

FACULTY newsletter

CPMS Physical and Mathematical Sciences



ABOVE : Dr. Bill Barrett

CPMS Welcomes Back Bill Barrett

The College of Physical and Mathematical Sciences (CPMS) is excited to welcome William "Bill" Barrett back to the Computer Science faculty.

After three years of service, Barrett is returning to BYU from his calling as president of the Wisconsin Milwaukee Mission. While Barrett is somewhat sad to be leaving the beautiful wooded areas of Wisconsin, his usual good humor shines through.

"It's very hard to leave," he said of being a mission president. "There's this completely other life with hundreds, even thousands of friends that have become very dear to you, but no one else knows anything about...It's like leading a double life, but in a good way."

Barrett is nonetheless eager and excited to begin his twenty-first year of teaching in the Department of Computer Science. Barrett studied at the University of Utah, where he received a B.S. in mathematics and a Ph.D. in medical biophysics and computing.

Prior to his appointment at BYU, Barrett worked as a research fellow for the National Institutes of Health (NIH) in the Division of Computer Research and Technology. While there, he investigated the formation of atherosclerosis (a condition in which plaque is deposited on the artery walls) with the National Heart, Lung, and Blood Institute.

Following his time at NIH, he worked in private industry in the field of medical imaging, making significant contributions to the revolutionary technology of digital intravenous angiography—complementing his original graduate research. Digital intravenous angiography is the process of imaging the vascular structure by registering and subtract-

ing images with and without injected contrast in order to visualize only the vessels of the body. This allows physicians to see the circulatory system and identify lesions and other pathology. Using computer vision algorithms, Barrett created software for obtaining actual measurements of the heart and arteries from these images.

In order to add this new area of expertise to BYU's computer science department, Barrett created graduate course offerings in digital signals, image processing, computer vision and pattern recognition. At BYU, Barrett's interests broadened beyond medical imaging to include digital document and handwriting analysis (in historical documents and genealogical microfilm), robot vision, satellite imagery and a variety of interactive techniques, including the creation of Intelligent Scissors, now featured as Adobe Photoshop's magnetic lasso tool.

For Barrett, the joy in his work comes from helping students arrive at creative solutions to challenging problems. Applying digital imaging technology to genealogical work is a perfect fit for that. His plans for upcoming research are centered on utilizing new algorithms and tools, including the iPhone's GPS and picture capabilities, to extract genealogical information from documents, gravestones, and other sources.

He's also excited to get reacquainted with his own family of seven children and ten grandchildren, including three brand new grandchildren he has yet to meet.

CPMS warmly welcomes Bill Barrett back and looks forward to the new insights he will bring.

by: Katie Pitts

DATES TO REMEMBER

National Chemistry Week

October 17 - 23

"Behind the Scenes with Chemistry"

CFS/Advancement Rank & Status

Deadline October 25

Deadline Binders due in college

ORCA Application Deadline

Deadline October 29

Career Exploration Series

October 19 - November 2

WSC

Women's Research Initiative Grant

Deadline November 2

Scholarly & Creative Works Grant

Deadline November 2

College Christmas Luncheon

December 10

ESC Pendulum Court



CPMS

BRIGHAM YOUNG UNIVERSITY



ABOVE: Dr. Eric Hintz

Did Ancient Greeks See Halley's Comet?

In 466 B.C., shooting stars fell over ancient Greece, a meteorite hit the ground in broad daylight and a comet appeared in the sky. After extensive research, two BYU professors now say it could have been the famous Halley's comet.

Physics and astronomy professor Eric Hintz and philosophy professor Daniel Graham recently determined the cosmic activity over Greece in 466 B.C. coincided with the expected path and time of arrival of Halley's comet.

If the heavenly apparition seen by the ancient Greeks was indeed Halley's comet, the finding, published in the *Journal of Cosmology*, would push back the date of its first documented observation by more than 200 years.

Working together, Graham conducted historical research while Hintz used computer modeling to reconstruct the comet's path. Even though Halley's comet appears about every 75 years, gravitational disturbances can speed up or slow down the comet's orbit by a few years—a fact taken into consideration during the modeling.

The research also built upon existing models, focusing not only on the comet's path but also on its visibility. The professors discovered that in 466 B.C. Halley's comet would have been visible to the Greeks for about 75 days.

They also concluded that the comet's tail would have been very large and could have been responsible for the reported shooting stars as debris shed from it fell through the Earth's atmosphere. But Hintz is quick to say the research does not show the comet was definitely Halley's.

"I think the solution we present is a nice, complete story that fits the ancient descriptions," he said, "but there are so many ways that Halley's comet could have been disturbed in its orbit."

Still, the finding has gained international attention, and the research behind it was something Hintz said he enjoyed.

"It was a fun project," he said. "I didn't think it would get the kind of response that it did."

by: Justin Ritter

Professor Appointed to Publishing Board

In 1988, astronomy professor Harold McNamara began the *Astronomical Society of the Pacific Conference Series (ASPCS)* at BYU. Fifteen years later, McNamara had retired as the editor, and current professor J. Ward Moody was just beginning his six-year journey as managing editor for the publication, which had developed into the largest publisher of astronomical conference proceedings in the world.

This experience lent Moody the clout he needed to land his next major appointment in scientific publishing. In June 2010 Moody was elected to a 4-year term on the American Astronomical Society's (AAS) publications board.

"In this capacity, I will help oversee the publication of the *Astrophysical Journal* and the *Astronomical Journal*, two of the largest and most prestigious astronomy journals in the world," Moody said.

Moody will be joining six other well-known astronomers on the AAS board. He has met a few of his new associates through astronomical meetings and conferences in the past.

"Most of us are former observatory directors and editors," Moody said. "Sidney Wolff was the long-time director of the National Optical Astronomy Observatories and is responsible for shaping much of modern observational astronomy in America. I'm very excited to get to know them better professionally. I am also excited to improve the quality of the journals. I have a few strong feelings on where the journals ought to go, and I'm glad I get to help steer them in those directions."

One issue Moody will address is that of publishing mainly for tenure review. He claims that for many, the pressure to publish to gain tenure can taint the quality of papers. And he hopes that a stronger emphasis on basic writing skills will improve the quality of the publications as a whole.

Moody will also assist with issues of electronic hosting, financial management and solving problems or issues that arise.

by: Meghan Fletcher



ABOVE: Dr. J. Ward Moody



ABOVE: Dr. Pace Nielsen

Math Professor Publishes Three Papers

Two nonzero numbers multiplied together never equals zero, right? Despite what most students have learned, Pace Nielsen of the Department of Mathematics has recently published three papers in ring theory, an area of mathematics where this principle isn't always true.

Ring theory is Nielsen's main area of research. Among other things, ring theory studies such topics as how multiplying non-zero matrices – rectangular arrangements of numbers – can create a zero matrix. By combining existing research with innovative work, these papers have the potential to spawn further studies into progressively more complex, and yet untapped areas of math.

"The immediate impact of these papers is that other people will look at them," Nielsen said. "It will influence their publications...There are all sorts of wild beasts in the forests of mathematics to tame, along with even more exotic animals in the zoo."

Though he is still in the early stages of his career, Nielsen has published a number of independent and co-authored peer-reviewed papers. The co-authors on two of his recent papers include his previous advisor, Victor Camillo, and several mathematicians from Korea, all of whom he met as a post-doctoral student at the University of Iowa. Nielsen said his work with these mathematicians has shaped his approach to research and publication.

"Some people have the skill to remember everything," he said. "In my case, I have a very good grasp of a few techniques, and I'm also very persistent. This paper was the result of three or four

years of thinking about this problem continually and throwing everything I could at it...Every time you learn a new tool, you throw it at the problem you have. There's also a little bit of inspiration involved."

Thanks to improvements in computer technology, Nielsen was able to obtain instantaneous feedback throughout the collaboration—a great benefit for this kind of work. However, despite the available technology, Nielsen still does most of his research by hand.

"A lot of the time, it is me and paper," he said. "Every once in a while I use the computer, but that's after the ideas have come. Usually, it first comes as reading and then writing a lot. It's very visual and messy until I write it down at the end. Math is not a spectator sport. You have to get your hands dirty."

Nielsen's prime enjoyment in research comes from the beauty of mathematics and the act of discovery. He feels that research into ring theory and other abstract mathematical concepts is vital to good teaching.

"The more properties you can discover, the more you understand," he said. "There is a direct correlation between my ability to teach and my understanding of why things are true...The more I understand about why these abstract things are true, the better I can teach new math majors and minors and give them a picture to think about...I paint this picture in my mind with mathematics, and I hope I can convey the process and the beauty of that picture to my students."

by: Katie Pitts



National Chem Week Comes to BYU

This year's National Chemistry Week will take participants "Behind the Scenes with Chemistry" at Brigham Young University on Oct. 18–23.

Hosted by BYU's Department of Chemistry and Biochemistry in conjunction with the Central Utah section of the American Chemical Society (ACS), the weeklong celebration will include something for people of all ages and interests.

Throughout the week participants can learn important principles of chemistry

through entertaining demonstrations at chemical magic shows, held in BYU's Ezra Taft Benson Building. More entertainment will follow as BYU professors examine scientific myths in blockbuster movies and popular television shows during the "Chemistry in the Movies" lecture series.

A research poster session and a Friday reception at BYU will give visitors an opportunity to learn more about current research projects by members of the Central Utah ACS section. The

Continued on next page

National Chemistry Week celebration will end with a kids' hands-on chemistry workshop held at the Provo Library at Academy Square.

National Chemistry Week is designed to further public awareness of chemistry's contributions to everyday life and the world we live in. It is celebrated annually during the third week of October and unites ACS sections, businesses, schools and the community.

The chemical magic shows will take place at 6 p.m. Oct 18 and 7 and 7:30

p.m. Oct. 19–22. All shows will be held in W111 BNSN. Admission is free, and tickets can be reserved by visiting <http://www.chem.byu.edu/nationalchemistryweek>.

The "Chemistry in the Movies" lecture series will take place on Thursday, Oct. 21. All lectures will be held in W140 BNSN.

The series will begin with "Biochemistry in 'Jurassic Park'" at 3 p.m. and continue with "Thermodynamics of 'Flubber' and 'The Saint'" at 3:35 p.m., "Forensics in 'CSI' and Real Life" at 4

p.m. and a lecture on lasers at 4:35 p.m. titled, "Why no, Mr. Bond, I expect you to die!"

Research posters will be on display in the Benson Building lobby on Oct. 21–22. The reception will be held in the lobby on Friday, Oct. 22, from 4–6 p.m.

The kids' chemistry workshop will be held on Saturday, Oct. 23, from 1–3 p.m. in the children's section of the Provo Library at Academy Square.

For more information, visit www.chem.byu.edu/nationalchemistryweek.

by: Justin Ritter

COLLEGE PUBLICATIONS

Chemistry & Biochemistry

Loertscher, B.M., [Castle, S.L.](#), "Nature Chemistry," 2010, 2, 807-808. Alkaloid Synthesis Back to Basics.

Geological Sciences

Hicks, T.C., [Morris, T.H.](#), and Fairbanks, M.D., "Facies analysis of the transitions between subtidal, intertidal, and supratidal zones of the Entrada Sandstone, south-central Utah: A provisional sequence stratigraphic analysis, in *Geology of South-Central Utah*," Carney, S.M., Tabet, D.E. and Johnson, C.L. eds., Utah Geological Association Publication 2010, 39, p. 317-337.

[Morris, T.H.](#), [Ritter, S.M.](#), and Laycock, D.P., "GEOLOGY UNFOLDED: An Illustrated Guide to the Geology of Utah's National Parks," BYU Department of Geological Sciences, ISBN #: 978-0-8425-2766-9, 72 p.

Mathematics Education

Sanchez, W., Chauvot, J., Kastberg, S. E., [Leatham, K. R.](#), Lovin, L., & Norton, A. H. "Navigating belief systems of mathematics teacher educators: Making the private public to inform practice." Proceedings of the Eighth International Conference on Self-Study of Teacher Education Practices. Navigating the Public and Private: Negotiating the Diverse Landscape of Teacher Education, 2010, (pp. 245-248).

Draper, R. J., Broomhead, P., Jensen, A. P., Nokes, J. D., & [Siebert, D.](#) (Eds.). "(Re) Imagining content-area literacy instruction." New York: Teachers College Press, 2010.

Draper, R. J., Broomhead, P., Jensen, A. P., & [Siebert, D.](#) "Aims and criteria for collaboration in content-area classrooms." In R. J. Draper, P. Broomhead, A. P. Jensen, J. D. Nokes & D. Siebert (Eds.), (Re)Imagining content-area literacy instruction (pp. 1-19). New York: Teachers College Press, 2010.

Draper, R. J., Nokes, J. D., & [Siebert, D.](#) "(Re) Imagining collaborations for content-area literacy." In R. J. Draper, P. Broomhead, A. P. Jensen, J. D. Nokes & D. Siebert (Eds.), (Re) Imagining content-area literacy instruction (pp. 159-171). New York: Teachers College Press, 2010.

Draper, R. J., & [Siebert, D.](#) "Rethinking texts, literacies, and literacy across the curriculum." In R. J. Draper, P. Broomhead, A. P. Jensen, J. D. Nokes & D. Siebert (Eds.), (Re)imagining content-area literacy instruction (pp. 20-39). New York: Teachers College Press, 2010.

[Hendrickson, S.](#), [Siebert, D.](#), Smith, S. Z., Kunzler, H., & Christensen, S. "Addressing parents' concerns about mathematics reform." *Virginia Mathematics Teacher*, 2010, 37(1), 24-27.

[Siebert, D.](#), & [Hendrickson, S.](#) "(Re)Imagining literacies for mathematics classrooms." In R. J. Draper, P. Broomhead, A. P. Jensen, J. D. Nokes & D. Siebert (Eds.), (Re)Imagining content-area literacy instruction (pp. 40-53). New York: Teachers College Press, 2010.

Physics

[Kent L. Gee](#), Julia A. Vernon, and [Jeffrey H. Macedone](#), "Auditory Risk of Exploding Hydrogen-Oxygen Balloons," *Journal of Chemical Education* 87, 1039-1044 (2010).

Sarvniipun Chawla, Matthew Anderson, Michael Besselman, Luis Lehner, Steven L. Liebling, Patrick M. Motl, [David Neilsen](#), "Mergers of Magnetized Neutron Stars with Spinning Black Holes: Disruption, Accretion and fallback." *Physical Review Letters* 105:111101,2010.

CFS Rank & Advancements

We apologize for our oversight in omitting W. Evan Johnson from Statistics in the July/August newsletter, where we announced those who had been granted candidacy for CFS. We offer our congratulations to Evan for this accomplishment.

GRANTS

Chemistry & Biochemistry

Daniel Austin
Sponsor: NASA
Title: Impact and shock Survivability of Micro-organisms

Milton Lee/Dennis Tolley (Statistics)
Sponsor: DTRA
Title: Differentiation of Bacterial Biothreat Agents Using Thermochemolysis Methylation and Gas Chromatography-Mass Spectrometry

Paul Savage
Sponsor: CIBA Vision Corp.
Title: Optimization of CSA Structure for Incorporation into Contact Lenses and Bacterial Growth

Computer Science

Michael Goodrich
Sponsor: University of Central Florida (NSF)
Title: Robotics CTA-Phase 1

Physics and Astronomy

Eric Hirschmann/David Nielsen
Sponsor: NSF
Title: Collaborative Research: Dynamics and Gravitational Wave Production

Statistics

Dennis Tolley/Milton Lee (Chemistry)
Sponsor: DTRA
Title: Differentiation of Bacterial Biothreat Agents Using Thermochemolysis Methylation and Gas Chromatography-Mass Spectrometry