September | 2014

FACULTY newsletter

CPMS Physical and Mathematical Sciences

Upcoming 2014 Summerhays Lecture: "Avoiding the Dogma Trap"

Dr. John D. Lamb, who recently retired from the BYU Department of Chemistry and Biochemistry, will deliver the 2014 Summerhays Lecture, titled "The Dogma Trap." The lecture will be held on September 18 at 7:00 p.m. in room 1080 of the Harold B. Lee Library (HBLL) at Brigham Young University.

Despite their seemingly conflicting natures, science and religion have one important truth in common—both are grounded in faith in fundamental principles. In LDS theology, we believe in a set of 13 Articles of Faith, just as scientists believe in scientific laws and theories. Most of the time these principles provide a strong foundation for our beliefs, but sometimes, Lamb explains, they can cause us to become resistant to new ideas.

"Sometimes we tend to adopt the same kind of adherence to other principles that we do for these articles of faith," Lamb said. "In some ways we can become rigid in our thinking and dogmatic in our beliefs to the extent that we close our minds to new possibilities."

To avoid dogmatic thinking, Lamb suggests gaining a broad education and keeping an open mind.

Lamb also reminds seekers of truth that, often, asking questions and addressing doubts is the best way to find new insights.

"Keep in mind that what you learn here will be of value to you forever," he said. "Many of the advances that we have seen in science over time have come about from people who were well educated, but also took the perspective that an open mind and thinking outside the box can lead to new insights."

Lamb believes his membership in the

Above: John D. Lamb, Department of Chemistry and Biochemistry

LDS Church has led him to become a better scientist because he strives to maintain an eternal perspective in his study of the natural world.

"The idea that the physical world is actually part of a long sequence of an eternal existence makes learning about the physical world more fascinating and more valuable, in my mind," he said.

by Meg Monk

Designing the Creators of Tomorrow

Above: Brent Adams, Department of Computer Science

Brent Adams of the Department of Computer Science had never intended to become a teacher. "I hated school," he said. "I was kind of strong-armed into teaching."

After earning a bachelor's degree in environmental design from the University of Utah in 1982, Adams worked in architecture at Fowler, Ferguson, Kingston, and Reuben and taught evening classes at BYU in interior and industrial design, something he was reluctantly convinced to do. During that time Adams began working with computerized design at work and eventually found that his interest in computer graphics had overtaken his interest in architecture.

"I was the most excited about where the field of computer graphics was going," he said. "What really got me excited was I knew that computer graphics would allow us to experience things that no human beings had ever experienced."

Adams returned to school and earned a Master of Fine Arts in computer graphics and, in 1990, accepted a full-time teaching position at BYU in the Design Department, the Visual Arts Department, and the School of Technology. He didn't expect to stay longer than a year, but Adams soon fell in love with teaching and, within a few years, helped to create the animation major at BYU.

Because he had disliked school himself, Adams is determined to be the kind of teacher he wishes he could have had. He pushes his students to try the hard-

continued on page 6

Upcoming Events

Useful features of the new BYU Bridge system include mock interviews, online scheduling with career counselors, an easy-to-navigate interface, profile data brought over from myBYU, and career finder resources. In addition, companies will be able to search for students by skills as well as by major.

It is really important that your students complete their profiles and prepare their portfolios BEFORE the STEM Fair so that recruiters will be able to review their resumes and contact them for an interview while on campus. Encourage them to do so!

Please show the following video in your classes to provide students with more information:
http://goo.gl/FpW5Te

The University STEM fair is coming up on September 25th. Please encourage students to take steps now to prepare themselves to meet recruiters for internship/career opportunities by attending the workshops listed below. For more info see: http://goo.gl/c0Nmu0

Women's Career Conversations
Thurs, September 18, 12 p.m.
3rd Floor HC Assembly Hall

STEM Preview
Weds, September 24, 4 p.m.–5 p.m.
1170 TMCB

Job Search Savvy Workshop
Weds, September 24, 7 p.m.–9:30 p.m.
3220 WSC

BYU STEM Fair
Thursday, September 25
9:00 a.m.–3:00 p.m.
WSC Ballroom

Honored Alumni Lecture
Mr. Gregory Hebertson of Midstates Petroleum will be speaking at this year's Honored Alumni Lecture. Hebertson will present a lecture titled "Mastering Your Fate: A Few Insights from a Career in Science."

When: Thursday, October 16, 11 a.m.
Where: 1170 Talmage Building

Questions Leading to . . . More Questions?

Above: Adam Woolley, Department of Chemistry and Biochemistry

Oftentimes in science, finding answers results in more questions, but Dr. Adam Woolley understands that it's just part of the process.

"The fun is often in the question and in finding out how to answer it," Woolley said. "Usually when you get an answer, it leads to a host of other questions."

Woolley, who has taught in the BYU Department of Chemistry and Biochemistry for fourteen years, was awarded the Karl G. Maeser Research and Creative Arts Award at the Annual University Conference (AUC) on August 26 in the Marriott Center.

Woolley received his BS in chemistry from BYU in 1992 and his PhD in chemistry from the University of California in 1997. Woolley was awarded the Young Scholar award in 2008 and was appointed associate chair of the Department of Chemistry and Biochemistry in 2010.

While Woolley is committed to his responsibilities in teaching, and administration, he always leaves time on his schedule for research. Currently, his research focuses on miniaturization of chemical analysis tools. In that research, he and his team work in three areas.

"One of [the projects] is a really simple, low cost, diagnostic that could be used in the field, third-world countries, and resource-limited environments," Woolley said. "Our goal with [the second system] is to be able to take a small blood sample—just a drop—and be able to take certain components of the blood and figure out how much of those components are in the sample. [With the third project] we've done a lot of work using DNA as a scaffold to make small things. In particular, we've been interested in making wires and semi-conductors, and those are kind of the nuts and bolts of integrated circuits."

Woolley was quick to acknowledge that his successes in research are a result of collaboration.

"I've been really fortunate to have great people work with me," Woolley said. "We've bounced ideas off of each other and worked together to solve problems. I've also been very fortunate to have some great graduate and undergraduate students who've worked in my lab and done some really nice work."

Teaching these students is where Woolley gets to share his passion for science with the students.

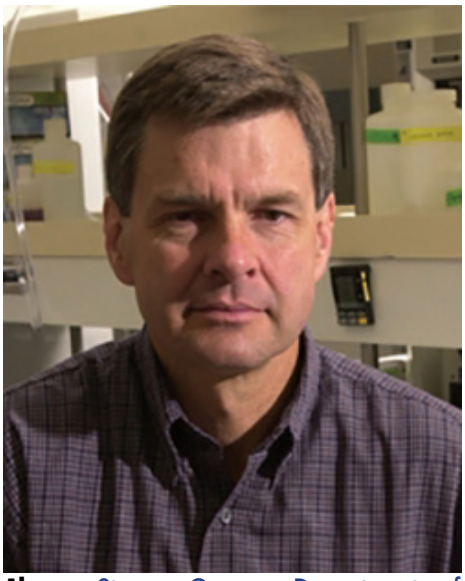
"Yes, I love the research, but I wouldn't want to be just a researcher," Woolley said. "It's also great having that opportunity to share the knowledge and help people learn. I've realized a lot of times that when students come in with questions, I usually bounce back with a question to get them to go through, answer it, and kind of figure things out that way. When students think (the problem or topic) is cool or they think, 'Oh, I really want to understand that!'—that's when students can really grow and learn."

The best thing, Woolley said, is when students find that passion and get to apply their wonder in research.

"Really good research projects that students do always lead to more questions than answers," Woolley said. "The answers are satisfying, but the questions—there are just so many more of them."

by Mackenzie Brown

Going Down Deep to Understand



Above: Steven Graves, Department of Chemistry and Biochemistry

What is more important: depth of knowledge or breadth of knowledge?

For Dr. Steven Graves, a professor in the Department of Chemistry and Biochemistry, depth of knowledge wins every time.

Graves was honored at the BYU Annual University Conference on August 26 with the Maeser Excellence in Teaching award.

"I was very surprised," Graves said. "I had no idea that I was even under consideration. I am still very surprised!"

When Graves first started teaching at BYU, he wasn't sure what to expect. Coming from his position as a researcher in charge of a clinical lab, he didn't have a lot of teaching experience and the learning curve was steep.

"There are a lot of mechanical things that are challenging in teaching," Graves said. "I mean, how do you know how much material to prepare? Is this enough, or will I run out of material after thirty minutes?"

Graves quickly picked up the necessary skills for teaching and soon taught both chemistry and biochemistry courses. One of the things that he noticed while teaching was that students really responded to the material when they had a deep understanding of it, so Graves changed his teaching style.

"I became prepared to spend a lot more time on one topic than some teachers would be comfortable doing," Graves said. "I . . . focus enough time and energy on [the topic] that the students really understand it in depth. That [process] moves [the knowledge] from a superficial knowledge to a place where the students really begin to understand the nuts and bolts and mechanics of how things occur. Once the students start understanding things they begin to realize that it is kind of interesting and that generates a lot of questions."

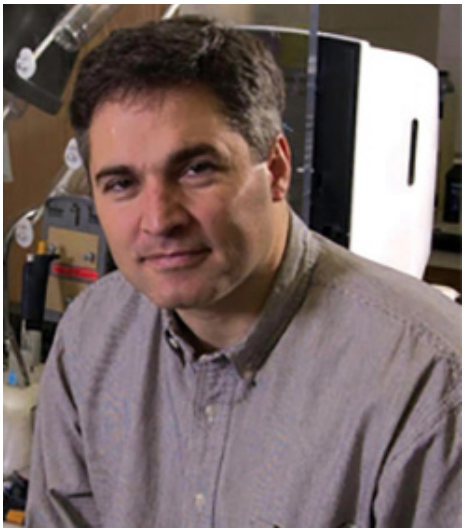
Graves understands that in order to teach his students a great depth of knowledge, he often has to sacrifice covering each and every topic. The trade off is worth it because he feels that students can relate and draw connections between processes that they know really well and processes they don't know well.

"We are trying to instill in students a curiosity and a need to understand their environment and the world around them," Graves said. "That generally requires them to be lifelong learners. So the idea of having discussions and being able to probe things in depth . . . is critical to people being able to understand how the discovery process takes place."

That ability to critically analyze and

continued on page 6

Fishing Lessons



Above: Barry Willardson, Department of Chemistry and Biochemistry

Dr. Barry Willardson has two great loves (in addition to his family): the love of research and the love of fishing.

"Fishing is kind of a passion of mine," Willardson said. "I love the feeling of being around running water, and plus, it's kind of like research. There's a challenge there: you have to find a way to catch the fish. That adds some intrigue to the process."

Willardson, a professor in the Department of Chemistry and Biochemistry, and his team of students focus their research on how cells assemble their proteins into signaling complexes. This research was recently featured in the Journal of Biological Chemistry for the discovery of the Programmed Cell Death Protein 5 (PCDP5) as a potential tumor suppressor.

For his effective and dedicated methods to graduate mentoring, Willardson was honored with the Wesley P. Lloyd Award for Distinction in Graduate Education at the BYU Annual University Conference held August 26, 2014.

Willardson has taught and researched at BYU for over eighteen years, working with numerous undergraduate and graduate students. When Willardson was a graduate student he had a mentor who really helped him along his path, and he said that he enjoys returning the favor to the students he works with.

"I feel like part of my role is to show them how to be good LDS scientists, [to demonstrate] where my priorities are, what my opinions are on controversial subjects, where I spend all of my time (home or work?). There is a lot of [quiet demonstration] that takes place indirectly as you interact with each other."

Willardson said that the worst part of mentoring is when students graduate and leave.

"You become good colleagues and good friends," Willardson said. "It's really a very enjoyable interaction, and I hate the student turnover. It's tough to see them leave."

Regrettably, students graduate all too often, but for Willardson it's enough that they spent the afternoon "fishing" together.

by Mackenzie Brown

Untying the Knot of Mathematics

Above: Jessica Purcell, Department of Mathematics

Alexander the Great allegedly became king of Asia by cutting the Gordian Knot. Today, Dr. Jessica Purcell solves those knots without swords.

Purcell, an associate professor in the Department of Mathematics, was recently awarded the Young Scholar award at this year's Annual University Conference for her research in knot theory. Purcell centers her research on an aspect of geometry focusing on 3-manifolds—objects that look 3-dimensional from any point. Examples of 3-manifolds include the set of all possible orientations of an airplane in space, our universe, and, Purcell's specialty, the exterior of knots.

"I take a piece of string, twist it into a knot, and melt the ends together," Purcell said. "I really like the visual aspects of my research. Recently, I've been studying surfaces that hang off of knots. These surfaces twist around in space in very beautiful, complicated ways."

Purcell takes complicated problems like these knots and translates them into mathematics.

"Knot theory asks questions such as, 'Can you untie the string without cutting it? . . . If you unwind the string as much as possible, how many crossings will be left?'" Purcell said. "For a complicated knot, there is usually a correct way to measure its volume. If you take all the knots with the same number of crossings, and find the one with the largest volume, what does that knot look like?"

Knot theory might not be the first thing that comes to mind when thinking of mathematics, but it holds a simple pleasure for those who study the complex workings of the knot.

"One way I've gotten interested in the problems I study is through their simple and compelling statements," Purcell said. "Answering these questions seems to be very hard. The description is simple, but the solution is generally unknown. I like being able to see the objects I want to study, and manipulate them, and yet encounter difficult challenges in research."

At first, Purcell wasn't sure she wanted to be a mathematician. When she was studying as an undergrad and again when she was considering applying for graduate school, she had moments of doubt; however, it was only

continued on page 6

Continuing a Legacy of Teaching and Learning

Above: Blake Peterson, Department of Mathematics Education

Dr. Blake Peterson's dream of becoming a teacher was born after what seemed to be a devastating blow—he was cut from his high school basketball team.

"Instead, they made me the assistant sophomore basketball coach and I found I really enjoyed that," Peterson said. "When I started college I thought, 'Hey, I like this coaching thing and I kind of like math, so let's be a math teacher and a coach.'"

Peterson did just that. After graduating from Utah State University with a degree in secondary mathematics education, he taught general math and geometry and coached basketball and football at Chino High School in southern California. Peterson earned a PhD in mathematics from Washington State University and taught at Oregon State University before accepting a position in the BYU Department of Mathematics in 1996.

Peterson joined the BYU Department of Mathematics Education in 2000 and has since dedicated his career to "coaching" young teachers. For his outstanding achievement in mentoring and teaching/learning activities, Peterson received the Richard Roskelley Teaching and Learning Fellowship at the BYU Annual University Conference on August 26.

Peterson has spent a great deal of time studying student teaching methods in Japan, but the majority of his research is currently dedicated to helping student teachers recognize and capitalize on teachable moments in the classroom, what Peterson calls "MOSTs," or "Mathematical Opportunity in Student Thinking."

"In my work with student teaching, we would notice moments that would happen in the class that the student teacher wouldn't recognize the value of, and how, if they capitalized on it, the students might really make some connections," he said.

Peterson credits much of the way he teaches to his family, in which there seems to be a legacy of teaching. Peterson's father was a psychology professor at Utah State University and two of Peterson's brothers have also taught at the university level.

Peterson explained that he learned from his father how important it is for teachers to take responsibility for their role in the learning process. He does this by making a detailed lesson plan for every class he teaches, regardless of how many times he has taught it, as well as carefully choosing the questions he asks his classes to keep his lectures on track.

"If my students don't perform well, I can't just look at them; I have to also look at myself and my teaching methods," Peterson said. "I can always be improving."

by Meg Monk

The Mission of General Education

Above: Steve Turley, Department of Chemistry and Biochemistry

At BYU, missions come in all shapes and sizes—foreign missions, local missions, service missions—but what about the General Education mission?

Dr. Steve Turley has taken that mission to heart. "I sort of consider myself a general education missionary," Turley said.

Turley, a professor in the Department of Physics and Astronomy, was recently awarded an Alcuin Fellowship at the BYU Annual University Conference for his work with the general education and honors programs. Turley has worked with the programs for many years and considers it to be an honor to be chosen for the award.

"I was excited [when I heard]," Turley said. "It's an award that recognizes contributions to general education and honors [programs], and those are areas of the university I have been very interested in and involved with ever since I was a student here. It is kind of nice to receive an award that's tied in with something that has been such a passion of mine."

Turley has worked extensively with the general education program at BYU, teaching Physical Science 100 and Honors Physical Science classes since 1995 and even worked as the associate dean over the First Year Experience program in Undergraduate Education.

"One [of the things that I love about the general education classes] is the idea that the university, to me, is an opportunity to bring together scholars from lots of different disciplines and diverse perspectives," Turley said. "Also, I think it's a unique opportunity to bring in the gospel perceptive. In some sense, the gospel is something that unites all of the things we do here at BYU, so that's kind of the ultimate interdisciplinary thing—all truth. It covers everything."

Though Turley was comfortable in his industry job of eleven years before coming to BYU, he always knew that he wanted to end up here.

"I always had a dream to be a part of the mission of this great university, and, when I had a chance, I jumped at it," Turley said. "It was pretty much a leap of faith. I didn't know it would be this amazing, wonderful experience that I've had since I've been here. I've never looked back for a second."

Turley enjoys teaching and researching, but he gets the most fulfillment out of working with the students. He loves to be able to open their minds to the new possibilities that science offers.

"It's wonderful to be able to associate with these students and to be a part of this expanding work," Turley said. "I am a student-centered person, and the students bring such an energy to campus with their youth, their enthusiasm, and their optimism; it just keeps charging me up. The mentoring relationship with students is something I treasure . . . Those are the pay days."

by Mackenzie Brown

The Glue that Holds CPMS Together

Above: Lynn Patten, Dean's Office

After nearly six years as the Marketing Manager for the College of Physical and Mathematical Sciences, Lynn Patten still feels her work gives her the opportunity to grow.

"I've learned a lot over the years and I'm still learning. That's what I enjoy about this job: it's always challenging me and pushing me," she said.

Patten joined the staff at BYU in the Department of Computer Science in 2003 as the department secretary. After two years in CS, she became the college secretary.

Throughout the years, she has been in charge of organizing the annual Student Research Conference, training and supervising office personnel, overseeing the remodel of the deans' suite, and serving on several college and university councils, among other projects and events.

In addition to her administrative responsibilities, Patten also manages the CPMS student marketing team. The marketing team was formed in 2009 in an effort to raise the visibility of the college and to increase recruitment efforts. Patten took on the task of organizing and managing the marketing team, without a background in marketing or any support staff. Today, she successfully manages a professional and productive team, despite the challenge of constant student turnover. Though she had to learn everything on the job, she is grateful to work with the college and departments to provide support in their marketing efforts. Patten is also grateful for the opportunity she has to interact with her student employees each day.

"I love watching the students launch," she said. "I feel like they're my kids.

continued on page 6

College Publications

Chemistry

Cai, Yu., Cardon, J.M., Castle, S.l., Ess, D.H., Jiang, J., Kay, B.M., Luo, S., and Ma, Z. (2014) "Selective access to the E- and Z-ΔIle-containing peptides via a stereospecific E2 dehydration and an O N acyl transfer" *Org. Lett.* 4044-4047.

Hansen, L.D., Lehrman, N.G., and Neven, L.G. (2014) "Effects of temperature and modified atmospheres on diapausing 5th instar codling moth metabolism" *Journal of Thermal Biology.* 42, 9-14.

Geology

Dorais, M.J. and Spencer, C.S. (2014). "Revisiting the importance of residual source material (restite) in granite petrogenesis," *The Cardigan Pluton, New Hampshire. Lithos,* 202-203, 237-249

Math

Bakker, L. and Simmons, S.(2014). "Stability of the rhomboidal symmetric-mass orbit," *Discret. Contin. Dyn. S. 35(1), 2015, pp. 1-23.*

Physics & Astronomy

Bergeson, S.D. and Lyon, M. (2014). "Precision spectroscopy using a partially stabilized frequency comb," *Applied Optics, volume 53, issue 23,* pp. 5163-5168

Creators continued from page 1

est thing they can think of and rewards them for creativity rather than "holding the fear of failure over their heads."

"I wanted to make this experience valuable for the student," he said. "I loved learning but didn't like the process of education, so I try to reach out to the students who don't like it either."

Since then, Adams has helped the Center for Animation, which now incorporates both Computer Science and Visual Arts faculty, into a nationally respected program that produces some of the best animation graduates in the country. In the past eleven years, his students have won sixteen "student Emmys." For his exceptional mentoring, Adams received the Alumni Professorship Award at the BYU Annual University Conference on August 26, 2014.

Adams is honored to be receiving the award, but feels his success is largely due to the support of the students, faculty, staff, and donors who help make the program run smoothly.

"The success of the animation major is the real reason I am receiving this award," he said. "I see it as a stamp of approval from the university that we're doing things they are proud of."

by Meg Monk

Knots continued from page 4

after she received encouragement from key mentors and won a prestigious award that she realized that she could succeed.

"[Winning the award] helped me realize that even though I had to work hard to succeed in math, I was no less likely to succeed than anyone else," Purcell said. "In other words, I was reminded again that everyone has to work hard to learn interesting and worthwhile things, like math!"

by Mackenzie Brown

Going Deep Down continued from page 3

piece together disparate facts and figures is what Graves believes makes a well-informed student. One of the favorite parts of his job is showing students how amazing living processes are.

"And as [the teaching process] goes on, the students start to say, 'Wait, I mean, this is crazy! This is so complex and so intricate!' And I say, 'Yes. You are starting to get it,'" Graves said. "Teaching becomes a living and learning experience."

by Mackenzie Brown

Glue continued from page 5

It's rewarding to see them succeed in their careers and in their lives outside of BYU."

For her outstanding service to the College of Physical and Mathematical Sciences, Patten received a President's Appreciation Award at the BYU Annual University Conference on August 26, 2014.

"[Patten] is simply remarkable as not only an employee, but a colleague. It is hard to imagine anyone more deserving of an award," said Dr. Scott Sommerfeldt, the dean of CPMS.

by Meg Monk

CPMS
BRIGHAM YOUNG UNIVERSITY