University of Wyoming
Department of Physics & Astronomy

January 2015

News from the High Plains

Spring 2014 Graduates

Fall 2014 Graduate

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Greetings Alumni & Friends,

Several major projects were in play over the past 12 months. The planetarium re-opened in November 2014 after undergoing a complete overhaul. Thanks to nearly $1.6M in private and state contributions, it is now know as the Harry C. Vaughn University of Wyoming Planetarium. The facility now sports full-dome capabilities including a 4.5M pixel digital projection system. The seating, lighting, audio, dome, and the lobby area were all upgraded as well. The bulk of our efforts continue to be focused on visiting school groups, but we still offer Friday evening shows for the public.

The $55M Michael B. Enzi STEM Facility is slated to open for the Fall 2015 semester. The first floor is dedicated to teaching undergraduates in our introductory physics and astronomy lab courses; the second and third floors are for teaching introductory biology and chemistry labs, respectively. We were fortunate to carve out a large, special space for teaching Studio Physics whereby lecture, lab, and discussion are integrated into a single experience.

In other major news, in response to a request from the Wyoming Legislature, we helped craft plans for a $200M Science Initiative that would transform the teaching and research within physics, chemistry, and biology. The Initiative would include a new building for carrying out interdisciplinary imaging science and active learning classrooms, among other features. In addition, there would be significant new funding for supporting student and faculty research. The Governor enthusiastically agreed with our vision and recommended fully funding the initiative. We eagerly await the response from the state legislature. A special thanks goes out to Lowell Burnett (Ph.D. 1970) who both helped with the planning and who recently established a graduate fellowship in physics!

Our student enrollment has held steady this year at 76 undergraduate majors plus 37 graduate students. As you are surely aware, the majority of our graduates eventually head off to careers outside of academia. Please let us know if you are interested in coming to campus to speak with our students about your career path. We are also particularly interested in placing our majors in summertime internships, as they can be absolutely crucial in informing our students in their career decision-making process -- let us know if you have such opportunities at your workplace.

We are in the process of converting to an all-electronic newsletter delivery, so please shoot us your permanent email address if possible (physics@uwyo.edu).

All the best,
Danny Dale
Department Head

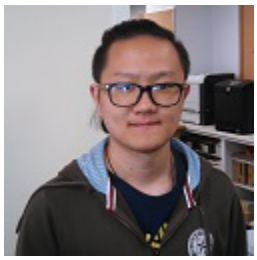
PHYS 5840 EXPERIMENTAL METHODS

Graduate and under-graduate students are testing a cryostat they built in the lab-section of a solid state physics course. Construction criteria included the maintenance of a 10-3 vacuum for more than five minutes in an outer shielding chamber and the reaching of nitrogen boiling temperature in the sample chamber. In that environment, the measurement of a physical property, like electrical resistance, had to be demonstrated. The students manufactured all construction pieces, O-ring joints, and electrical feed-through from scrap parts in the mechanical workshop. The parts were welded and brazed by the students to form the final device.

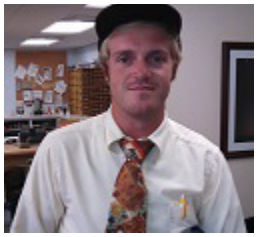
Planetarium Director Travis Laurance sits at the helm of the new digital planetarium, and demonstrates a fly-by of the Milky Way galaxy.

We previously relied on a mechanical starball -- simply a light bulb inside a sphere that had holes drilled all around it. The locations of these holes mimicked the distribution of the stars in the night sky. We could show visitors what the night sky would look like at different locations on Earth, and at different times. With our new system we can easily fly to different locations throughout the Universe, and more importantly, more effectively teach science. It is incredibly easier to teach astronomy concepts that are rooted in a three-dimensional foundation when you can take your audience off of Planet Earth and thus not be limited to merely a 2D view of the sky.

This year we welcomed 5 new grad students and a postdoc, from both near and far.



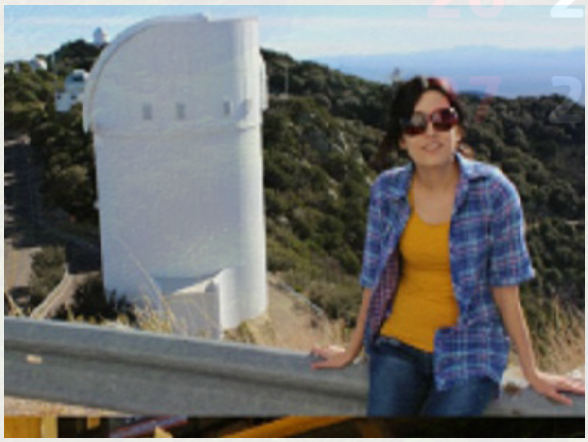
(pictured from left to right - top)
Aaron Wang - Nanjing U., China
Will Chick - U. Minnesota
Henry Wladkowski - U. Rhode Island



(pictured from left to right-bottom)
Josh Heiner - BYU Idaho
Uppalaiah Erugu - U. Alabama
Joe Findlay - U. Durham

GRADUATE STUDENT PROFILES

Sarah Eftekharzadeh



Quasars are more abundant between redshift 2 and 3 which means something triggers them to shine at this epoch. But because it's hard to separate stars from quasars at this redshift range, there hasn't been many observational data to study quasars at this epoch. I measure the correlation length, bias of quasars relative to dark matter and average dark matter halo mass of quasars at the peak of quasar activity. I measure clustering of quasars by counting the number of quasar pairs at bins of distance and compare that to a neutral field of randomly distributed objects. Then I use analytical models to estimate the necessary mass for dark matter halos around quasars to get the clustering signal that we observe.

Shawn Staudaher

Simulations of spiral galaxy formation predict that the primary component of spiral galaxies, the disk, should be surrounded by a diffuse halo of stars. These halos come from smaller galaxies that have been ripped apart by the larger spiral galaxy. However, evidence for such a halo has been scant; these halos have been observed in the Milky Way and in just a handful of other galaxies. I am part of a team that has used the Spitzer Space Telescope to image 100 nearby galaxies. The data allow us to measure the mass of the stellar halo and compare that to the mass of the disk component of the galaxy. From there we can estimate how many smaller galaxies have been destroyed by the larger, which tells us about how galaxies formed in the early Universe. We can compare our results to the results from simulations to determine if the simulations accurately model what the Universe is like.

Andy Yost

My current research centers around Ultra High Vacuum (UHV) and scanning tunneling microscopy studies. I am specifically interested in the spatial evolution of energy bands across interfaces of materials in semiconductors. My research includes studies pertaining to organic molecules on graphene, novel graphene fabrication techniques, quantum dot sensitized solar cells, dye sensitized solar cells, and perovskite structured semiconductors and their applications in solar cell devices. I am also very interested in xray UHV experiments which I am in the process of pursuing at Argonne National Laboratory.

Gaurab Rimal

I work on Lead Sulfide (PbS) Quantum Dots. My work concerns primarily with the synthesis and characterization of these nanoparticles. These are mainly used in photovoltaic research for studying quantum dot sensitized solar cells. I also use PbS based diluted magnetic semiconductor (DMS) for studying changes in electronic and magnetic properties associated with doping. These materials find applications ranging from solar cells to optoelectronic devices such as photodiodes and LEDs.

ALUMNI NEWS

Sey Hwang (M.S. 2005) - Currently, I am in a Ph.D. program in Electrical Engineering at the University of Minnesota - Twin Cities. Yep, I changed my major from astrophysics to EE. I am working on semiconductor material and devices, particularly in photovoltaics and energy harvest.

Greg Sloan (Ph.D. 1992) - Senior Research Associate, Center for Radiophysics and Space Research, 2010-present. My current research focuses on studying large populations of evolved stars in clusters and nearby galaxies to prepare for the launch of the James Webb Space Telescope. (http://isc.astro.cornell.edu/~sloan/research/experience.html)

Andy Monson (Ph.D. 2009) - Instrumentation Science Post-Doc: Currently, I am working on the Four-Star project for the 6.5m Magellan Telescope at the Las Campanas Observatories in Chile.

Jeff Sudol (Ph.D. 2000) I am a tenured, assistant professor in the Department of Physics at West Chester University. I am currently modeling the dynamical evolution of the HR 8799 planetary system.

William (Bill) Ketzeback (M.S. 1996) - Chief Telescope Engineer on the Astrophysical Research Consortium's 3.5-m and 0.5-m Telescopes at Apache Point Observatory in Sunspot NM. He also leads the spectroscopic study of Epsilon Aurigae using APO's ARCES and Triplespec spectrographs. http://users.apo.nmsu.edu/~bketzeba/

Thank you to our recent donors! David & Dianne Bertsch, Wilbur & Margaret Bunch, Burnett Family Charitable, Daniel & Kimberly Dale, Cheryl Dellai, Robert Ellefson, Terrence & Margaret Flower, Lowell Hill, W. F. & Janet Klawiter, Chip & Carol Kobulnicky, Leslie Fung & Michael Johnson, Roland Lamberson, W. David & Lois Larmouth, Terry Scott & Jean Meyer-Scott, D. Mark Manley & Mari Takai-Manley, Paul M. Miller, William Roberts, Jerry Tastad, Windy Ridge Foundation.
If you would like to donate please visit uwyo.edu/foundation.

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