

FACULTY newsletter

CPMS Physical and Mathematical Sciences



ABOVE Dr. Joshua Price

Levi Price

New Faculty Spotlight: Joshua Price, Chem

CPMS welcomes Joshua L. Price, a new faculty member in the Department of Chemistry and Biochemistry.

Professor Price received his bachelor's degree in biochemistry from BYU and went on to earn his PhD from the University of Wisconsin-Madison in organic chemistry. After completing his degree, Price accepted a postdoctoral fellowship sponsored by the National Institutes of Health (NIH) at The Scripps Research Institute where he focused his efforts on understanding how asparagine glycosylation affects protein folding.

Now at BYU, Price plans to continue researching protein folding, structure

and function. This research applies to the emerging class of protein drugs used to treat cancer, macular degeneration, autoimmune disease and other conditions. Price is trying to understand how post-translational modifications can stabilize proteins, which could ultimately enhance protein drugs by helping them last longer in the bloodstream.

As a BYU professor, Price hopes to continue the university's strong tradition of mentoring students – a tradition from which he personally benefitted. Price had a positive experience during his time as a BYU undergrad. He says he was blessed with helpful mentors and a unique opportunity to participate

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ABOVE Dr. Perpetua Lynne Nielsen

BYU Photo

Lifetime Student and Passionate Teacher

Perpetua Lynne Nielsen, a faculty member of the Department of Statistics since 2000, is a firm supporter of continuing education. She not only helps her students learn but also welcomes the challenge of furthering her own mental development.

Born in the Philippines, Nielsen had a multilingual childhood. Using a native dialect at home and then learning Tagalog and English in the elementary grades, she attended a high school that fined any student who was caught speaking anything other than English.

As a young adult studying mathematics at the University of the Philippines, Nielsen was caught in the middle of a nationalist movement. For two years, professors taught strictly in Tagalog and all course material was translated into this mother tongue. For students like Nielsen, who were academically trained in English, these years became a major struggle as they tried to learn newly invented Tagalog words and equate them with concepts they already knew.

Perhaps these early experiences have helped Nielsen empathize with and reach out to her students. Knowing what

it feels like to be on the receiving end of a difficult language, she has made introductory statistics classes as accessible as possible by mixing group activities and quizzes with several mini lectures.

"I take it seriously that the average attention span of college students is like twenty minutes," she said. "I really want active learning, even in my large lectures, not just my small classes."

Nielsen has not always been proud of her teaching approaches, however. Over the years, experience and practice have polished her delivery methods and attitude.

"I don't even want to think about my first year of teaching!" she laughed. "I wouldn't want to be in that class! Because my focus was on me, how my lecture came across. But now, I've shifted my focus to how the students . . . best learn."

Along with a better focus, Nielsen has also developed approaches to asking more and better questions. Early in her teaching career, she would quickly answer her own questions if students did not immediately volunteer a response. However, she now forces herself to wait.

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ABOVE Dr. Steven Wood

BYU Photo

Dates to Remember

CHIRP Proposal Deadline
Fri., September 30, 2011

HITS Proposal Deadline
Fri., September 30, 2011

New Teaching Tools

The Center for Teaching and Learning has developed new tools to help your courses be more effective and efficient. Instructional videos and more information on the new BYU Learning Suite can be found on their website, <http://ctl.byu.edu/>.

ChemCompanion: Reinventing the Classroom

Test out ChemCompanion at <http://www.chem.byu.edu/ChemCompanion/>

For a long time, classrooms have remained essentially the same: teacher, chalkboard, textbook and a lecture to help students absorb the information.

Dr. Steven Wood is one of those helping to change that. A professor in the Department of Chemistry and Biochemistry, Wood is in charge of ChemCompanion, an interactive website that helps students understand chemistry. Easy to navigate and well-organized, the website is filled with video explanations and entertaining animations which explain important concepts to first year students.

The website looks like a classroom, with an interactive chalkboard – one that shows illustrations, notes and videos – and Dr. Wood explaining the concepts. The website combines classroom, website and textbook elements.

“The real power is that you have simultaneous delivery of text along with the visuals,” he said. “You can’t do that with a book.”

He describes ChemCompanion as a one-on-one experience. Students can view videos as many times as necessary; this is unlike the typical classroom lecture where if students miss a concept, it is difficult to catch up.

Two-thirds of students surveyed said they were likely or very likely to choose ChemCompanion over a textbook. In addition, two-thirds said the textbook was very intimidating, while 88 percent said ChemCompanion was not at all intimidating.

Recently the group has been developing new ways to visually present the solutions to numerical problems. In a pilot test of prototype materials, students

who used the visual materials were more likely to complete more practice programs than those studying out of a standard textbook.

Development of ChemCompanion started in 2001 as a department project involving five faculty members, but Wood took sole responsibility in 2004. In 2009, the project was awarded a National Science Foundation grant, providing funding for further development.

At the conferences where Wood presented the software, many were surprised that undergraduate students produced the videos because they look very professional.

In a small room in the Benson building, all of the videos and animations are created, edited and published online by undergraduates under Dr. Wood’s supervision. Students have been involved in all aspects of the project, from editing the scripts to creation of the animations to the final finished products. Two of the current students preparing the visual materials are Eliza Meeks and Brendan Tobler. This project provides a great opportunity for these well-rounded students to combine their talents in art and science.

“For me, I’m an art history major, and I’m minoring in chemistry,” Meeks said. “So this job is a nice blend of those two.”

Though ChemCompanion looks complete, the team is adding more content to the website and altering it to help students remember concepts. When it is complete, the interactive website will be marketed, making it available for use at other universities and programs.

by: Alysa Hoskin

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in graduate level research. Price appreciates BYU’s atmosphere.

“We are really blessed here in the chemistry department,” he said. “The faculty [members] here are very collaborative and collegial. It’s an excellent environment you don’t find in a lot of other places.”

When not working, Price loves to spend time with his family. He and his

wife, Amber, enjoy reading fantasy novels together. One of their favorite series is *Fablehaven*, by BYU alumnus Brandon Mull. Price and his four boys like to wrestle and dig in their backyard.

Professor Price will teach Organic Chemistry 351 starting Winter 2012.

by: Stacie Carnley



ABOVE Dr. Mark Clement

BYU Photo

College Grants

Chemistry & Biochemistry

[Greg Burton](#)

Sponsor: Institute of Arthritis Research
Title: A Novel Immunomodulating Drug Candidate to Prevent Transplantation Rejection

[Daniel Ess](#)

Sponsor: ACS Petroleum Research Fund
Title: Quantum Mechanical Investigation of Fundamental Concepts in Hydrocarbon C-H Bond

[Paul Savage](#)

Sponsor: Varied Sources
Title: Development of DSA-13 Miranol Implant Coating

[Barry Willardson](#)

Sponsor: NIH
Title: Mechanisms of Assembly of Photoreceptor G Protein Complexes

Geological Sciences

[Eric Christiansen](#) & [Bart Kowallis](#)

Sponsor: USGS
Title: Geologic Mapping of the Birdseye 7½ Minute Quadrangle

Mathematics

[Eric Swenson](#)

Sponsor: Simons Foundation
Title: Group Boundary Dynamics

Meet the Neighbors: Mapping Out the Tree of Life

How are flowers related to bugs? What do human DNA and E. coli bacteria have in common?

The Tree of Life, a worldwide project partly funded by the National Science Foundation, hopes to find answers to questions like these by mapping out the genetic fingerprint of every living species. Mark Clement, a faculty member of the Department of Computer Science, is involved in creating this massive database.

By understanding what genes different species have in common, scientists may be able to develop new human treatments using knowledge gained from other species. Clement offered a hypothetical application.

"If we can understand, for example, what causes a grasshopper to grow an extra leg," he said, "then maybe we can understand how to grow new organs for humans."

Clement has already worked on a branch of the Tree of Life by participating in a project that determined the relationships between two thousand hexapods, a class of insect. During this research, he became frustrated with how long computers were taking to process and connect genetic information; finding the genetic similarities between 500 species required up to six months of computing. As a solution, he developed a new computer algorithm for comparing genetics.

Recently published in the journal BMC Genomics, Clement's research

shows that simpler and faster algorithms are just as accurate as the more complex methods of determining evolutionary relationships. Equipped with better computational tools, scientists can cut through larger chunks of information at a time and tackle more pieces of the vast genetic puzzle.

The Tree of Life project may also have beneficial applications in agriculture and medicine. If farmers can identify which genes affect taste, size and other qualities, they can more easily decide which species to crossbreed for better crops.

An understanding of the genetic code can result in increased access to quality medicine, as it has for individuals suffering from diabetes. In the past, diabetics had to use insulin from other creatures like pigs, but pig insulin is not exactly the same as human insulin and caused health problems in some people. However, with a modern understanding of the genetic code, human insulin can now be produced by E. coli bacteria. Scientists can harness the rapid reproductive abilities of E. coli to produce large quantities of insulin by replacing a small portion of E. coli DNA with human DNA.

Clement is continuing to look at new ways of fitting large numbers of sequenced species into the grand scheme of life, hopeful that continued advancements will help identify solutions and further improve our quality of life.

by: Natalie Rice

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"Now I tell [my students] they have two or three seconds to think about it," Nielsen explained. "And then if no one answers, then I will randomly call on a person to answer the question. And they get more engaged."

Del Scott, the department chair, fully supports Nielsen's pursuit of more education but notes that she already provides invaluable service. Her many duties include managing all Stat 121 courses – including those administered through Independent Study and the Salt Lake Center – leading TA training and interfacing with companies that provide homework submissions.

Going beyond the call of duty, Nielsen also volunteers her time to grade high school AP statistics exams and works individually with Stat 121 students, helping them keep up with assignments when unexpected events complicate their semester.

"She continually looks for ways of improving the responsibilities she has," Scott said.

"Hopefully it really affects how people do research in a variety of areas," he said.

by: Natalie Rice



ABOVE Dr. Bill Hays

CS Dept

In Remembrance of Former Dean, Bill Hays

Former dean, Bill Hays, who served BYU faithfully for over thirty years, passed away July 19, 2011.

Bill's involvement with BYU began in 1970 when he was hired as a professor for the Computer Science Department. His responsibilities increased when he agreed to serve as chair of the department in the early '80s. During this time he greatly altered the direction of the department and made changes that have had a lasting impact.

Dan Olsen, Bill's longtime friend and associate, said, "He had the vision that the department could be an excellent researching department. Before Bill, basically all faculty did was teach classes; nobody ever published a paper. When he was chair, he said, 'This is going to change; we're going to be a real department.'"

Under his leadership, new faculty members with special emphases in research were hired, and the west wing of the Talmage building, which now houses the Computer Science Department, was completed. As computer science's popularity increased, Bill

worked tirelessly to strengthen faculty and was successful in getting the PhD program approved.

Bill was named associate dean of the College of Physical and Mathematical Sciences in 1992, and then dean a year later. While serving as dean, Bill not only continued to improve academic programs but made a lasting impression on those he came in contact with.

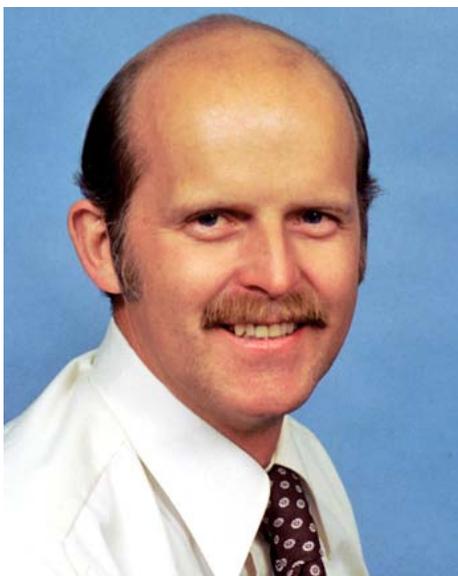
Rebecca Ott, Bill's former secretary, described him as being a genuine man who looked for the good in others and knew how to effectively utilize their talents.

"His exterior may have been daunting to some, but when you got to know the real person, he was as kind-hearted as they come," she said.

Whether working with Bill directly, or simply touched by his work, students and faculty alike have been positively influenced.

"There is nobody that has done more for BYU's Computer Science Department than Bill Hays. He deserves more credit than anyone else for what the department is today," Olsen said.

by: Stacie Carnley



ABOVE Dr. James Thorne

Daily Herald

Remembering James Thorne, Emeritus Chem Prof

Former chemistry professor, James Thorne, passed away on July 21, 2011 at the age of 73.

Jim joined BYU's faculty in 1966. As a physical chemist, his research interests ranged from photo dynamic therapy used in cancer treatment to X-ray nanotechnology. Jim was usually involved in several projects and always engaged students in his research.

Former BYU chemistry professor, Fran Nordmeyer, explained that Jim was not only an educator, but a friend to students and staff alike.

"His faculty colleagues always found him to be friendly, kind, softly spoken and very generous. Many students have greatly benefitted from his efforts," said Nordmeyer.

In addition to teaching classes, Jim held numerous scientific patents and co-founded the company Moxtek with Larry Knight, an emeritus physics professor. Knight described the first time he met Jim.

"The first day I came to BYU, Jim came to my office and said he thought we had similar interests. And that was the beginning of a collaboration that lasted for about 40 years" said Knight.

Thorne and Knight shared similar in-

terests including lasers and applications, and plasma physics. They helped develop X-ray optics used in the laser fusion program at both Los Alamos National Laboratory and Livermore National Laboratory. These mutual fascinations inspired them to start their own company.

Moxtek was founded in 1986 with technology Thorne and Knight developed at BYU. The genesis product of Moxtek was multilayer X-ray optics and thin X-ray windows used for elemental analysis. Today, Moxtek is a leader in the design, development and manufacturing of X-ray optics, spectrometers, small X-ray tubes and wire grid polarizers used in projectors and high-definition televisions.

Knight described Jim as being very good at anything he chose to do.

"[Jim] was one of the brightest people I know. He was very good at doing analysis, taking measurements and figuring out clever ways to solve problems," he said.

Although his adult life was compromised by ill health, Jim was a hard worker and displayed a positive attitude.

"Jim was a very remarkable man," said Knight. "I think anybody who knew him would say that he was quite a guy."

by: Stacie Carnley



New and Continuing Dept Leadership Announced

Department chair and associate chair appointments were recently announced in the departments of Chemistry and Biochemistry, Computer Science and Mathematics Education.

John Lamb has been named as a new associate chair of the Department of Chemistry and Biochemistry, replacing Steven Goates. Professor Lamb has been involved in research and leadership at BYU beginning in 1978. The expertise he has developed from these years of experience will be an asset to the growth and management of his department.

In Computer Science, Mark Clement is replacing Christophe Giraud-Carrier

as associate chair. Though involved in many research projects, Clement focuses mainly on developing computer programs to determine evolutionary histories by examining DNA. Also, Paris Egbert has been reappointed as department chair for another three years of service.

Dan Siebert, of the Department of Mathematics Education, has been appointed to replace Blake Peterson as associate chair. Siebert researches and publishes on literacy and its role in teaching mathematics. Steve Williams has also been reappointed for another three-year term as department chair.

by: Natalie Rice

College Publications

Chemistry and Biochemistry

R. Anderson, W. Hu, J.W. Noh, W. Dahlquist, S. Ness, T. Gustafson, D. Richards, S. Kim, B. Mazzeo, [A. Woolley](#), G. Nordin, "Transient Deflection Response in Microcantilever Array Integrated with Polydimethylsiloxane (PDMS) Microfluidics", *Lab on a Chip*, 2011, issue 11, pp. 2088-2096

N. Barros, S. Feijóo, [L.D. Hansen](#), "Calorimetric Determination of Metabolic Heat, CO₂ rates and the Calorespirometric Ratio of Soil Basal Metabolism", *Geoderma*, 2011, volume 160/issues 3-4, pp. 542-547

X. Chen, [H.D. Tolley](#), [M. Lee](#), "Monolithic Capillary Columns Synthesized From a Single Phosphate-containing Dimethacrylate Monomer for Cation-Exchange Chromatography of Peptides and Proteins", *Journal of Chromatography A*, 2011, volume 1218/issue 28, pp. 4322-4331

A. Curtis, [S. Burt](#), A. Calchera, [J. Patterson](#), "Limitations in the Analysis of Vibrational Sum-Frequency Spectra Arising from the Nonresonant Contribution", *The Journal of Physical Chemistry C*, 2011, volume 115/issue 23, pp. 11550-11559

M. Hamblin, A. Hawkins, D. Murray, D. Maynes, [M. Lee](#), [A. Woolley](#), [H.D. Tolley](#), "Capillary Flow in Sacrificially Etched Nanochannels", *Biomicrofluidics*, 2011, volume 5/issue 2, 021103-1-6

S. Liu, [D. Ess](#), C. Shauer, "Density Functional Reactivity Theory Characterizes Charge Separation Propensity in Proton-Coupled

Electron Transfer Reactions", *J. Phys. Chem. A*, 2011, volume 115/issue 18, pp. 4738-4742

M. Mayo, A. Nicholson, [L.D. Hansen](#), [J.C. Hansen](#), "Chemical Treatment of Algae to Facilitate Biogas Production by Anaerobic Digestion", *American Society of Agricultural and Biological Engineers*, 2011, volume 54/issue 4, pp. 1-4

L. Wiest, D. Jensen, C. Hung, R. Olsen, [R. Davis](#), M. Vail, A. Dadson, P. Nesterenko, [M. Linford](#), "Pellicular Particles with Spherical Carbon Cores and Porous Nanodiamond/Polymer Shells for Reversed-Phase HPLC", *Analytical Chemistry*, 2011, volume 83/issue 14, pp. 5488-5501

Physics and Astronomy

L. Wiest, D. Jensen, C. Hung, R. Olsen, [R. Davis](#), M. Vail, A. Dadson, P. Nesterenko, [M. Linford](#), "Pellicular Particles with Spherical Carbon Cores and Porous Nanodiamond/Polymer Shells for Reversed-Phase HPLC", *Analytical Chemistry*, 2011, volume 83/issue 14, pp. 5488-5501

Statistics

Y. Chang, K. Hatch, H. Wei, H. Yuan, C. You, [D. Eggett](#), Y. Tu, Y. Lin, H. Shiu, "Stable Nitrogen and Carbon Isotopes May Not Be Good Indicators of Altitudinal Distributions of Montane Passerines", *The Wilson Journal of Ornithology*, 2011, volume 123/issue 1, pp. 33-47

X. Chen, [H.D. Tolley](#), [M. Lee](#), "Monolithic Capillary Columns Synthesized From a Single Phosphate-containing Dimethacrylate Monomer for Cation-exchange Chromatography of Peptides and Proteins", *Journal of Chromatography A*, 2011, volume 1218/issue 28, pp. 4322-4331

[D. Engler](#), Y. Shen, J. Gusella, R. Betensky, "Comparison of Clinical Subgroup aCGH Profiles through Pseudolikelihood Ratio Tests", *Statistical Applications in Genetics and Molecular Biology*, 2011, volume 10/issue 1/article 31

M. Hamblin, A. Hawkins, D. Murray, D. Maynes, [M. Lee](#), [A. Woolley](#), [H.D. Tolley](#), "Capillary Flow in Sacrificially Etched Nanochannels", *Biomicrofluidics*, 2011, volume 5/issue 2

B.C. Healy, [D. Engler](#), T. Gholipour, H. Weiner, R. Bakshi, T. Chitnis, "Accounting for Disease Modifying Therapy in Models of Clinical Progression in Multiple Sclerosis", *Journal of Neurological Sciences*, 2011, volume 303/issue 1-2, p. 109-113

G. Mohapatra, [D. Engler](#), K. Starbuck, J. Kim, D. Bernay, G. Scangas, A. Rousseau, T. Batchelor, R. Betensky, D. Louis, "Genome-Wide Comparison of Paired Fresh Frozen and Formalin-Fixed Paraffin-Embedded Gliomas by Custom BAC and Oligonucleotide Array Comparative Genomic Hybridization: Facilitating Analysis of Archival Gliomas", *Acta Neuropathologica*, 2010, volume 121/issue 4, p. 529-543