

Newsletter

College of Physical and Mathematical Sciences

February 2009



In this issue:

1
Applied Spectroscopy
2009

2
Important Dates

Chambliss
Astronomy
Achievement Student
Awards

3
U.S. Air Force Young
Investigators Award
Gives Professor
\$300K

Annual College
Awards Banquet

4
College Publications

Applied Spectroscopy 2009

The College of Physical and Mathematical Sciences would like to congratulate Steven Goates for his recent recognition in the January 2009 edition of *Applied Spectroscopy*. A publication written by Goates, a professor from the Department of Chemistry and Biochemistry, along with Robert Baker, Andrew Orton, and Brent Horn, was featured as the cover article in the January issue. The piece is entitled “Characterization of Carbon Dioxide Mobile Phase Density Profiles in Packed Capillary Columns by Raman Microscopy.” Included below is the Abstract to the article. The article can be found by going to: [http://docserver.ingentaconnect.com/deliver/connect/sas/00037028/v63n1/s21.pdf?](http://docserver.ingentaconnect.com/deliver/connect/sas/00037028/v63n1/s21.pdf?ex-)

[ex-](http://docserver.ingentaconnect.com/deliver/connect/sas/00037028/v63n1/s21.pdf?ex-)

[pires=1235495697&id=49012049&titleid=230&accname=Brigham+Young+University&checksum=60EEF875240C4B7AC398F4C330A106B9](http://docserver.ingentaconnect.com/deliver/connect/sas/00037028/v63n1/s21.pdf?ex-pires=1235495697&id=49012049&titleid=230&accname=Brigham+Young+University&checksum=60EEF875240C4B7AC398F4C330A106B9).

Abstract: “Efforts to understand and optimize separations employing compressible mobile phases have been limited by a lack of understanding of the mobile phase density gradient. Mobile phase compressibility leads to gradients in linear velocity and solute retention and affects separation speed and efficiency, especially in packed columns. Gas chromatography (GC), supercritical fluid chromatography (SFC), and solvating gas chromatography (SGC) each rely on compressible mobile phases. This work describes the on-column density measurement of carbon dioxide, a common carrier fluid for SFC and SGC, in packed capillary columns using Raman micro spectroscopy of the position of the Fermi doublet. Correlation of the spectrum with density was calibrated over a pressure range of 15 to 290 atm and 125 and 150° C, which then allowed for determination of the density gradient of fluid flowing through a packed capillary column. The results of this work will be used to model the flow behavior of compressible fluids to understand the effects of mobile phase compressibility on separation speed and efficiency.”



Important Dates & Events in the College

February 2009

Saturday, March 21st
Spring Research Conference

Wednesday, March 25th
Choose to Give Campaign

Tuesday, April 7th
Senior Banquet
5:30pm 3228 WSC

Chambliss Astronomy Achievement Student Awards

The Astronomy Achievement Student Awards are given to recognize exemplary research by undergraduate and graduate students who present at one of the poster sessions at the meetings of the AAS. Awardees are honored with a Chambliss medal and a certificate.

This award began in 2006 and only 11 have been previously awarded. On average about two graduate awards per American Astronomical Society Meeting are given. The Chambliss Astronomy Achievement Student Award was awarded to Tabitha C. Bush and was given for her poster at the 213th American Astronomical Society Meeting in Long Beach, California from January 4-8, 2009.

This is an impressive award for Tabitha to win since it is at THE national astronomy meeting and she was going up against graduate students from all the major astronomy graduate programs.

The poster represented the work Tabitha did for her Master's Thesis from BYU, under the direction of Dr. Eric Hintz. Tabitha is currently a PhD student in the BYU Department of Physics and Astronomy working with Dr. Denise Stephens.

Poster Information:

Rotational Velocity Determinations for 118 δ (delta) Scuti Variables

Tabitha C. Bush and Eric G. Hintz

We present a calibration method used for the determination of projected rotational velocities ($v \sin(i)$) of 118 δ Scuti variables from FWHM measurements of metal lines near 4500 Å. The calibration relation used was derived from measurements of 29 stars. Of the 44 stars brighter than 8th magnitude and north of -1° declination which did not have values in the Rodríguez catalog (Rodríguez, E., López González, M. J., & López de Coca, P. 2000, A&AS, 144, 469), we present values for 38. In addition, we present new $v \sin(i)$ values for 10 stars south of -1° or fainter than 8th magnitude for a total of 48 $v \sin(i)$ values for stars with no previously published values. We acknowledge the Dominion Astrophysical Observatory for making available the 1.2-m and 1.8-m telescopes to aid in this research.



U.S. Air Force Young Investigators Award Gives Professor \$300K

The Air Force Office of Scientific Research awarded James Patterson, a BYU assistant professor in the Department of Chemistry and Biochemistry, a Young Investigators Program award of \$300,000 for research on campus.

The Young Investigators Program award is open to scientists and engineers at research institutions across the United States who have received a doctorate degree or equivalent degrees in the last five years and show exceptional ability and promise for conducting basic research.

The program fosters creative basic research in science and engineering and enhances early career development of outstanding young investigators. Patterson will receive the \$300,000 over a period of three years for his research on the molecular basis of adhesion. Using nonlinear laser spectroscopy, he will work to understand the molecular basis of adhesion in polymer-based materials.

"We are very excited by this recognition of our work on understanding adhesion," Patterson said, "Adhesives are used all throughout modern technology, from simple paints and glues to high-performance materials used in the aerospace industry, yet our current understanding of these phenomena is very limited."

He joined the BYU faculty in the fall semester of 2007. Prior to coming to BYU, Patterson worked for the Institute for Shock Physics at Washington State University. He received a bachelor's and master's degree in chemistry from BYU. He then received a doctorate in chemistry from the University of Illinois at Urbana-Champaign.

--Angela Fischer, YNews



Annual College Awards Banquet

During the recent college annual awards banquet, the College of Physical and Mathematical Sciences presented a variety of awards to Faculty and Staff in honor of their service to the college and university. Among the awards acknowledged were several University Service Awards: John Ellsworth and Jeff Farrer, Physics and Astronomy – 5 years; Jeanette Lawler, Physics and Astronomy - 10 years; Bart Whitehead, Chemistry and Biochemistry - 20 years; Dan Johnson, Dean's Office - 25 years; Kelly Jensen, Chemistry and Biochemistry - 30 years; and Nan Ellen Ah You, Physics and Astronomy - 35 years.

In addition to the university service awards, several college awards were also presented. Wayne Anderson, Chemistry and Biochemistry received the Outstanding Admin/Staff Award. Darrin Doud, Mathematics, received the Faculty Excellence in Teaching Award for 3-10 years. Harold Stokes, Physics and Astronomy, received the Faculty Excellence in Teaching Award for 10 or more years. Kent Seamons, Computer Science, received the Young Scholar Award. Bruce Collings, Statistics, received the Distinguished Citizenship Award.

Shirley VanLeuven, Chair of the university Administrative Advisory Council (AAC), was in attendance at the event to present a University President's Appreciation Award to Dan Johnson (Dean's Office). Janet J. Fonoimoana (Chemistry and Biochemistry), who was unable to attend the banquet, also received a President's Appreciation Award at a later date.

College Publications

Chemistry & Biochemistry

Merrell, K.; Thulin, C.D.; Esplin, M.S.; Graves, S.W., "Systematic Internal Standard Selection for Capillary Liquid Chromatography—Mass Spectrometry Time Normalization to Facilitate Serum Proteomics", *Journal of Biomolecular Techniques* 19:320-327 (2008).

Henderson, D., "Attractive Energy and Entropy of Particle Size: The Yin and Yang of Physical and Biological Science", *Interdisciplinary Sciences: Computational Life Sciences* 1:1-11 (March 2009).

Boda, D; Henderson, D., "The Effects of Deviations from Lorentz-Berthelot Mixing Rules on the Properties of a Simple Mixture", *Molecular Physics* 106:2367-2370 (October 2008).

Becerril, H.A.; Woolley, A.T., "DNA-templated nanofabrication", *The Royal Society of Chemistry* 38:329-337 (2009).

Nielsen, D.K.; Nielsen, L.L.; Jones, S.B.; Toll, L.; Asplund, M.A.; Castle, S.L., "Synthesis of Isohasubanan Alkaloids via Enantioselective Ketone Allylation and Discovery of an Unexpected Rearrangement", *Journal of Organic Chemistry* 74:1187-1199 (2009).

Zhang, F.; Sautter, K.; Davis, R.C.; Linford, M.R., "Subsurface Oxidation for Micropatterning Silicon (SOMS)", *Langmuir, American Chemical Society* 25 (3):1289-1291 (2009).

Computer Science

T. W. van der Horst and K. E. Seamons. pwdArmor: Protecting Conventional Password-based Authentications. 24th Annual Computer Security Applications Conference (ACSAC 2008), Anaheim, CA, December 2008.

Daniel Sco eld, Lei Wang and Daniel Zappala, HxH: A Hop-by-Hop Transport Protocol for Multi-Hop Wireless Networks, The Fourth International Wireless Internet Conference (WICON_2008), November 2008.

Jared Jardine and Daniel Zappala, A Hybrid Architecture for Massively Multiplayer Online Games, The Seventh annual Workshop on Network and Systems Support for Games (NetGames), October 2008.

Manoj Pandey and Daniel Zappala, Hop-by-Hop Multicast Transport for Mobile Ad Hoc Wireless Networks, The Fifth IEEE International Conference on Mobile Ad Hoc and Sensor Systems (MASS), October 2008.

Manoj Pandey and Daniel Zappala, Scalable Multicast Routing for Ad Hoc Networks, The Fourth International Workshop on Localized Communication and Topology Protocols for Ad Hoc Networks (LOCAN), October 2008.

Qiuyi Duan, Lei Wang, Charles D. Knutson and Daniel Zappala, Autonomous and Intelligent Radio Switching for Heterogeneous Wireless Networks, The Fourth IEEE International Workshop Heterogeneous Multi-Hop Wireless and Mobile Networks (MHWMN), October, 2008.

Lee, J. and Giraud-Carrier, C. (2008). New Insights Into Learning Algorithms and Datasets. In Proceedings of the Seventh International Conference on Machine Learning and Applications, 135-140.

Lee, J. and Giraud-Carrier, C. (2008). Predicting Algorithm Accuracy with a Small Set of Effective Meta-Features. In Proceedings of the Seventh International Conference on Machine Learning and Applications, 808-812.

Gashler, M., Giraud-Carrier, C. and Martinez, T. (2008). Decision Tree Ensemble: Small Heterogeneous Is Better Than Large Homogeneous. In Proceedings of the Seventh International Conference on Machine Learning and Applications, 900-905.

Giraud-Carrier, C. (2008). Improving Clinical Research with Predictive Informatics. Poster at the AMIA Clinical Research Informatics Working Group Expo.

Brazdil, P., Giraud-Carrier, C., Soares, C., and Vilalta, R. (2009). Metalearning: Applications to Data Mining. Springer.

"A graphical environment for interactive four-dimensional data navigation." D. R. Wilding and R. P. Burton. SPIE Visualization and Data Analysis 2009.

Geological Sciences

Shlegel, Melissa E., Mayo, Alan L., Nelson, Steve, Tingey, Dave, Henderson, Rachel and Eggett, Dennis. "Paleo-climate of the Boise area, Idaho from the last glacial maximum to the present." *Quaternary Research* 71, 172-180 (2009).

Bickmore, B.R., Wheeler, J.C., Bate, B., Nagy, K. L., and Eggett, D. L., "Reaction Pathways for Quartz Dissolution Determined by Statistical and Graphical Analysis of Macroscopic Experimental Data," *Geochimica et Cosmochimica Acta*, Vol 72, Iss 18, (2008).

Mathematics

Wayne Barrett, Jason Grout (former Ph.D. student), Raphael Loewy, "The minimum rank problem over the finite field of order 2: Minimum rank 3", *Linear Algebra and its Applications*, 430, 890-923 (2009)

Jessica Purcell, "Slope lengths and generalized augmented links", *Communications in Analysis and Geometry*, 16, No. 4, 883-905 (2009)

Mathematics Education

Physics and Astronomy

W. Weyerman, B. Neyenhuis, J. Archibald, M. Washburn, D. Durfee, and S. Warnick, "Identification and Control of a Grating-Stabilized External-Cavity Diode Laser," *IEEE Transactions on Control System Technology* 17, 161-166 (2009).

Statistics

Long L.N., and Christensen W.F., "Clearly, using intensifiers is very bad--- or is it?" *Idaho Law Review*, 45, 171-189 (2008).

Engler D.A., and Li Y., "Survival Analysis with High-Dimensional Covariates: An Application in Microarray Studies," *Statistical Applications in Genetics and Molecular Biology*: Vol. 8 : Iss. 1, Article 14, (2009).

Larsen, R.A., Schaalje, G.B., and Lawson, J.S., "Food Shelf Life: estimation and optimal design," *Journal of Statistical Computation and Simulation*, Vol 00 No 0 1-15 (2008). DOI: 10.1080/00949650802549135

Florence, L.B., Fellingham G.W., Vehrs, P.R., and Mortensen, N., "Skill evaluation in women's volleyball." *The Journal of Quantitative Analysis in Sports*, 4(2), Article 14, (2008).

Bickmore, B.R., Wheeler, J.C., Bate, B., Nagy, K. L., and Eggett, D. L., "Reaction Pathways for Quartz Dissolution Determined by Statistical and Graphical Analysis of Macroscopic Experimental Data," *Geochimica et Cosmochimica Acta*, Vol 72, Iss 18, (2008).

Tolman, J.R., Lephart, E.D., Setchell, K.D., Eggett, D.L., and Christense, M.J., "Timing of Supplementation of Selenium and Isoflavones Determines Prostate Cancer Risk Factor Reduction in Rats," *Nutrition & Metabolism*, 5, 31, (2008).

Bahr, D.L., Bosse, M.J., and Eggett, D.L., "Gauging the Relative Effects of Reform-Based Curriculum Materials and Professional Development in Promoting Changes in Teacher Beliefs," *NCSM Journal of Mathematics Education Leadership*, 10(2), 28-37, (2008).