

FACULTY newsletter

CPMS Physical and Mathematical Sciences



Alysa Hoskin

ABOVE Seth Holladay

Former Pixar Animator Brings Classes to Life

The Holladay family enjoys the movie *Ratatouille* in a different way than most families. Instead of just watching Remy, the mouse turned chef, experiment with food while having exciting adventures, Seth Holladay, a new instructor in the Computer Science Department, and his family discuss aspects of Remy's cooking that don't really meet the eye. While animating at Pixar Animation Studios, Holladay specialized on the intricate details of Remy's food in *Ratatouille*, so his wife and children hear special commentary on his contributions to the movie.

His film experience with *Ratatouille* is just an appetizer in Holladay's feast of a résumé; Holladay also contributed to box-office hits *Cars*, *Wall-E*, and *Up*. While he makes creating victorious characters look easy, Holladay's own

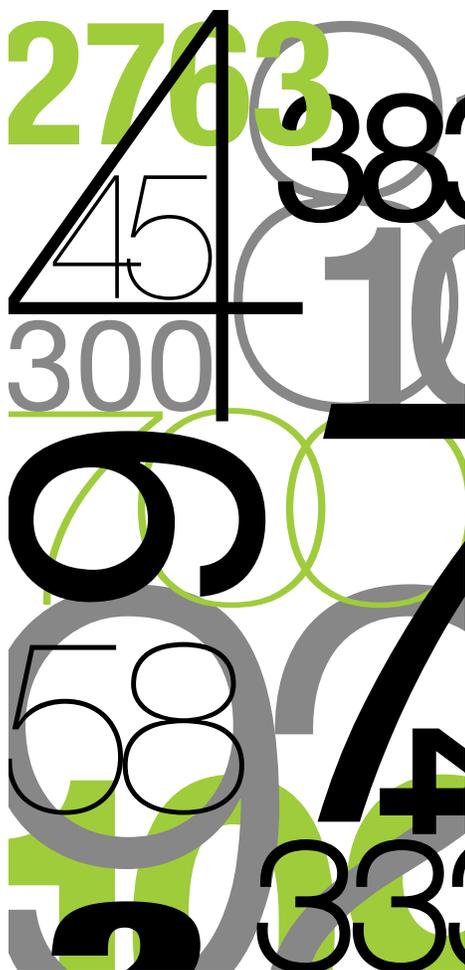
road to animation was quite the adventure.

As a student, he always knew he wanted to have a career in computer animation, but was unsure how to get there. Holladay attended BYU before the animation major and the Center for Animation had been developed, so he was referred to the Department of Computer Science.

After graduating with a BS in 2004, Holladay was not immediately hired into the industry, so he decided to pursue a master's degree. The semester he started his master's program, he applied for an internship at Pixar, knowing his chances of getting it were slim.

"I thought it couldn't hurt to apply," Holladay said. "I kind of felt like if they rejected me, I wouldn't feel too bad, because Pixar is so prestigious."

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Math Department Announces New Emphasis

Big changes are happening in the Department of Mathematics! Beginning Fall 2013, students will have the option of majoring in mathematics with an emphasis in applied and computational mathematics. Students who enroll in the new emphasis will be exposed to a variety of environments in which mathematics is applied and will learn the mathematical tools most commonly used in these applications. One of the goals of the emphasis is to successfully launch students into exciting careers that they otherwise might never become aware of.

A recent study examining the roadblocks to innovation in the coming generation found several general themes as being of prime importance for future sustainable economic growth. A common thread to each of these themes was that the mathematical sciences would play a central role in future innovation. Mathematics, statistics and computation are the means by which scientific thought is abstracted, analyzed and communicated. Through this common language, new ideas and information can efficiently flow between disciplines, as practitioners of different

fields engage one another effectively. These are important themes in the new emphasis in applied and computational mathematics at BYU.

This carefully planned educational experience will provide students with a tightly integrated combination of coursework and computer labs, along with capstone projects and careful mentoring. The new emphasis includes a modernized curriculum that develops a foundational core in mathematics, statistics and computation. This integration across multiple quantitative disciplines will give students a broad interdisciplinary exposure through classes and laboratories, while allowing each student to choose a primary area of specialization. The program will foster teamwork and the ability to communicate effectively, and it will provide valuable networking opportunities for students.

While other math programs nationwide have shrunk in numbers, BYU's program has grown. The department expects that even more good students will be attracted to mathematics by their new offerings in applied and computational mathematics.

by: The Department of Mathematics



Kylea Knecht/BYU

ABOVE Dr. Dawn Teuscher

Announcement

Due to construction, the Dean's Office is temporarily located in C-381 ESC. The Advisement Center is in N-227 ESC. To make an appointment with one of the deans, please call 2-3882.

Dates to Remember

Spring Term Begins

Tuesday, April 24

Grade Submission Deadline

Thursday, April 26

Grades Online for Students

Monday, April 30

College Grants

Chemistry and Biochemistry

[Emily Bates](#)

Sponsor: University of Utah

Title: Examination of Susceptibility of Pain After Trauma

Computer Science

[Mike Goodrich](#)

Sponsor: NSF

Title: I/UCRC Phase I: Center for Unmanned Aircraft Systems

Mathematics

[Jessica Purcell](#)

Sponsor: NSF

Title: Moab Topology Conference

Focusing on Foundations: Dr. Dawn Teuscher

Some BYU freshmen who enter the university with Advanced Placement (AP) math credits struggle in BYU mathematics classes. Most of them wonder why these college preparation courses don't help them more during their first year at college. Calculus is a required course for many majors, but even students who take AP calculus in high school find it far from easy.

Dr. Dawn Teuscher and other faculty in the Department of Mathematics Education discovered that by testing students' foundational calculus skills, they can discover who could excel in the class. Teuscher has found that whether or not the content of high school math courses focuses on the basics makes a big difference between these varying levels of success.

Her study showed that students who have not learned specific foundational concepts will not perform as well in a college calculus class. "The curriculum makes a difference because if teachers have that [foundation], then they know what the students need . . . instead of just teaching what [educators] know," Dr. Teuscher said. "To me, the driver is curriculum."

Teuscher and her colleagues studied two groups of AP calculus students: those who used a traditional pre-calculus textbook and those who used a new pre-calculus curriculum called Pathways.

Both groups of students took the Pre-Calculus Concept Assessment (PCA) at

the beginning and end of the school year to test five foundational concepts. Teuscher found those students who score higher on the PCA have a better chance of passing AP calculus, which is equivalent to BYU's introductory calculus course, Math 112.

Dr. Teuscher explained that the Pathways curriculum is unique. "It focuses on the foundational concepts of calculus based on [educational] research," she said. "Most students look at a math problem and create a picture in their head instead of a mathematical relationship, even though the picture is just a visual image of what's happening."

The Pathways curriculum helps students learn how to translate vague, visual images into more precise mathematical concepts. The curriculum also acknowledges that initial misconceptions are common in the learning process, so it discusses them in the classroom instead of attempting to prevent them.

"Students are talking a lot more in the Pathways classroom rather than just listening to a lecture," Teuscher said. "They are working together, and then there's discussion at the end So it's not the typical [classroom] setup."

Teuscher previously taught AP calculus at Lone Peak High School in Alpine, and she attributes her dissertation and research in AP calculus to her experiences there.

by: Alysa Hoskin

Former Pixar Animator

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Two weeks later, Holladay was happily surprised with a phone call from Pixar, informing him that he had been accepted into the internship. His first assignment at Pixar was rendering Cars, helping to complete the finished visual product. Since Holladay's experience at Pixar, several other BYU students are accepted annually to the exclusive internship program. But Holladay was the first one to take that chance and apply, and now he is helping his own students get first-rate internships as well.

After gaining invaluable experience completing the internship, he returned to Provo to finish obtaining his master's in computer science. Upon graduation, Pixar offered Holladay a full-time position, and for three years, he animated environmental effects in several Pixar films. He prefers working with environ-

mental special effects because it illustrates how phenomena occur in real life.

"It's like combining animation and physics," Holladay said. "I really love animating how things work."

Working for Pixar provided Holladay with important experience in the animation industry. He now passes down these valuable lessons in the classroom as he instructs future animators while concurrently earning his PhD. But what was the best part of working for a major motion picture studio in California?

"I have five children, and when we were there, they were excited that we got free tickets to Disneyland. So we always got into the parks for free," Holladay said. He laughed that his kids were more excited about that than the fact that their dad helped create several of the films featured at Disneyland.

by: Alysa Hoskin



Levi Price

ABOVE Dr. Bill Barrett

Spreading His Roots: CS Professor Leads Family History Technology Workshop

Family history is spreading its roots in the future of technology.

Acting as the general chair of the Family History Technology Workshop (FHTW), BYU professor William Barrett is expanding family history work through new technology, and he is teaching others how to further their own family history by using that new technology.

"We're interested in creating a workshop that can kind of be an incubator for new, cool technologies," Barrett said. "We think that we're just seeing the tip of the iceberg."

The workshop, which began as an effort to share emerging research in family history and genealogical technology, continues to gather support.

Barrett began the Family History Technology Workshop in 2001, and it was held at BYU for many years. In 2011, he decided to move the FHTW to Salt Lake City and hold it in conjunction with the much larger Rootstech Family History and Technology Conference.

Barrett decided to join with the Rootstech Conference in order to increase visibility of the FHTW. The two conferences address different needs: Rootstech is geared towards practitioners,

whereas FHTW is focused on technology researchers and developers.

"The real purpose, then, of this workshop is to create an environment where people can come – and not just members of the Church, but people from all over the world – to present and discuss enabling technologies for family history research," Barrett said. "This year, we think we really broke ground on that, where we really did have an international audience at the workshop."

The workshop accepted 23 of 32 submitted research papers dealing with areas such as image recognition and extraction, enhanced search tools, handwriting and text detection and name matching techniques. Presentations were made on topics such as improving search techniques through examining geographical migration patterns and learning to overcome challenges related to indexing and text recognition.

"We've got a ways to go, but we think we're on the right track," Barrett said. "We'd like to use this as a focal point for anybody that's interested in family history or related technologies that can be brought to bear on family history."

by: Chris Scheitinger

College Publications

Chemistry and Biochemistry

H. Ganegoda, D. Jensen, D. Olive, L. Cheng, C. Segre, [M. Linford](#), J. Terry, "Photoemission Studies of Fluorine Functionalized Porous Graphitic Carbon", *Journal of Applied Physics*, 2012, volume 111/issue 5

[D. Henderson](#), J. Wu, "Electrochemical Properties of the Double Layer of an Ionic Liquid Using a Dimer Model Electrolyte and Density Functional Theory", *Journal of Physical Chemistry*, 2012, volume 116/issue 8, pp. 2520-25

[D. Henderson](#), "Oscillations in the Capacitance of a Nanopore Containing an Electrolyte Due to Pore Width and Nonzero Size Ions", *Journal of Colloid and Interface Science*, 2012, volume 374/issue 1, pp. 345-47

[J. Lamb](#), N. Li, "Ion Chromatography and Membrane Separations Using Macrocyclic Ligands", *Supramolecular Chemistry: From Molecules to Nanomaterials*, 2012

M. Muhlestein, [K. Gee](#), [J. Macedone](#), "Educational Demonstration of a Spherically Propagating Acoustic Shock", *Journal of the Acoustical Society of America*, 2012, volume 131/issue 3, 2422-30

V. Mukhanov, [L. Hansen](#), R. Kemp, "Nanocalorimetry of Respiration in Micro-Organisms in Natural Waters" *Thermochimica Acta*, 2012, volume 531, pp. 66-69

Mathematics Education

L. Lovin, W. Sanchez, [K. Leatham](#), J. Chauvot, S. Kastberg, A. Norton, "Examining Beliefs and Practices of Self and Others: Pivotal Points for Change and Growth for Mathematics Teacher Educators", *Studying Teacher Education*, 2012, volume 8/issue 1, pp. 51-68

G. Wright, P. Rich, [K. Leatham](#), "How Programming Fits with Technology Education Curriculum," *Technology and Engineering Teacher*, 2012, volume 71/issue 7, pp. 3-9

Physics and Astronomy

[B. Anderson](#), B. Moser, [K. Gee](#), "Loudspeaker Line Array Educational Demonstration", *Journal of the Acoustical Society of America*, 2012, volume 131/issue 3, pp. 2394-400

[B. Anderson](#), [W. Peterson](#), "The Song of the Singing Rod", *Journal of the Acoustical Society of America*, 2012, volume 13/issue 3, pp. 2435-43

M. Muhlestein, [K. Gee](#), [J. Macedone](#), "Educational Demonstration of a Spherically Propagating Acoustic Shock", *Journal of the Acoustical Society of America*, 2012, volume 131/issue 3, 2422-30

[T. Neilsen](#), [W. Strong](#), [B. Anderson](#), [K. Gee](#), [S. Sommerfeldt](#), [T. Leishman](#), "Creating an Active-Learning Environment in an Introductory Acoustics Course", *Journal of the Acoustical Society of America*, 2012, volume 131/issue 3, pp. 2500-09