

FACULTY newsletter

CPMS Physical and Mathematical Sciences

World-Renowned Chemical Engineer Comes to BYU



Photo courtesy of Code Poet

It's not everyday that one of the 100 most important people in America comes to Brigham Young University.

Dr. Robert Langer, from MIT, will present the Izatt-Christensen lecture for the general public February 6, 2013. This annual event is sponsored by the Department of Chemistry and Biochemistry and the Department of Chemical Engineering.

Deemed one of the 100 most important people in America by Time Magazine and CNN, Langer has more than 200 prestigious awards to his name, including the 2006 United States National Medal of Science. Forbes Magazine and BioWorld Today also named him one of the 25 most important individuals in biotechnology in the world.

Dr. Langer will be discussing the history of biotechnology—from cancer research to pharmaceutical drugs to tissue engineering. He has published

more than 1,175 articles on the topic and is the most cited engineer in history.

The public is invited to attend both of Dr. Langer's lectures, the first of which will be the general session February 6, 2013, at 4:00 p.m. in the Joseph Smith Building auditorium. The more technical presentation will be February 7, at 11:00 a.m. in W111 of the Ezra Taft Benson Building.

These lectures are part of the yearly Izatt-Christensen lecture series hosted by the Chemical Engineering Department of the Ira A. Fulton College of Engineering and Technology and the Department of Chemistry and Biochemistry in the College of Physical and Mathematical Sciences.

Members of the public and press are invited to attend. For more information visit <http://apm.byu.edu/langer.htm> or contact John Hedengren, john.hedengren@byu.edu.

by: Curtis Penfold

2013 Awards Banquet Celebrates Service

Faculty, staff, and their families gathered in the Wilkinson Ballroom on Thursday, January 31, for the College Annual Awards Banquet—an evening to honor faculty and staff within the College of Physical and Mathematical Sciences.

The announcements began with University Service Awards, granted for every five years of service to the university. These honors were given to Shane Jorgenson (10 yrs., College Advisement Center), Jackie Robertson (10 yrs., mathematics), Greg Corlett (15 yrs., computer science), Ruth Dauwalder (20 yrs., statistics), Peggy Erickson (20 yrs., chemistry & biochemistry), Kurt Huntington (20 yrs., deans' office), Kathy Lee Garrett (25 yrs., math education) and Kim Sullivan (25 yrs., geology).

Next, Sommerfeldt announced the recipients of the College Faculty Awards for citizenship and service.

John Ellsworth, who works as the Research Laboratory Supervisor in physics and astronomy, was honored with the Outstanding Staff/Administrative Employee Award. Ellsworth has tremen-

dous skill in electronic design and has taken care of all the vacuum systems within the department on top of many other tasks.

Jeff Macedone, a professor in the Department of Chemistry, received the Faculty Excellence in Teaching Award (3-10 years at BYU). Macedone is an energetic teacher whose enthusiasm is contagious. Though his courses can be tough, students continue to give him the highest ratings.

Said one colleague, "Jeff is the best presenter I have ever seen. He truly makes the subject come to life. His enthusiasm is infectious. He makes me want to take his class."

William Christensen, a professor in the Department of Statistics, was also honored with the Faculty Excellence in Teaching Award (10 or more years at BYU). Christensen is an impressive scholar who routinely draws research results into his courses to capture students' interest.

Next, Jessica Purcell received the Faculty Young Scholar Award (3-10 years of service). Purcell joined the

Department of Mathematics after a postdoctoral position at the University of Oxford Mathematical Institute. Purcell's work shines within the classroom, as she played a major role in raising Math 112 to one of the top 16 calculus programs in the country.

Finally, Dan Olsen received the Distinguished Citizenship Award for his work within the Department of Computer Science. Olsen supervised the construction of the west wing of the Talmage Building and later served as chair of the department. On the university level, Olsen served on the Faculty Advisory Council and currently serves on the Rank & Status Committee.

"Dan is a great example of what true citizenship and loyalty to BYU means, and he has successfully done this without sacrificing excellence in his scholarship or teaching."

Enjoying dinner and jokes, faculty and staff spent the evening honoring friends and colleagues and recognizing dedication and hard work.

by: Carly Huchendorf

Sridhar Tayur: A Model for Success



ABOVE OrganJet uses private jets to save lives.

Photo courtesy of Scott J. Lowe

Million-dollar business deals, video games, and life-saving jet planes. What sounds like a weekend blockbuster is actually a small portion of mathematician Sridhar Tayur's résumé.

As Tayur certainly demonstrated in his lecture on January 25—a career in math doesn't have to be boring.

In his lecture titled "The Unreasonable Effectiveness of Certain Mathematical Models in Practice," Tayur discussed how he has successfully used mathematical models—a means for describing how a system works through mathematical concepts—to solve problems in business, advertising, and healthcare.

His spirit of creativity and entrepreneurship led him to the business of inventories, where one trillion U.S. dollars are tied up.

"I was never a very studious guy of inventory when I was a PhD student, but I listened to this, and I said this, 'One trillion dollars of inventory? If I can remove 1% of unnecessary inventory and get paid 1% for every one of that inventory I removed, wouldn't I be in the top 0.1% of the world? Yes.'"

So Tayur did just that, using a mathematical model to help companies free millions of their dollars unnecessarily tied up in inventory.

The same process applies to more than just business. Tayur turned next to advertising.

"Super Bowl ads for 30 seconds go for \$2 million." However, advertisers are realizing that their target audiences are not watching TV as much any more. "What are they doing?" asked Tayur, "18- to 30-year-old males are

playing video games."

So a friend asked him to work for her new company, Massive Inc., creating a model for placing ads into video games through the Internet. This company was sold to Microsoft for \$400 million.

Tayur's career has obviously been lucrative, but his interests extend beyond profit.

"It is unfortunate," Tayur joked, "but there comes a time when even a shallow guy like me starts thinking. And then you say, 'Maybe I can be of some use to somebody other than myself.'"

For Tayur, this meant reexamining the way people receive kidney transplants in the U.S., where every 90 minutes, someone dies waiting for a transplant. Because waiting lists in certain states are shorter than others, a patient's wait for a kidney largely depends on his or her location. Tayur wanted to fix that.

He learned that Steve Jobs, because of his access to a private jet, was able to put his name on multiple waiting lists around the country with the promise that if a kidney became available, he'd arrive in time to receive it.

Tayur decided, "I'm going to make what Steve Jobs had available for everyone. I'm going to democratize Steve Jobs."

From this decision, Tayur's company OrganJet was created to fly patients in private jets to states with available kidneys.

Tayur's final message was simple: math is about the joy of creating.

"Why do I do what I do?" asked Tayur. "I do it because I find it fun."

by: Carly Huchendorf

A Chemical Breakthrough

Dr. Daniel Ess's new chemical reaction has caused a national reaction among chemists.

Pharmaceutical companies don't like to use metal catalysts to synthesize their drugs. So when Dr. Ess and a collaboration of professors discovered a way to do a needed reaction without metal, it gained national attention.

"The problem is even if you put a little bit of metal in your reaction, you're going to spend enormous effort and time cleaning the metal up," Dr. Ess explained. The FDA requires most drugs to be free of metal.

For decades, chemists have worked to construct aryl amine bonds without

using metals, but to no avail. Dr. Ess, Brigham Young University Department of Chemistry and Biochemistry, and a group led by Dr. Laszlo Kurti at University of Texas Southwestern have recently published a paper that describes the invention of a new amination reagent that works without the assistance of any metals.

Their publication also provides key theoretical insights into why this reagent is so effective at conversion of aryl boronic acids into aryl amines.

"The key thing is that we found a new avenue that's much more practical," Dr. Ess said. The other avenues to get the

same reaction involved either reagents that led to the expensive removal of metal or reagents that didn't respond well with other chemicals.

Chemistry and Engineering News, a prestigious publication read nationwide by thousands of chemists, picked up on the exciting news after the Kurti/Ess team and another independent team simultaneously published approaches to the metal-free synthesis of aryl amines.

"Pharmaceutical companies would always opt to use metal-free conditions if that's available," Dr. Ess said. "Until now, that option just was not available to them."

by: Curtis Penfold

Dates to Note

University Award Nominations
Due to the College

Wednesday, February 6

Izatt-Christensen Lecture

Biomaterials and Biotechnology:
Drug Delivery to Tissue Engineering
Wednesday, February 6
4p.m., JSB Auditorium

Novel Drug Delivery Systems
Thursday, February 7
11a.m., BNSN W111

SRC Abstract Submissions Due

Friday, Feb. 15, by midnight
<http://src.byu.edu>

Rank and Status Files

Due to the College

Monday, March 4

Student Research Conference

Saturday, March 9
8 a.m., 1102 JKB

Twitter Helps Track Outbreaks



Photo courtesy of Jonathan Hardy BYU Photo

ABOVE Tweets help track outbreaks.

This flu season you've probably seen a number of friends on social media talking about symptoms.

New research from Brigham Young University says such posts on Twitter could actually be helpful to health officials looking for a head start on outbreaks.

The study sampled 24 million tweets from 10 million unique users. They determined that accurate location information is available for about 15 percent of tweets (gathered from user profiles and tweets that contain GPS data). That's likely a critical mass for an early-warning system that could monitor terms like "fever," "flu" and "coughing" in a city or state.

"One of the things this paper shows is that the distribution of tweets is about the same as the distribution of the population so we get a good representation of the country," said BYU professor Christophe Giraud-Carrier. "That's another nice validity point especially if you're going to look at things like diseases spreading."

Professor Giraud-Carrier and his computer science students at BYU report their findings in a recent issue of the *Journal of Medical Internet Research*.

The researchers found surprisingly less data than they expected from Twitter's

feature that enables tweets to be tagged with a location. They found that just 2 percent of tweets contained the GPS info. That's a much lower rate than what Twitter users report in surveys.

"There is this disconnect that's well known between what you think you are doing and what you are actually doing," Giraud-Carrier said.

Location info can more often be found and parsed from user profiles. Of course some people use that location field for a joke, i.e. "Somewhere in my imagination" or "a cube world in Minecraft." However, the researchers confirmed that this user-supplied data was accurate 88 percent of the time. Besides the jokes, a portion of the inaccuracies arise from people tweeting while they travel.

The net result is that public health officials could capture state-level info or better for 15 percent of tweets. That bodes well for the viability of a Twitter-based disease monitoring system to augment the confirmed data from sentinel clinics.

"The first step is to look for posts about symptoms tied to actual location indicators and start to plot points on a map," said Scott Burton, a graduate student and lead author of the study. "You could also look to see if people are talking about actual diagnoses versus self-reported symptoms, such as 'The doctor says I have the flu.'"

The computer scientists collaborated with two BYU health science professors on the project. Professor Josh West says speed is the main advantage Twitter gives to health officials.

"If people from a particular area are reporting similar symptoms on Twitter, public health officials could put out a warning to providers to gear up for something," West said. "Under conditions like that, it could be very useful."

BYU undergraduate Kesler Tanner is a co-author on the study. He wrote the code to obtain the data from Twitter. When he graduates in April, he'll be headed off to graduate school to earn a Ph.D.

Earlier this year, this same group of researchers published a study showing that most exercise apps are based on bad info.

by BYU News

College Publications

Chemistry and Biochemistry

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Computer Science

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