are 591, 644 and 607 respectively for Critical Reading, Math and Writing, (up slightly from last year's applicant SAT scores which were 583, 635 and 595). The average GPA among transfer applicants increased from 3.35 to 3.37, compared to last year. The most popular majors chosen by freshman applicants are engineering, biology and the social sciences. Almost 50 percent of UC San Diego's transfer applications are social science majors.

Faculty Highlight: Raymond de Callafon, Cluster 2

In this issue we hear from Raymond de Callafon, UCSD MAE Professor and COSMOS Cluster 2: Engineering Design & Control of Kinetic Sculptures faculty:



As inaugural COSMOS faculty, and celebrating your 10th summer this year, any insights or experiences you would like to share?

The last 10 years with COSMOS at UCSD during the summer have been an amazing experience. During our first year I was doubtful whether or not we would be able to keep a group of high school kids engaged and entertained for 4 full weeks during the summer. Well, that all changed after the first year. The COSMOS students were not only motivated to work in our design studio, they were thrilled to interact with professors and teaching assistants, they were excited to learn about the engineering tools we brought to our cluster and they loved the extracurricular activities outside the classroom during their 4 week stay at the UCSD campus. On top of that, I have the privilege to work with Nathan Delson. He has been instrumental in setting up many of the original ideas of our unique cluster, while Chris Cassidy has been our rock star in the design studio where our COSMOS students work. Last but not least, I was fortunate to work side-by-side with some inspiring high school teachers in our cluster. Our COSMOS Teacher Fellows gave us a lot of tips on teaching, how to inspire students and helped in creating engaging experiments and design challenges.

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

My background is in the area of control systems and in particular in dynamic modeling from time-series data. I teach both undergraduate and graduate courses in this area of control systems and dynamic modeling of time-series data. My graduate courses focus mainly on my main research topics in time-series analysis and include two System Identification courses and a Robust Control course. At the undergraduate level, I teach basic linear control at a junior level. In addition, I like

hands-on experiments and I am responsible for most of the senior level laboratory experiments in our department that are being used in special laboratory courses that focus on control, linear circuits and dynamic vibration analysis.

What are your current research topics and initiatives?

With my background in the area of dynamic modeling from time-series data, I am in the 'business' of measuring time-dependent signals from a dynamic system and use these signals to either formulate models or update control algorithms to describe or alter the dynamic behavior of that system. I apply these techniques to model the dynamics of intricate small mechanical components found in a hard disk, magnetic tape or an optical disk drive, but also to model the behavior of large complex systems such as aircraft dynamics, electric (micro)grids, ocean flow and wildfire behavior. Our effort in modeling the dynamics of electric grids is based on time-series data measurements with Phasor Measurement Units (PMUs) and has unleashed new methodologies to control and safeguard our electric grid that we hope to develop more into the future. Furthermore, our latest project on observing wildfire behavior and predicting the dynamics and the rate of spread of a wildfire in collaboration with the San Diego Supercomputer Center, the Qualcomm Institute and the University of Maryland is very important here in Southern California, where we recently have seen many wildfires.

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

My laboratory holds experimental facilities on which we can test new algorithms that process time-dependent signals to either formulate models or update control algorithms to alter the dynamic behavior of that system. The experiments include sound equipment to model sound propagation and embedded systems to implement noise cancellation. We also have several intricate mechanical systems such as special hard disk and magnetic tape drives to test out new (adaptive) control algorithms to improve the data storage capabilities of these systems. Our latest experimental facility runs outside our lab: in collaboration with Lou Shrinkle from Pacific Battery Management Systems we have developed a prototype Electric Vehicle (EV) that runs on user-exchangeable battery modules. The main idea of this experiment is that one could easily swap out parts of a complete battery of an EV to extend the range of an EV, while allowing the mixing of partial charged battery modules. This would provide an extreme flexibility in EV charging and refueling that has not been seen before and we are planning to demonstrate this with a cross-country drive by the end of the summer of 2014. Many undergraduate students participate in this fun project.

Why did you choose to get involved with COSMOS?

When I was in high school, I only had a vague idea what engineering was and whether or not I would like to study it more. In addition, my parents never went to college and the idea of applying to college

and picking a topic to study seemed daunting with the limited help and advice my parents could give me. I realized that the choice I was going to make would have a big impact on the upcoming years and perhaps set the career path in my life. When I heard about COSMOS program 10 years ago, I was immediately convinced that this program was providing the missing stepping stone from high school to college that students need. I am still thrilled to be part of that stepping stone.

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

Many of the COSMOS students in our cluster keep in touch with me via email. I am, unfortunately, not a fan of Facebook, but keep my LinkedIn active for students to connect to me, as I am often 'buried under email'. One of the many positive outcomes of COSMOS is that I have a fairly good idea on the academic skills and level of the students. This knowledge is extremely helpful when students ask for recommendation letters for their college application.

Do you have a favorite COSMOS memory or impression?

One of the most wonderful experiences for me is still the last day of the program when students are suddenly all dressed up to give their presentations and demonstrate the projects to their parents. You can see, but mostly, hear the cheers when everything seems to work as planned, while their parents stand in awe and affirm to the instructors how amazed they are with the design completed by their son or daughter. Partly because I became a parent myself during these last 10 years, I have come to appreciate the amount of time and effort parents put into teaching and motivating their children. It is wonderful to see how our COSMOS students demonstrate their appreciation to their parents during their COSMOS summer.

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

COSMOS provides a rare opportunity for high school students to study one of their favorite topics. At the same time, it allows students to figure out what is their favorite discipline to study and experience life at a university for four weeks in a row. Surrounded by other students who are just as eager to learn more about what it is like to live, work and study at a university.

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

With so many students applying to college it is important to diversify yourself and show that you have an extra edge over the other students applying. The fact that you participated in COSMOS already gives you some of that edge, but it is important to keep it strong by continuing to participate in outside school activities that promote science, math and engineering education and research. Collaborative work demonstrates that you are a team player, but make sure you can always identify your specific contributions in a team effort. Extracurricular activities that demonstrate your interesting hobbies, your unique team spirit and your special qualifications always make your file stronger.

Jack Takahashi, COSMOS 2011, Intel STS 2013 Finalist

Currently attending: Stanford University;
Expected Graduation: 2017
Major: Undecided
COSMOS Year: 2011;
Cluster 8: The Molecular Biology Revolution



What kind of research are you currently involved in, and/or what extracurricular activities and organizations do you participate in?

I'm currently working in the de Jesus Perez lab in the Pulmonary and Critical Care department of the Stanford School of Medicine. My research is on PDGF-related beta catenin activation in idiopathic pulmonary arterial hypertension (IPAH). On the side, I'm learning ballroom dance and writing for the Stanford Flipside, a satirical newspaper.

Did you participate in any science/engineering competitions or fairs after COSMOS? How did you do?

Intel STS 2013 Finalist; I-SWEEEP 2012 Gold Medal; Synopsys Championship 2012, 1st Place Microbiology

How did COSMOS help prepare you for your undergraduate journey?

My COSMOS cluster gave me a solid foundation in molecular biology that allowed me to work with advanced techniques like qRT-PCR and western blots comfortably. This gave me a leg up when I started research in high school and continues to help me with my research at Stanford. At the same time, COSMOS introduced me to dorm life, so college wasn't a shock for me.

What are your future aspirations?

I plan on earning an MD or MD PhD. I'm not sure whether I want to work clinically or as a physician researcher, but I'm confident I want to be in the medical field.

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

Don't stress about where you end up going to college. What you do in college matters more than where you go.

Because of my participation in COSMOS, I am encouraged/inspired to....

explore the sciences an inch wide and a mile deep. COSMOS was great because it allowed me to learn at a high-level while my high school courses were still teaching the basics.

NCWIT Aspirations in Computing Awards



Shirley Miranda, COSMOS Teacher Fellow/Advisory Board member and Morse High School teacher; Khelsey Gozum and Charlotte McGinn, COSMOS 2013; and Noa Glaser, COSMOS 2011 (above, L to R) were honored recently at a ceremony at Qualcomm as 2014 NCWIT San Diego Competition Winners and 2014 NCWIT National Community Competition Runner Up Winners. Shirley Miranda received a 2014 NCWIT Educator Award for her extraordinary efforts in teaching computing skills to students. The National Center for Women & Information Technology is a non-profit community of more than 500 prominent corporations, academic institutions, government agencies, and non-profits working to increase women's participation in technology and computing. NCWIT helps organizations recruit, retain, and advance women from K-12 and higher education through industry and entrepreneurial careers by providing community, evidence, and action.

Connor Worley, COSMOS 2013, Macy's Thanksgiving Day Parade- FIRST Robotics

The Macy's Thanksgiving Day Parade® is the beginning of the American holiday season. More than 3.5 million people in New York and 50 million people around the country watch this holiday tradition. This year, there was something never before seen in the parade – ROBOTS! Five award-winning FIRST Robotics Competition (FRC) teams opened the 87th annual event on November 28, 2013 in New York City, cutting the ribbon to signal the official start of the parade. The teams spent many hours retro-fitting their competition robot from shooting discs to shooting confetti, and operating the scissors to cut the ribbon. One of the participating teams, The Holy Cows from San Diego, included COSMOS alum Connor Worley. Following are his impressions:

This Thanksgiving break, I helped lead the Macy's Day parade with my FIRST robotics team, The Holy Cows. Along with four other teams we were selected to cut the ribbon and shoot confetti, then drive two and a half mile-long parade route. When I first heard the news that our team was selected I was thrilled, but the team quickly realized that we would need to make some modifications to the robot before Thanksgiving. We decided to use three batteries connected in parallel, and were satisfied after some testing. To shoot confetti, we purchased a confetti launcher, mounted it to the robot, and rewired it to use our robot's power distribution system rather than an internal battery. After more testing we were ready to crate up the robot for New York.

We arrived on Tuesday evening and went to bed right after dinner. On Wednesday we woke up at three in the morning to make an appearance on Fox & Friends and hype up the parade. Later that day we did some sightseeing with a tour of Yankee Stadium and a visit to the 9/11 memorial. We woke up at three again, and drove to the parade with the other teams. After one last systems check we waited for the parade to start. It was freezing cold, but I knew the experience would be worth it. When the parade cheered, started and the crowd the cold seemed to disappear. Overall, I had a great time in New York. Not only was it a blast to be there, but I'm also glad to have helped promote FIRST, a program that has given so much to me. I hope they'll be invited back next year!



COSMOS 2014 Intel Scholars Reception and Project Presentation

COSMOS 2014 Intel Scholars presented their projects to representatives from the Intel Corporation on Thursday, March 20, 2014 at an event in the Qualcomm Room at Jacobs Hall. One student from each cluster was chosen as an Intel Scholar during the summer COSMOS program, and all recipients had to reside in San Diego County. Students were paired with a UCSD engineering student mentor, through the Jacobs School of Engineering IDEA Center. Scholars and mentors met in advance of the presentation to polish their project posters and presentation skills. Scholars and mentors both proclaimed that the experience was more beneficial and rewarding than they thought it would be and definitely worth the time spent. The Intel representatives attending were Grace Davis, Director of Corpo-

rate Affairs and Sponsor of US Girls and Women Programs At Intel, and Wilberth Escalante-Tamayo and Daniel Ugarte, from the local Intel Office. Each Intel Scholar presented both an oral presentation and poster board of their project and exhibited confidence and knowledge to the audience. The Intel Scholars are: Cluster 1: Khelsey Gozum; Cluster 2: Cristabel Otero; Cluster 3: Joey Uy; Cluster 4: Diego Espinoza; Cluster 5: Marcella Marquez; Cluster 6: Angela Chen; Cluster 7: Brandon Nguyen; Cluster 8: Laura Leon.



Pictured above, front row, l to r: Khelsey Gozum, Angela Chen, Grace Davis, Cristabel Otero, Laura Leon, Marcella Marquez. Back row, l to r: Brandon Nguyen, Wilberth Escalante-Tamayo, Daniel Ugarte, Diego Espinoza, Joey Uy

My Journey to Silicon Valley: How one individual got into the CODE2040 Fellows Program

By: Alex Rodriguez, COSMOS 2010

Sophomore Year

It was my sophomore year of college and like many Computer Science students, I was looking for a summer internship. I first heard about the CODE2040 Fellows Program as a sophomore Computer Science major at UCSD through an alumna, Jennifer Argüello. As a person that always strives for the best opportunities, I decided to apply. I felt enthusiastic that for the first time, there was a program that aided underrepresented minorities, specifically African Americans and Latinos, to get into the tech hub of entrepreneurship, mentorship, and pathways to success. I submitted the application and unfortunately, a week later, I heard that I would not be making the next round. Reading these words, I started to doubt myself. Was I meant for this field where there were so few people of my race? Why were there so few Latinos in the tech world that I could look up to? In the end, this lack of inspiration and imagery, pushed and inspired me the next year to have the strongest profile. I started to broaden myself more with experiences like interning at Life Technologies as a Software Developer Intern, becoming a Webmaster for SHPE @ UCSD, working as a ThoughtSTEM Mentor and as a College Ambassador, attending Startup Weekend events and national hackathons, and becoming an advocate for Women in Computing by going to their regional conferences and annual general body meetings. By fall, I knew I was ready.

Junior Year

Junior year started and I was determined to do better in all of my coding interviews and internship searches. Mid-October the application came out. I was excited to prove myself and show my maturity and growth in the last year. I was typing personal essays and coding algorithms on the application. Unlike last year, I really pondered why did I want to join the CODE2040 Fellows Program? No, I did not want to join it just for the company perks, I wanted to join the program for what I believed about myself. I was surprised that only 5% of the tech world is Latino, and being one myself, I wanted to prove that being a minority is nothing to take a step back from. You have to be an example and inspire others that anyone can do it—you just need to work hard! In addition, I was passionate about going to Silicon Valley, after being there for two days while at the SheCodes conference. Most of my friends were interning at major companies like Google, Facebook, Amazon, Cisco, Workday, Apple, etc., but I knew that I could learn more with a startup. I hit the application button, "100% complete". Thanks Liz, Reyna, & Mana for reviewing my essays! One Week had passed....and I saw this in my inbox: **"CODE2040 Fellows Program-Application Under Review!"** I made it to the phone interview stage! Was it possible that my dream of going to Silicon Valley might happen? I knew my family, especially my mother, and my dad up in heaven would be proud. Who knew that parents who had a basic elementary education's kid could do this?

Phone Interview = True Connection

I started to freak out about the interviews coming up. One day while reading a post about the "Imposter's Syndrome", I saw that that the

author was a recent graduated fellow from CODE2040, Ingrid. I wanted to contact her, but I felt a little awkward doing so. How did she feel about this program? How was the interview? Eventually I did and we formed a wonderful connection, casually talking every so often still. Ingrid gave me strong pointers on what to say in the interview and really just to be yourself and show what makes you different. From this experience, I learned the importance of reaching out to individuals, even if you do not know the person. It shows initiative and for me was helpful because Ingrid personally recommended to the team my initiative. A week later, I had an interview with the Program Manager. We talked about the program, what I did in my free time, what the program meant for me, etc. Final decisions would be around mid-December.

Final Decision

Mid-December, I checked my email constantly, no emails from CODE2040 yet. Did I get in? Did I do something wrong in the interview? Did I sound too passionate for this world? On December 20 something was in my inbox: **I was selected to be a finalist for the CODE2040 Fellows Program for the company matching process!** A dream being achieved. I was going to San Francisco this summer, matched with a startup company, entering the entrepreneurship world. I called friends, tweeted, posted on Facebook and lastly, made a Place board of San Francisco startup companies to visit. I was going to Silicon Valley this summer not only to learn about the culture of San Francisco, startups, Meetups, people, but to indulge in the world I always dreamt of. I am excited to be meeting the entire CODE2040 Team in person, my new Fellows, my mentors, working at a startup company, and the city itself.

Structural Engineering Outreach, Lelli Van Den Einde, Cluster 4 Faculty

Engineering students use hands-on approach to teach sixth graders fundamentals of earthquake engineering

Over the past seven years, more than 7,000 sixth graders from 26 schools in San Diego County have visited the Jacobs School of Engineering to build model structures and test them on small shake tables. It's all part of the Earthquake Engineering with K'NEX Outreach Program run by the UC San Diego chapter of the Society of Civil and Structural Engineers.

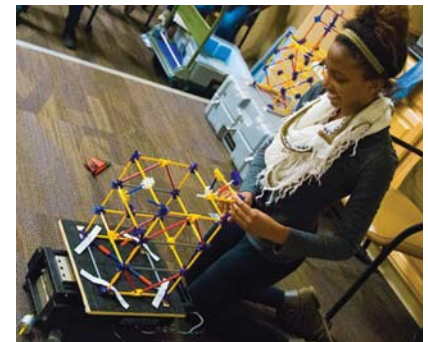
On a recent Monday morning, nearly 50 of these sixth-grade students dotted the lawn outside of Jacobs Hall en route to test their toy structures. Headed by third-year structural engineering major Kayse Sheppard, the student-run program educates local students in the fundamentals of earthquake engineering.

Sheppard was one of seven volunteers that went out to local elementary schools to teach students about earthquakes and how good design can prevent buildings from collapsing. The volunteers then provide students with K'Nex building blocks, so they can create model buildings to be tested on UC San Diego's miniature shake table – a tool used to simulate earthquakes–worth \$30,000 commercially.

Built by teams of five students, the designs are judged by UC San Diego seismic outreach volunteers for how well they held up on the shake table, creativity and cost effectiveness. The best designs are awarded a certificate of achievement.

"I think in elementary schools, science is sometimes put on the backburner," program faculty advisor Lelli Van Den Einde said. "I think the program is a great opportunity to get kids engaged and excited in science. Some of these kids have never had the chance to come to a college campus, and it's amazing to see the energy and excitement they bring to the project."

Van Den Einde – a UC San Diego lecturer teaching the Conceptual Structural Design course – says the program now in its eighth year, is looking to expand. The effort is spearheaded by two Jacobs School Ph.D. students, Scott Ouellette and Colin Haynes, who are also Gordon Center scholars. "I believe that it's very important for engineers to reach out in our communities and educate kids about what we do," Haynes said. "We not only inspire kids to choose engineering careers, but also develop young engineers into more effective communicators and more engaged citizens."



UCSD Jacobs School of Engineering, Gordon Center Engineering Leadership Awards Dinner, 2014

On Tuesday, April 8, the Bernard and Sophia Gordon Leadership Center had their 5th Anniversary Leadership Awards Dinner. The members of one project team from each COSMOS Cluster are selected for Gordon Center Leadership Awards by their cluster faculty and teacher fellow. This year's award dinner was held at The Great Hall on the UCSD campus. In attendance for COSMOS were Charlotte McGinn, Cluster 1, James Chang, Cluster 4, Angela Chen, Cluster 6 and Becky Hames, COSMOS Assistant Director.



From far right: Angela Chen, Charlotte McGinn and James Chang with 2014 Gordon Center Engineering Leadership Honorees that were present

Ryan Kastner, Cluster 1 Faculty



(Hayne Palmour IV, San Diego UT)

Ryan Kastner, UCSD Computer Science Professor, and COSMOS Cluster 1 lead faculty, will use high-resolution imaging tools in June to help archeologists map Mayan ruins in Guatemala and a sunken ship in Lake Tahoe's Emerald Bay Underwater Park. He will be joined by graduate student Perry Naughton (former COSMOS Cluster Assistant) and undergraduate students. In the photo at right, Kastner displays the underwater stereo camera system that he developed for producing 3D reconstruction of underwater objects. Learn more through the [Engineers for Exploration](#) website.

Rajesh Gupta, UCSD CSE Chair, Former Faculty COSMOS Cluster I and COSMOS Supporter

In the movie "Her", the smart phone operating system, "Samantha", is so powerful it can carry on conversations that seem to tap into everything Theodore sees, thinks and feels. Gary Robbins, U-T San Diego, interviewed Rajesh Gupta, chair of CSE at UCSD, a leader in machine learning and artificial intelligence to ask the question: will smartphones soon become sentient?

What is the scope of the information that smartphones, apps and wearable devices can collect on us now?

It's quite significant. Your smartphone knows who you are, where you are, where you've been, and a lot about what you're doing. Its sensors can tell if you're walking, running or sitting. Some phones also can sense air pressure, temperature, light, humidity and your proximity to objects. What the smartphone can't do is sense your mood, like your pets can do.

Mood?

Computers are beginning to elicit emotional responses from users. But they can't sense mood, which you need to know to have a conversation. That will change as sensors are developed to give computers 'people skills,' like being able to detect when you're annoyed or frustrated. There are already applications in automobiles that look for distraction in drivers. Most of the advances will be tied to wellness, an area where there's a lot of sensors and apps. Your smartphone can determine your heart rate by using its camera to see changes in the color of your skin. That information can help reveal if you're excited or anxious, or not. Advances are being made in learning algorithms that navigate this data and make sense of it. Javier Movellan from UCSD's Machine Perception Lab, along with others, is beginning to fuse information from voice (things like vocal tone), images (the frequency and length of frowns and smiles), skin (conductance, heart rate, temperature, breathing rate), and device usage patterns. The problem is, smartphones don't have the processing power or the energy to pull all of this together to determine your mood in real time. Without that, your computer

wouldn't be able to engage you in a realistic conversation, like Samantha does.

I dislike Siri's computer-generated voice on the iPhone. I know others who feel the same. Will scientists need to give these operating systems natural voices, like Samantha's? The OS is able to convey surprise, empathy and curiosity.

The problem is more difficult than it sounds. There's the issue of creepiness; some people don't like it when a machine becomes too life-like. But the operating systems will have to behave more like people if they're going to be widely accepted and used. That means scientists will have to improve the computer's ability to synthesize verbal and non-verbal emotional cues, like a person's laughter or a shrug, or their posture.

So smartphones will need better voice recognition?

Yes. This is not a well researched area. Machines are not good at knowing whether they're hearing things like sarcasm, or a sentence that actually means the opposite of what's being said, or whether a sentence is simply filler in a conversation. The smartphone can't make inferences about what a person is saying. The phone needs to do that, and analyze how a person is interacting with other people, or other things. For example, the machine could pick up on mood if it knows that a person is yelling at another driver in traffic, or whether a person is listening to a certain type of music for a long period of time.

What about facial and gesture recognition?

We are beginning to build a pretty rich vocabulary of facial and hand gestures. That's being used to build better computer games and music players. Advances in this area are moving rapidly with innovative startups such as Flutter, whose app lets you control music players with hand gestures, and PointGrab, (which does the same with home appliances and electronics.)

In other words, an operating system like Samantha could read your body language and determine mood?

Yes, automatic mood assessment from gestures is possible.



It sounds like you're saying that an OS like Samantha could be developed if the system could integrate all of this information and process it in real-time in order for the computer to have a conversation...

There are both technical and sociological challenges to building Samantha. Sensors already grab a lot of raw data that could be pulled together. We have to be able to do all this in real time. Trust is a bigger issue. We can live with giving away some information. But we do care about who is collecting it. We find it easier to trust individual humans, even ones we meet casually, than it is to trust corporations or government, which can lack a heart or conscience. We love our pets because they aren't out to hurt us. If we create sentient computers, we would first need to make sure that they are working and speaking in our best interests. *I'm a bit torn by the essence of "Her." Everyone needs companionship. But Theodore develops a more meaningful relationship with a smartphone than he does with humans. That seems pathetic. What's your take?*

I know we can cross the bridge of affection with our devices. But making an emotional bond takes more than a few lines of code. There has to be genuine reciprocity as a precondition to intimacy. It goes to the heart of a question in computer science: can machines think? I think Samantha makes us examine the nature of intimacy more closely than the nature of computation. Living in this sensory-simulated world, what fundamental moral principles will she, or her real-life companion, violate? That is the troubling aspect.

You're a computer scientist who's totally into OS. Would you buy a smartphone with Samantha if she/her/it existed?

As a curious computer scientist, yes. Not sure, if I can bring her home with me.

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

UCSD COSMOS is on Facebook!
Link up with us at:

Are you a COSMOS alum attending UCSD? Would you like to talk about your COSMOS/UCSD experience to help prospective COSMOS students visualize what could be? If so, please contact the COSMOS office so we can tell your story on our YouTube channel! Here's a peek:
<https://www.youtube.com/user/cosmosucsd> ~ cosmos@ucsd.edu