College of Science Board of Trustees Report April 22–August 24

Four UAH College of Science Undergraduates and Three College of Science Graduate Students Win BioTrain Internships at the HudsonAlpha Institute for Biotechnology.

UAH College of Science undergraduate students Candice Coppola, Garrett Dunn, Jonathan Trinh, and Rebecca Hauser and College of Science graduate students David Gray, Fariba Shater Ferdosian, and Adam Miller won competitive HudsonAlpha Institute for Biotechnology BioTrain summer internships **.**

UAH Atmospheric Science Professor Dr. Sundar Christopher has been appointed as Dean of the College of Science.

UAH Atmospheric Science Associate Professor Dr. Lawrence Carey has been appointed Interim Chair of the Department.

UAH Atmospheric Science Professors Conduct Field Studies in Panama.

Atmospheric Science Assistant Professor **Dr. Phillip Bitzer** and ESSC Research Associate Jeff Burchfield, in collaboration with Dr. Steve Yanoviak of the University of Louisville, are currently on Barro Colorado Island in Panama doing initial field work in support of an NSF grant on the Ecology of Lightning in Tropical Forests.

UAH Atmospheric Science Professors Conduct Field Studies in Peru

Atmospheric Science Professors **Dr. Tom Sever and Dr. Robert Griffin,** along with researchers at Boston University, are jointly conducting field studies in northern Peru focused on the application of satellite remote sensing for identifying the remnants of ancient human adaptation to past environments.

UAH Atmospheric Science Professors Participate in NASA IPHEX.

Atmospheric Science Associate Professor **Dr. Lawrence Carey** and graduate student Charanjit Pabla are participating in the NASA Integrated Precipitation and Hydrology Experiment (IPHEX) in the Great Smoky Mountains focused on the study of orographic rainfall using satellite remote sensing, radar, ground instruments and research aircraft.

UAH Earth System Science Students Awarded RCEU internships.

Earth System Science Students Jeanné le Roux, Christopher Phillips and Robert Rossell are conducting research funded through UAH's Research and Creative Experiences for Undergraduates (RCEU) program.

UAH Biological Sciences Graduate Student Wins Best Poster Prize

Michelle Morris, a master's student in Biological Sciences, received the Taylor & Francis Biomolecular Crystallography Best Poster Prize at the American Crystallographic Association Annual Meeting, May 24-28, 2014, in Albuquerque, NM. Her poster was titled "Monoclinic and rhombohedral crystals of Inorganic Pyrophosphatase from *Thermococcus thioreducens*".

UAH College of Science Associate Professor Gives Talk at Amercian Crystallographic Association Annual Meeting

Dr. Joe Ng, Associate Professor of Biological Sciences, was selected to give an oral presentation at the American Crystallographic Association Annual Meeting held in Albuquerque, NM, May 24-28, 2014. The title of the presentation was "Neutron crystallographic structure of the Inorganic Pyrophosphatase from *Thermococcus thioreducens* at 2.2A: Insights to a structure-based mechanism".

UAH Department of Biological Sciences Faculty Appointed Adjunct Faculty at the HudsonAlpha Institute for Biotechnology.

Drs. Leland Cseke, Luciano Matzkin, Eric Mendenhall, and **Joe Ng** have been appointed Adjunct Faculty Investigators at the HudsonAlpha Institute for Biotechnology. All four are involved in collaborative research with investigators at the institute. Their appointments resulted from the strong ties between UAH and HudsonAlpha.

UAH College of Science Assistant Professor Presents His Research at National Evolution Meeting

Department of Biological Sciences Assistant Professor **Dr. Luciano Matzkin** gave a talk at the Society for the Study of Evolution Annual Meeting in Raleigh, NC. The talk was titled, "Genome sequencing, assembly and analysis of the four cactus host populations of *Drosophila mojavensis*". **Dr. Matzkin** also presented a poster at meeting titled "Diversifying selection on candidate genes involved in reproductive incompatibilities between *Drosophila mojavensis* and *D. arizonae*".

UAH College of Science Assistant Professor Presents Paper on Freshwater Fish Parasites.

Assistant Professor **Dr. Bruce Stallsmith** of the Department of Biological Sciences in the College of Science presented a paper, "Monogenoidean gill parasites of the poeciliid fish *Brachyrhaphis episcopi* in Panamá," at the Joint Meeting of Ichthyologists and Herpetologists in Chattanooga, Tennessee, on Sunday, August 3. Co-authors are Assistant Professor **Dr. Luciano Matzkin** and graduate student Kara Million of the Department of Biological Sciences as well as two researchers from the Smithsonian Tropical Research Institute in Panamá. One goal of the current project is to identify any trematode monogenoidean gill parasites found in the freshwater stream fish *B. episcopi* along with patterns of parasite infection that might exist within and

between host populations. They found that larger individual hosts of a given species carry larger parasite loads than smaller individuals largely as the result of more exposure with age, and infection can vary between seasons.

UAH College of Science Faculty Give Lectures at ORNL

UAH College of Science Associate Professor **Dr. Joe Ng**, of the Department of Biological Sciences and Assistant Research Professor **Dr. Hanna McFeeters** of the Department of Chemistry, gave invited lectures for the New Frontiers in Neutron Macromolecular Crystallography at the Oak Ridge National Labs, July 15-16, 2014, in Oak Ridge, TN. Dr. Ng's presentation was "Neutron crystallographic structure of the Inorganic Pyrophosphatase from *Thermococcus thioreducens* at 2.2A: Insights to a

structure-based mechanism" and Dr. McFeeters' presentation was "Probing the enzyme mechanism of *P. aeruginosa* Pth 1 by high resolution neutron studies". Dr. Ng also spoke in the Neutrons in Structural Biology Symposium hosted by the Spallation Neutron Source, Oak Ridge National Labs held on June 16 in Oak Ridge, TN.

UAH College of Science Associate Professor Selected as Delegate to International Crystallography Meeting

UAH College of Science Associate Professor of Biological Sciences **Dr. Joe Ng** was selected on June 9, 2014 by the National Academy of Science, the U.S. adhering body to the International Union of Crystallography, as one of five delegates to the 23rd Congress and General Assembly of the International Union for Crystallography. The primary responsibility will be to represent the U.S. at the General Assembly.

UAH College of Science Associate Professor Grows Protein Crystals on the International Space Station

UAH College of Science Associate Professor of Biological Sciences, **Dr. Joe Ng** and coworkers along with biotech company iXpressGenes sent protein samples to crystallize on the ISS via SpaceX3. Samples were returned May 18th in the SpaceX3 Dragon capsule. They were received at UAH in early June where the analyses are still in progress.

UAH College of Science Biotech Startup Company Puts First Instrumentation Product on the Market

iXpressGenes, a UAH supported biotech company at the HudsonAlpha Institute for Biotechnology, and founded by UAH Associate Professor of Biological Sciences **Dr. Joe Ng**, launched its first instrumentation product, CrystalX2. CrystalX2 is an automated fluorescent imager that reveals early nucleation of protein crystal growth. The instrument expedites the high-throughput screening of crystallization conditions to obtain macromolecular crystals suitable for crystallographic analyses and subsequently structural determination

(http://www.crystalx2.com/). Molecular Dimensions is distributing the product and it is being shown in scientific conferences.

UAH Sophomore's Product Drawing Investor Attention

Nestegg Bio, a 3D printing start-up founded by University of Alabama in Huntsville (UAH) student Tanner Carden and collaborators Devon Bane, Gavon Carden, and Tim Gualdin, were selected to participate in the GIGTANK Accelerator program by The Company Lab (Co.Lab) in Chattanooga, Tenn. Co.Lab will invest $15,000 toward accelerating development of Nestegg Bio, a company that leverages an innovative 3D printing process to lower the cost of producing cellular structures used in drug testing. Advised by Biology Department Chair Dr. Debra Moriarity, the developers of CarmAl were earlier awarded $9,948 in UAH Charger Innovation Fund support. As part of its investment, business incubator Co.Lab worked to accelerate the NestEgg Bio startup at Chattanooga's Gigtank startup accelerator this summer.

UAH Chemistry Student Garrett Dunn (Chemistry Major, Biochemistry emphasis) has been awarded a Hudson-Alpha Institute of Biotechnology Biotrain summer research internship.

Dr. John C. Gregory, Professor of Chemistry and Materials Science, UAH, and Director of the Alabama Space Grant Consortium is invited to Washington DC to receive the 2014 NASA Distinguished Public Service Award from NASA Administrator Charles Bolden on August 14th.

The award ceremony is followed by a special tour of the Smithsonian Air and Space Museum. According to: *http://nasapeople.nasa.gov/awards/nasamedals.htm*, the award is "NASA's highest form of recognition that is awarded to any non-Government individual whose distinguished service, ability, or vision has personally contributed to NASA's advancement of United States' interests. The individual's achievement or contribution must demonstrate a level of excellence that has made a profound or indelible impact to NASA mission success, therefore, the contribution is so extraordinary that other forms of recognition by NASA would be inadequate." **Dr. Gregory's** citation reads: "For sustained and exceptional leadership in integrating research and education in space science and engineering over several decades**". Dr. Gregory** says: "The award really reflects on the special importance that space research and education, and the integration of the two, have to the universities and people of Alabama and to the National Space Grant Program".

UAH Modeling & Simulation Ph.D. students Mitchell Bott and Daniel O'Brien win $10,000 each to support their Ph.D. studies.

The scholarship, which is officially known as the RADM Fred Lewis Postgraduate I/ITSEC Scholarship, is awarded by the National Training and Simulation Association (NTSA). The I/ITSEC scholarship, which has been awarded annually since 1989, is highly prestigious and sought after in the Defense M&S community. Normally the awards go to one M.S. and one Ph.D. student each year; it is somewhat unusual for two Ph.D. awards to be given in the same year. However, it is unprecedented for both awards in a year to go the students at the same university.Previous years' awards have gone to students from Old Dominion University, the University of Central Florida, Texas A&M University, Renssalaer Polytechnic Institute, Johns Hopkins University, the University of Southern California, and Iowa State University.

UAH Physics professor wins NASA HOPE Achievement Award

Don Gregory and his graduate student **Tomasz Lis** are members of a NASA/MSFC team that has been awarded a NASA Headquarters Hands On Project Experience (HOPE) Group Achievement Award for their contribution to the recent balloon flight of HEROES (High Energy Replicated Optics to Explore the Sun). **Gregory** and **Lis** designed and built the optical system that monitored the X-ray telescope's critical alignment to the star camera used for position determination.

College of Science Distinguished Professor's Journal Selected by the Journal of Plasma Physics

Distinguished Professor **Dr. Gary P. Zank's** article "The equations of reduced magnetohydrodynamics JPP 48, 85 (1992)" was selected by the Editorial Board of the Journal of Plasma Physics as one of the 12 "Classic JPP Papers". The list was made by the vote of the Editorial Board, who were asked to choose from amongst all papers with more than 100 citations. Below are links to view Dr. Zank's journal, as well as the Editorial Board that selected Dr. Zank's paper. The list currently appears on the JPP website and the papers from the list have been made free to download. http://journals.cambridge.org/action/displayJournal?jid=PLA

UAH Space Science Professors Give Talks at ASTRONUM 2014 in Long Beach, CA.

Drs. Nikolai Pogorelov and Gary P. Zank gave talks at Astronum-2014, the 9th Annual International Conference on Numerical Modeling of Space Plasma Flows that took place in Long Beach, CA, U.S.A., on 23–27 June, 2014. They also served in the Program Committee of the conference.

The conference attracted about 70 participants from all over the world and covered the following topics:

(1) Advanced numerical methods for space, astrophysical and geophysical flows;

(2) Large-scale fluid-based, kinetic, and hybrid simulations;

(3) Turbulence and cosmic ray transport;

(4) Magnetohydrodynamics

(5) Software packages for modeling and analyzing plasma flows / Visualisation

with the application to

(1) Physics of the Sun-Heliosphere-Magnetosphere; (2) Interstellar medium and star formation;

(3) Cosmology and galaxy formation; (4) Dynamo effect;

(5) Stellar Physics.

Program Committee: Tahar Amari (CNRS Ecole Polytechnique), Edouard Audit (CEA, Maison de la Simulation, co-chair), Phillip Colella (Lawrence Berkeley National Laboratory), Jo´ se-Mar´ıa Iba´n˜ ez (University of Valencia), Ewald Mu¨ller (Max-Planck-Institute for Astrophysics, Garching), **Nikolai Pogorelov (UAH, chair),** Kazunari Shibata (Kyoto University), James Stone (Princeton University), Brian Van Straalen (Lawrence Berkeley National Laboratory), and **Gary P. Zank (UAH).**

The NSF-funded Heliophysics Research Experience for Undergraduates (REU), a partnership between UAH-CSPAR and NASA-MSFC, just completed its 10-week 2014 summer program.

This year 12 students, 6 male and 6 female, were selected to work with scientists from either MSFC or CSPAR and completed research projects related to various topics in heliophysics. Students came from Alabama, Tennessee, Florida, Colorado, Georgia, Texas, Kansas, New York, Virginia and one student (non NSF-funded) came from Cambridge University in the UK. Research projects ranged from testing the next generation of solar instruments to using Voyager data to understand the structure of the heliosphere.

During the last week of the program each student presented a poster on their work, and also submitted an abstract to present a version of their poster at the American Geophysical Union Fall Meeting in December. Students were housed in dorms on campus, shared office space in the NSSTC building (Bud Cramer Hall), and participated in various group activities including caving and astrophotography workshop. This year marks the third year of the program, and currently a proposal is being written to continue this very successful program in the future. **Dr. Jacob Heerikhuisen** (UAH-CSPAR/SPA) is the Principal Investigator of this program and Dr. Amy Winebarger (NASA-MSFC) is Co-investigator. More information can be found at the programs website: http://www.uah.edu/cspar/research/reu.

Laxman Adhikari is one of six UAH student recipients of prestigious ALEPSCoR Graduate Research Scholars Program awards.

Distinguished Prof. Gary P. Zank, Chair of Space Science and Director of CSPAR, is his Faculty Advisor. A total of 36 graduate students from seven universities across the state of

Alabama are round nine GRSP awardees, receiving a total of $849,370. Each of the six UAH graduate students wrote a proposal for external research funding in a STEM (science, technology, engineering and mathematics) discipline. The student awards are being funded for the fall 2014 academic year. Students will work with their faculty advisors, during the award period. Additionally, students are expected to make formal presentations of their GRSP research findings at nationally recognized technical meetings and/or an Alabama EPSCoR meeting.

Matthew Bedford, CSPAR Graduate Research Assistant Accepted to Blue Waters Graduate Fellowship Program

Prof. Nikolai Pogorelov Space Science and Faculty Advisor of CSPAR's Graduate Research Assistant III**, Matthew Bedford**, was selected as one of the seven recipients of the University of Illinois at Urbana, Champaign's Blue Waters Graduate Fellowship program for the 2014 – 2015 academic year! Recipients of this award were evaluated based on their academic record, GRE score, related experience and service, research plan and its relationship to use of the Blue Waters supercomputer, and letters of reference. Bedford met those requirements and has been awarded a total of $50,000 to cover stipend and tuition and an allocation of 50,000 node hours on the Blue Waters system. Bedford will focus on the research program and will later present the research progress at the 2015 Blue Waters symposium.

College of Science Peer-reviewed Publications During Reporting Period

"Essential oils: New perspectives in human health and wellness." Fabio Firenzuoli, Vikas Jaitak, Gyorgyi Horvath, Imaël Henri,Bassolé, William N. Setzer, and Luigi Gori. *Evidence-Based Complementary and Alternative Medicine*, 2014, ID 467363.

"The volatile constituents of *Parquetina nigrescens* from southwestern Nigeria." Moses S. Owolabi, Oladipupo A. Lawal, Rebecca M. Hauser, and William N. Setzer. *Natural Product Communications*, 2014, *9(6)*, 857-858.

"Accumulation of silicon in cacti native to the United States: Characterization of silica bodies and cyclic oligosiloxanes in *Stenocereus thurberi*, *Opuntia littoralis*, *Opuntia ficus-indica*, and *Opuntia stricta*." Cynthia R. Wright, Emanuel A. Waddell, and William N. Setzer. *Natural Product Communications*, 2014, *9(6)*, 873-878.

"Recombinant production, crystallization and X-ray crystallographic structure determination of peptidyl-tRNA hydrolase from *Salmonella typhimurium*." Venugopal Vandavasi, Kasey Taylor-Creel, Robert L McFeeters, Leighton Coates, and Hana McFeeters. *Acta Crystallographica Section F Structural Biology and Crystallization Communications*, 2014, *70(7)*, 872-877.

Nishikawa, Ken-ichi, et al, Magnetic field generation via the kinetic Kelvin-Helmholtz instability in core-sheath jets, *ApJ*, September 10, 2014 (arXiv:1405.5247)

Choi, E. J., K. Min, Ken-ichi Nishikawa, & C. R. Choi, A Study on the Evolution of Relativistic Electron-Ion Shock Using 3D PIC Simulations, *Physics of Plasmas*, 21, 072905, 2014 (arXiv:1407.4540).

P. Jachym, F. Combes, L. Cortest, Ming Sun, J. D. P. Kenney *ApJ*, 2014 (arXiv:1403.2328).

E. Roediger, M. Brüggen, M.S. Owers, H. Ebeling, Ming Sun, *MNRAS*, 2014 (arXiv:1405.1033).

L. David, Ming Sun, et al. *ApJ*, 2014, in press (arXiv:1407.3235).

Fe Enhancements in SEP onsets: Flare/CME mixture or transport effect?, by G. M. Mason, G. Li, C. M. S. Cohen, M. I. Desai, D. K. Haggerty, R. A. Leske, R. A. Mewaldt, and G. P. Zank, in Outstanding Problems in Heliophysics: From Coronal Heating to the Edge of the Heliosphere. Proceedings of the 12th Annual International Astrophysics Conference held 14-19 April 2013 at Myrtle Beach, South Carolina, USA. Edited by Qiang Hu and Gary P. Zank. ASP Conference Series, Vol. 484, p. 137 (2014).

Turbulence Transport Modelling of the Temporal Outer Heliosphere, by L. Adhikari, G. P. Zank, Q. Hu, A. Dosch, in Outstanding Problems in Heliophysics: From Coronal Heating to the Edge of the Heliosphere. Proceedings of the 12th Annual International Astrophysics Conference held 14-19 April 2013 at Myrtle Beach, South Carolina, USA. Edited by Qiang Hu and Gary P. Zank. ASP Conference Series, Vol. 484, p. 1 (2014).

Heliospheric Structure: The Bow Wave and the Hydrogen Wall, by G.P. Zank, J. Heerikhuisen, B.E. Wood, N.V. Pogorelov, E. Zirnstein, and D.J. McComas, in Outstanding Problems in Heliophysics: From Coronal Heating to the Edge of the Heliosphere. Proceedings of the 12th Annual International Astrophysics Conference held 14-19 April 2013 at Myrtle Beach, South Carolina, USA. Edited by Qiang Hu and Gary P. Zank. ASP Conference Series, Vol. 484, p. 255 (2014).

A New Hybrid Method, by R. Burrows, X. Ao, and G.P. Zank, in Outstanding Problems in Heliophysics: From Coronal Heating to the Edge of the Heliosphere. Proceedings of the 12th Annual International Astrophysics Conference held 14-19 April 2013 at Myrtle Beach, South Carolina, USA. Edited by Qiang Hu and Gary P. Zank. ASP Conference Series, Vol. 484, p. 8 (2014).

Advected Invariants in Magnetohydrodynamics and Gas Dynamics, by G.M. Webb, Q. Hu, J.F. McKenzie, B. Dasgupta, and G.P. Zank, in Outstanding Problems in Heliophysics: From Coronal

Heating to the Edge of the Heliosphere. Proceedings of the 12th Annual International Astrophysics Conference held 14-19 April 2013 at Myrtle Beach, South Carolina, USA. Edited by Qiang Hu and Gary P. Zank. ASP Conference Series, Vol. 484, p. 228 (2014).

MHD Analysis of the Solar Wind Structure from the Photosphere to the Inner Heliosphere, by H. Washimi, G.P. Zank, Q. Hu, T. Tanaka, A. Nakamizo, and M. Kojima, in Outstanding Problems in Heliophysics: From Coronal Heating to the Edge of the Heliosphere. Proceedings of the 12th Annual International Astrophysics Conference held 14-19 April 2013 at Myrtle Beach, South Carolina, USA. Edited by Qiang Hu and Gary P. Zank. ASP Conference Series, Vol. 484, p. 222 (2014)

Electron Acceleration and Spectral Hardening of Continuum Emission in Solar Flares, by Gang Li, X. Kong, Y. Chen, G.P. Zank, and L. Zhao, in Outstanding Problems in Heliophysics: From Coronal Heating to the Edge of the Heliosphere. Proceedings of the 12th Annual International Astrophysics Conference held 14-19 April 2013 at Myrtle Beach, South Carolina, USA. Edited by Qiang Hu and Gary P. Zank. AS

A paper was accepted by the Astrophysical Journal on July 23rd, entitled "Structures of Interplanetary Magnetic Flux Ropes and Comparison with Their Solar Sources" with Dr. Hu as the lead author, followed by Dr. Jiong Qiu at Montana State University, and CSPAR colleagues B. Dasgupta, A. Khare, and G.M. Webb, as co-authors.

Kim, T. K., N. V. Pogorelov, S. N. Borovikov, K. Hayashi, B. V. Jackson, M. Tokumaru, and H.-S. Yu (2014), Modeling the Global Heliosphere Using IPS-derived Time-dependent Boundary Conditions, in Outstanding Problems in Heliophysics: From Coronal Heating to the Edge of the Heliosphere, Astronomical Society of the Pacific Conference Series, vol. 484, edited by Q. Hu and G. P. Zank (San Francisco, CA: ASP), pp. 92–98.

A SOLAR TYPE II RADIO BURST FROM CORONAL MASS EJECTION–CORONAL RAY INTERACTION: SIMULTANEOUS RADIO AND EXTREME ULTRAVIOLET IMAGING, Yao Chen, Guohui Du, Li Feng, Shiwei Feng, Xiangliang Kong, Fan Guo, Bing Wang, and Gang Li, ApJ, 787, 59, 2014

Zhang, M., Zuo, P., Pogorelov, N.V., Heliospheric Influence on the Anisotropy of TeV Cosmic Rays, Astrophys. J., 790, 5, 2014

Zhang, Bin-Bin; Zhang, Bing; Murase, Kohta; Connaughton, Valerie and Briggs, Michael S., HOW LONG DOES A BURST BURST?, 2014,The Astrophysical Journal, Volume 787, 66. http://iopscience.iop.org/0004-637X/787/1/66/