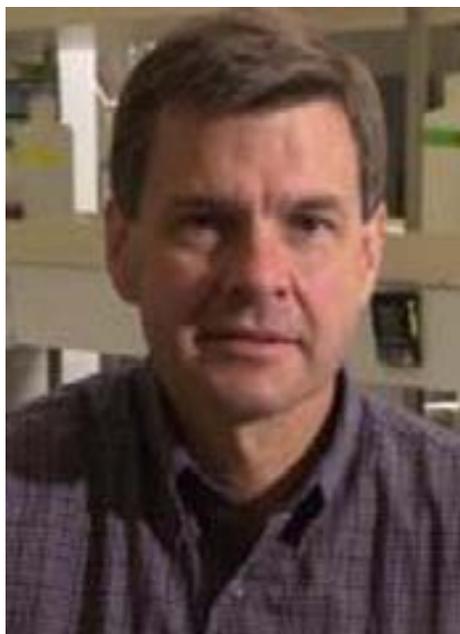


FACULTY newsletter

CPMS Physical and Mathematical Sciences



ABOVE : Dr. Steven Graves

Professor Researches Cure for Preeclampsia

There is a disease that only pregnant women can get: preeclampsia. It is responsible for up to 76,000 maternal and 500,000 infant deaths every year, according to the official preeclampsia website.

Though relatively easy to diagnose, there are currently no effective treatments for preeclampsia and no known cause. Characterized by high blood pressure and protein in the urine, preeclampsia is closely related to pregnancy-induced hypertension. If the disease progresses, the only solution is to deliver the baby, no matter how far along in the pregnancy this may occur.

Dr. Steven Graves, of the Department of Chemistry and Biochemistry, has been studying this disease's symptoms and possible causes since 1983. His focus is on a biological product known as a "digitalis-like factor" which has been implicated in several forms of clinical high blood pressure (or hypertension) including preeclampsia.

"This is a material that the body produces that is really not completely characterized," Graves said. "This means that we don't know all of its' chemical makeup or exactly how it works."

Graves helped perform a double-blind, placebo controlled, multi-centered clinical trial on 51 pregnant women with severe preeclampsia. Half were administered a placebo, but half were given a compound known as Digibind®. This antibody fragment was predicted to bind to this digitalis-like factor and eliminate its effects.

The study hoped to reduce the need of anti-hypertension medication and to have a beneficial effect on kidney function. It did not meet the first goal, as many women were too far along in the disease and had already received anti-hypertensive medications before enrollment. But the study was able to demonstrate an improvement or preservation of renal function in response

Continued on page 2

Emeritus Faculty Among Nation's Most-Cited

Two emeritus faculty members from Brigham Young University's College of Physical and Mathematical Sciences were recently ranked in the country's top 250 most-cited researchers by the website ISIHighlyCited.com.

Jerald S. Bradshaw and Reed M. Izatt, from BYU's Department of Chemistry, both made the list. The two began working together in the 1970s, exploring separation science and pioneering molecular recognition technology. They published hundreds of studies over the course of their careers. Their current citation ranking is one reflection of the importance of their contributions.

"Citation is a direct measure of influence on the literature of a subject, and it is also a strong indicator of scientific contribution, since it is derived from a pattern of interaction among millions of published articles," according to the website.

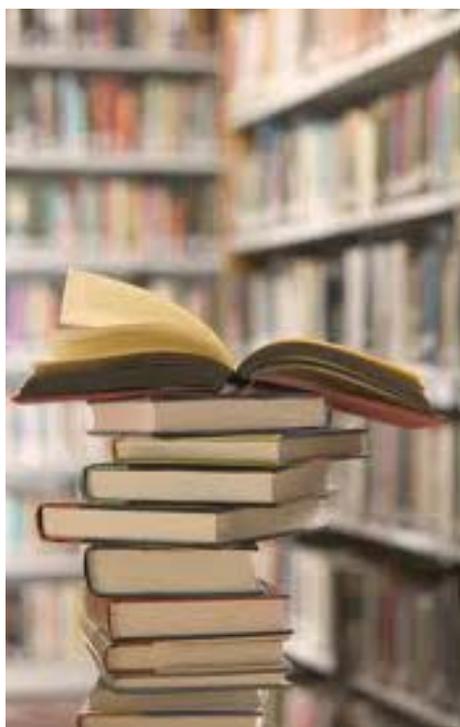
"When one researcher cites another's work, he or she is acknowledg-

ing the relevance of that work to the current study."

In addition to their research, Bradshaw and Izatt founded the Center for Chemical Separations at BYU as well as IBC Advanced Technologies, Inc., a company known internationally in the metal separations field. In 1996 they received the ACS Separation Science and Technology Award. The two were also separately awarded the Governor's Medal for Science and Technology.

ISIHighlyCited.com calculates its rankings using research articles from the Thomson Reuters Citation Databases. The current rankings use citations from 1981 to 2008.

by: Justin Ritter





ABOVE : Dr. Charles Knutson

Dates to Remember

Annual Awards Banquet
January 21, 6pm-8pm
3220-3224 WSC

Student Research Conference
Online abstract submissions due
February 25 by midnight

University Award Nominations
due to College
February 7

BYU-based Wiki Promotes Internet Safety

Dr. Charles Knutson, a professor in the Computer Science Department and father of ten, has always recognized that technology can be a double-edged sword. With all of the benefits that the Internet offers society, there are a number of dangers as well. In 2007, Dr. Knutson decided to address this issue by launching The Internet Safety Podcast. When Knutson approached his CS 404 (Computers and Society) class for assistance, two students stepped up to help launch the podcast. That early effort formed the kernel of what would later become The Internet Safety Project.

The mission of The Internet Safety Project is to empower youth, parents, and educators to maximize the positive aspects of technology while protecting families from its increasingly pervasive negative effects. The goal is to educate across the full spectrum of Internet safety topics, utilizing emerging Web-based technologies and social media mechanisms.

During 2010, the project expanded dramatically. Building on contributions by more than 200 students over the previous three years, and with financial support from an Eliza R. Snow grant, the Internet Safety Project portal has now grown to include a wiki, a blog, and a forum in addition to the podcast. The Internet

Safety Wiki is now the largest and most popular wiki on the topic of Internet Safety on the web, currently hosting more than 1,000 articles. The project has also expanded into the social networking scene with a Facebook page and Twitter feed.

"Everything we've done has been largely through student volunteer work," Knutson said. "The Eliza R. Snow grant allowed us to hire more students to fill critical roles as the project continues to expand."

Knutson has assembled a cross-disciplinary team of students to help run the project. English majors work to edit and expand the wiki. Business majors work to promote the site and form relationships across the Internet community. Computer Science majors work to improve the mechanics of the site. There is even a Biology major who moderates the forum.

With podcast listeners and wiki contributors from more than 120 countries around the world, the Internet Safety Project is helping to bring people together around a common goal of maximizing the benefits of technology while minimizing the negative impact.

Knutson encourages everyone to visit the project at www.internetsafetyproject.org.

by: Meghan Fletcher

Preeclampsia (cont.)

to the drug. This is the first clinical trial of a medication in cases of severe preeclampsia that has showed an end organ effect.

The study also hinted at reduced complications for the baby upon delivery, but further work needs to be done in this area to verify this outcome.

"This was a completely unexpected finding," Graves said. "Yet, even when matched for gestational age at the early delivery of the baby, the infant had fewer problems when their moms received the drug."

Though Graves has been working on this project since 1983, his work is not nearly over. He and his collaborators will next conduct a study on

women with preeclampsia in the earlier stages of pregnancy. He hopes that treatment will prolong pregnancies, resulting in fewer premature deliveries and, therefore, healthier babies. This will also allow him to further explore the possible benefits of the treatment on the baby.

"Because this compound [the digitalis-like factor] is not a protein and present in blood at exceptionally low concentrations, it makes exploring its structure and function much, much more difficult," Graves said. "All of the clinical trials, human subjects, and human specimens really make this medical research so it differs from what usually goes on in chemistry and biochemistry."

by: Meghan Fletcher



ABOVE : Professor Kent Seamons

Professor Increases E-mail Security, Usability

For many, sending and receiving secure email can be tedious and inconvenient. But that could change soon, thanks to the work of a BYU professor and his team.

Most secure email exchanges require the sender and recipient to decide on an encryption key before a message is sent. But with the technology developed by Kent Seamons and his students, an encrypted email appears with a plugin for the software needed to unscramble the message.

With just a few clicks the recipient can view the message and be able to encrypt their own emails. "People don't want to think about security," Seamons said. "We want it to be there, but we don't want it to dominate. ... We tried to make it very usable."

Seamons' software also works as an overlay with browser email, which he said is important because more people are moving toward providers like Gmail, Yahoo and Hotmail—providers that have little security.

"That's kind of what makes it novel," Seamons said, "this easy setup

and overlay for browser email."

The group's efforts have not gone unnoticed. The software won this year's Tech Transfer Award at BYU and was a finalist for the Utah Innovation Award. In addition, a local start-up company licensed the software and is working to industrialize it.

"This was kind of a tangent," Seamons said of the software. "At first we weren't expecting that this would be the big idea that would become commercially viable. But as people saw it, (they) were more excited about it than we were."

The team isn't finished yet, either. Next they plan to tackle social media.

"Our next plan is to make it so you can have secure chat," Seamons said. He said the core technology that allows his team to encrypt email messages could also be used to encode Internet chat and Facebook wall posts.

"We're continuing to explore," Seamons said. "We've learned a lot."

by: Justin Ritter



ABOVE : Professor Barry Willardson

Biochem Prof Wins Award for Sponsored Funding

Recently at the Annual University Conference, Barry Willardson, a professor in the Department of Chemistry and Biochemistry, received the Sponsored Research Recognition Award. This was to recognize his outstanding achievements in scholarly activities funded by external funding for his research. Willardson's work has focused on important research problems in medicine and health.

Willardson's research has been supported by the National Institutes of Health, the National Science Foundation, and the American Heart Association. While funding for science research has become very competitive, Willardson has successfully secured over \$3.6 million and has leveraged this funding to make significant strides in his research.

Overall, he has been awarded over \$3.6 million. But it has taken a lot of hard work to get these grants. The average success rate for grants from these agencies is one in five.

"The overall funding landscape in this nation is pretty tight," Willardson said. "With the economic downturn

and federal deficits, funding agencies are not able to give as much."

Willardson's research focuses on cell signaling, the process by which cells respond to hormones and other signaling molecules. His work is important mainly for medical purposes, as many pharmaceuticals target cells through their signaling systems. This research could lead to alternative drugs in such areas as depression, migraines, heart disease or even cancer.

"We try to understand at the molecular level what's going on with proteins as they respond to signals the cell is receiving," Willardson said.

In recent years, his research has turned to how the G protein complex and other protein complexes are assembled by the cell. This assembly process is accomplished by other proteins called "chaperones." Chaperones bring each component of a multi-protein complex together in a way that allows the complex to assemble properly. Without these chaperones, cells cannot function and organisms cannot live.

by: Meghan Fletcher

Japanese Profs Visit BYU, Share Techniques



ABOVE : Professor Blake Peterson

COLLEGE PUBLICATIONS

Computer Science

Smith, M., [Clement, M.](#), [Martinez, T. R.](#) and [Snell, Q.](#), "Time Series Gene Expression Prediction using Neural Networks with Hidden Layers." Proceedings of the Biotechnology and Bioinformatics Symposium (BIOT 2010), 2010.

Physics & Astronomy

B. Xu, [H. Stokes](#), J. Dong, "First-principles calculation of kinetic barriers and metastability for the corundum-to-Rh2O3 (II) transition in A12O3", *Journal of Physics: Condensed Matter*, 2010, volume 22/issue 31, (6pp)

B. Xu, [S. Sommerfeldt](#), "A Hybrid Modal Analysis for Enclosed Sound Fields," *Journal of the Acoustical Society of America*, 2010, volume 128/issue 5, pp. 2857-2867

Grants

[Michael Goodrich](#)

Sponsor: Honda Research Institute
Title: "Socially Assistive Robotics for Children with Autism: Imitation Captured-Based Robot Programming"

Three professors from Japan recently visited BYU campus and shared their expertise and teaching methods with students and faculty members in the Department of Mathematics Education.

Professors Hiro Ninomiya of Saitama University and Kazuhiko Souma of Hokkaido University of Education, as well as Masayuki Sugimori, an elementary teacher on sabbatical at Saitama, visited the United States in early November to observe American classrooms and compare teaching techniques. After a brief stay in Connecticut, the trio made their way to Utah Valley for a weeklong visit hosted by the BYU Mathematics Education department.

Professor Blake Peterson has built a professional friendship with Ninomiya and his colleagues over the last several years – a relationship that helped lay the groundwork for the professors' visit to Provo.

"[Ninomiya] arranged for me to come to Japan and do research in Matsuyama back in 2003," Peterson said. "I lived there for two months with my family, observing classes and gathering data. This is the second time he has come to the United States, kind of to return the favor."

Peterson said the visitors were interested in observing four areas of the American educational system – gifted education; teacher education, such as the classes taught at BYU; technology and how technology is used in teaching; and elementary education, because Professor Souma and Mr. Sugimori were both elementary-focused.

Peterson arranged for them to visit several classes of varying academic rigor across Utah Valley – including everything from an AP Calculus class at Spanish Fork High School right down to a 2nd Grade class at Maple-

ton Elementary School.

The visiting professors also spoke with BYU's mathematics education faculty and gave a presentation about Japan's new national math standards to the department's student organization, the Mathematics Education Association.

Peterson said the Japanese bring a different perspective to teaching mathematics, something Professor Souma – who is very well known in his country as an advocate for teaching math through problem-solving – demonstrated in his presentation to the BYU students.

"He had one problem in particular that was a pretty simple, routine problem that's taught in the U.S. in a very memorized, procedural way," Peterson said. "And with a very simple change, he turned it into a problem of inquiry where students are looking at him, wondering, 'Wow! I wonder if? What if?' He turned it into a real problem instead of something to memorize."

The problem-solving approach demonstrated by Souma represents one of many differences between the teaching techniques practiced in Japan and those common in the United States. Peterson said examining such differences can provide educators and policymakers with a better perspective on how improvements can be made to the current system.

"One of the big benefits of looking at math education in other countries is that it gives us a different lens with which to look at math education in the U.S.," he said. "There are things we do that we never think about, and we never think about it because we've never seen anything different. But when you go look at it in another country where it's very different and then you look back at your own, you can really start to see those differences."

by: Steve Pierce