ASTROPHYSICAL AND PLANETARY SCIENCES

Fall 2014 University of Colorado Boulder

From the Desk of the Chair

APS Alumni, Colleagues and Friends,

This is my first letter to you as incoming Chair of APS. I salute my predecessor, Mitch Begelman, who was Chair for the last six years. Mitch presided over an expansion of our astronomy and astrophysics majors program into one of the largest in the country, graduating about 25 majors per year.

One of the reasons our major is popular is that we offer two tracks: an astrophysics track and an astronomy track. The astrophysics track is heavy on physics and mathematics, and is aimed at students who hope to become professional scientists. But we also offer an astronomy track aimed at students who do not plan to be scientists as such, but who for one reason or another are excited by astronomy and science in general.

At CU-Boulder, we believe that scientific thought is not confined to what scientists do for a living, but rather rational, evidence-based argument and decision-making. The students who go through our program have the opportunity to acquire some highly marketable skills, such as computing, data analysis, image processing, and statistics. But most importantly, they learn to think, communicate and contribute to all walks of life.

Meanwhile, it is a pleasure to welcome our new faculty member, Ben Brown, more about whom you can read in this newsletter. Ben was a former APS graduate student, and we are thrilled to have him on board. Also showcased in this issue is Julie Comerford, who joined our faculty last year, in Fall 2013.

I am especially excited and optimistic about the now completed upgrade of the Fiske planetarium to a state-of-the-art 8000 x 8000 pixel digital dome, along with the hiring of a new Educational Video Producer, Thor Metzinger, formerly on the faculty at the Art Institute of Colorado. The Fiske planetarium operates an unusual business model: its primary mission is the education of CU students, which includes not only those who attend classes at Fiske, but also the 25 or so students whom Fiske employs each year. Fiske does serve many thousands of school-children every semester, but its priority is CU students. Classes at Fiske are free to CU students and the professors who wish to use Fiske. In return, Fiske wins the enthusiastic services of professors who often channel parts of their grants to Fiske to create educational shows for local and national consumption by college level students.

We hope you will stay in touch and invite you to visit and witness the exciting happenings at APS yourself! If you have any further interest in the department please do not hesitate to contact us.

Andrew Hamilton
Chair, APS
Professor of Astrophysics and Physics
Fellow of JILA

Congratulations to our 2013-2014 Graduates!

Bachelor of Arts

George Booth
James Brobst
Emma Bunnell
Nickolas Conant
Julie Davis
Jeremy Emmett
Brett Feldman
Raymon Furth
Erin George
Benjamin Gerard
Akeem Huggins
Lauren Kidd
Gahye Kim
Christopher McCabe
Sean McGill
Eric Morrison
Bryan Nagel
Karyn Perdue
Clemente Plantureux
Rachel Plesha
Katherine Shanahan
Sydni Smith
Michael Topping
Andrew Trujillo

Doctor of Philosophy

Jason Henning
Julia Kamenetzky
Susanna Kohler

Recent Undergraduate Student Awards

Ryan Dewey	Goldwater Scholarship
Logan Dougherty	Wesley Undergraduate Scholarship
John Noonan	CU Student of the Year
Allyssa Riley	Wesley Undergraduate Scholarship

Recent Graduate Student Awards

Hilary Egan	DOE Computational Science Graduate Fellowship
Jordan Mirocha	NASA Earth and Space Sciences Fellowship
Greg Salvenson	NASA Earth and Space Sciences Fellowship
Andrew Sturner	George Ellery Hale Graduate Fellowship
Evan Tilton	NASA Earth and Space Sciences Fellowship

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Other recent departmental awards

Dan Baker	American Astronomical Society Kavli Prize
Mitch Begelman	College Scholar Award
Jack Burns	Elected Vice President of the American Astronomical Society
Jim Green	College Scholar Award
Nils Halverson	Award of Excellence as an Outstanding Teacher for Technology in Teaching

New Faculty of APS

Dr. Ben Brown

After an extensive search, Dr. Benjamin Brown accepted CU's offer to fill the APS (Astrophysical & Planetary Sciences) solar physics faculty position.

Ben is no stranger to CU-Boulder, having earned his M.S. and Ph.D. in 2009 in the APS Department working with Juri Toomre. His research focus has been in dynamical processes occurring in stellar interiors and in how stars generate large-scale magnetic fields in their convection zones. Before accepting his new position at CU, Ben was with the University of Wisconsin in Madison. Committee chair Mark Rast is very pleased with this outstanding conclusion to a very thorough search, noting that Ben is a tremendous addition to the APS Department! Assistant Professor Brown began this fall as a tenure-track faculty member. The APS and LASP solar communities are excited about future collaborations with Ben.

This position was the first of several aimed to strengthen academic and research ties to the National Solar Observatory's (NSO) Daniel K. Inouye Solar Telescope (DKIST) and synoptic programs, as part of CU's bid to bring the NSO headquarter to the Boulder campus. The DKIST will achieve unprecedented high-resolution observations of solar photospheric and coronal magnetic fields, and CU-Boulder and the local research institutions are thrilled to be associated with future NSO activities.

Dr. Julie Comerford

Dr. Julie Comerford received her Ph.D. from the University of California, Berkeley in 2009 and was an NSF postdoctoral fellow at the University of Texas, Austin before joining CU in Fall 2013. She works on observations of supermassive black holes; unlike the more common stellar-mass black holes, supermassive black holes are a million to a billion times the mass of the Sun and lie at the hearts of most galaxies.

Along with her team at CU, Julie studies what happens to these supermassive black holes when two galaxies merge. The black holes form a pair and orbit ever closer together until they eventually merge. Julie's work has been featured in news outlets such as Wired and U.S. News and World Report, which have referred to these merging pairs of black holes as "waltzing black holes."

Julie is leading the first systematic search for these waltzing black holes, which has advanced the number of known black hole pairs from a few curiosities to a statistically significant sample . She and her team use a wide variety of different wavelength regimes and telescopes to discover and characterize the black hole pairs: radio (using the Very Large Array in New Mexico), near-infrared (using the Keck telescopes in Hawaii), optical (using the Hubble Space Telescope and Apache Point Observatory in New Mexico), and X-ray (using the Chandra X-ray Observatory).

The black hole pairs discovered with these approaches are valuable tracers of the evolution of galaxies with time. For example, they enable Julie to study how much black holes grow in mass by accreting gas from the merging galaxies.

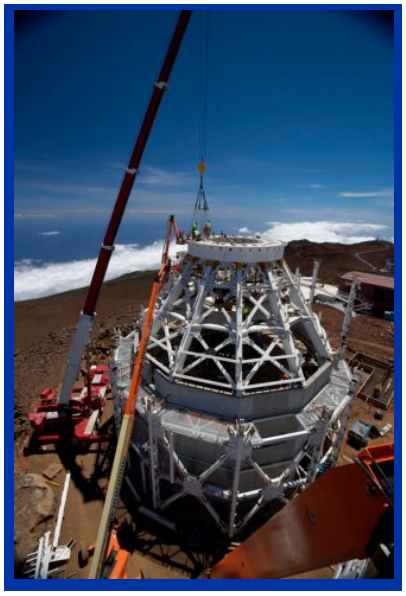
Susanna Kohler is the winner of the 2013-2014 Ray Mace Smith Graduate Fellowship, and she will be defending a unique two-component Ph.D. thesis this semester. On the astrophysics side, Susanna has been working with Professor Mitch Begelman, studying the extremely relativistic jets that are emitted from the centers of active galaxies. Her work involves modeling these jets to better understand how they are accelerated and what happens when they slam into the gas and dust around them. On the astronomy education side, Susanna has been working with Dr. Seth Hornstein to study the effects of integrating science communication training into undergraduate and graduate astronomy classes. After graduating, Susanna plans to continue studying ways to better prepare future scientists to communicate their work with the public. In her free time, Susanna can usually be found on the dance floor — she actively competes in and teaches ballroom dance!

NSO Headquarters Moves to Boulder

The move of the National Solar Observatory (NSO) headquarters to CU's East Campus is in full swing. Fourteen of the ~70 member staff that will relocate to Boulder have arrived and are sharing space with LASP scientist on the first floor of the Space Science Building. The remaining NSO staff will start arriving next summer when dedicated NSO space on the third floor of the SPSC building becomes available.

The NSO is the premier ground-based solar-observing institution in the United States, and along with its ongoing synoptic program is currently building the worlds largest solar telescope, the 4-meter Daniel K. Inouye Solar Telescope (DKIST) on Haleakala, Maui. The telescope will observe the Sun with an unprecedented 0.025" diffraction limit (visible), yielding observations of tens of kilometers resolution on the Sun and making measurements of the magnetic field strength and direction in the Sun's photosphere, chromosphere, and corona. First light is expected in 2018 with all instruments fully commissioned and operational by summer of 2019.

To support these tremendous new scientific activities with the education of the next generation of solar and space physicists, the University of Colorado Boulder has pledged a series of faculty appointments and postdoctoral and graduate student fellowships. Four graduate students are currently being supported, and joining the APS department this year is the first postdoctoral fellow and two new tenure track faculty members, Dr. Ben Brown (previously of University of Wisconsin, Madison and Kavli Institute for Theoretical Physics, University of California, Santa Barbara) and Dr. Steven Cranmer (previously of Harvard–Smithsonian Center for Astrophysics). Both Ben's and Steve's work will help us come to a better understanding of how the Sun influences the sometimes dangerous space environment above the Earth.



The DKIST currently being built in Haleakala, Maui.

The APS department welcomes the NSO to Boulder and Ben and Steve into the department. We look forward to a bright future!

25th Anniversary of Voyager at Neptune just as New Horizons Passes Neptune's Orbit

On August 25th 1989, the Voyager 2 spacecraft made a flyby of Neptune – the 4th and last planetary flyby of the pioneering Voyager twins. Voyager 2 took pictures of Neptune's dramatic dark spot, imaged the bizarre geysers erupting from Triton's icy surface and mapped out Neptune's highly tilted magnetic field. It just so happens that 25 years later – to the day – NASA's New Horizons spacecraft passed Neptune's orbit on the last leg of its trip to Pluto. Launched on January 19, 2006, the New Horizons spacecraft has spent the past 8.5 years traveling out to Pluto – gaining a gravity kick from Jupiter in 2007. On July 14th next year, New Horizons will fly past Pluto at a distance 32 times farther from the Sun than the Earth. The New Horizons cameras will click images of Pluto (with better resolution than Hubble) for several months beforehand but the few hours of closest approach will provide the best data on this unknown world and its five (at last count) moons.

The Principal Investigator of the New Horizons mission, Alan Stern, obtained his Ph.D. in Astrophysics from CU in 1989, just as Voyager was approaching Neptune. He started organizing meetings to discuss Pluto science and promoted a mission to explore what rapidly changed from "the last planet" to the "first of a vast, new territory." This was before even the second Kuiper Belt Object was discovered in 1992, and now there are thousands! Fran Bagenal, who had recently joined the APS faculty in 1989, brought her experience as a Voyager Co-I to CU classrooms. Around the same time, she was pulled by Alan Stern into the web of curiosity about Pluto and ended up as the theme lead of New Horizons' two particle instruments. Breaking ground in deep space exploration, CU students (supervised by Physics Dept's Mihaly Horanyi) designed, built and now operate from LASP the Student Dust Collector on New Horizons – basically a piezoelectric film that detects the small fragments produced in collisions of outer-solar system objects.

APS' Nick Schneider (middle) pointing out Neptune at the JPL mission board during the Voyager 2 flyby (Aug 28, 1989), with Dave Grinspoon (left, now at Planetary Science Institute and APS Adjunct) and John Spencer (right, now at SWRI, Boulder).

This fall as CU students swarm across campus for their first classes, think of the first glimpses of different worlds that the Voyagers gave us and celebrate the continued exploration of the outer reaches of the solar system by New Horizons.

APS at the Vatican

In June 2014, Prof. John Stocke (APS and CASA) was the Chair of the Faculty for the 14th Vatican Observatory Summer School (VOSS) in Observational Astronomy and Astrophysics held in the Papal Summer Gardens of Castel Gandolfo, outside Rome. This year's topic was "Galaxies, Near and Far, Young and Old."

The VOSS is a non-denominational, international school which has won the prestigious service award from the American Astronomical Society (AAS) in 2009 for "… the diversity and scientific richness it has brought to the scientific community." This year, twenty-five university and post-graduate students, from twenty-two nations, spent four weeks at the Vatican Observatory attending lectures and working on projects related to their research. These students were chosen from more than a hundred applicants as those most likely to pursue an active career in astronomy. The final enrollment included participants from six continents, and an almost even split of 13 men, 12 women.

The 2014 Summer School class of faculty, students and observatory staff during a tour of the Papal Gardens, Castel Gandolfo, Italy.

It was a wonderful time, not only due to the warm hospitality provided by the Jesuits of the Vatican Observatory and the wonderfully historical environment of the Alban Hills just south of Rome, but also the excitement provided by the cutting-edge research topics presented and the culturally-rich and diverse student body.

The entire faculty and Observatory staff marveled at how quickly and congenially the students, from Iran, Argentina, Portugal, Burkina Faso, the USA, Indonesia, Turkey and Australia, to name a few, bonded with each other. "It was an honor to serve the international community by teaching these incredible students at the VOSS," said Dr. Stocke. "Now if we can only get the leaders of these and other countries to act as warmly and respectfully as these students did with each other, real progress towards a better world can be made. It was an experience that we all, myself and other faculty, Vatican Observatory staff, and these wonderful students, will never forget. We have made life-long friendships."

You can make a gift to APS easily through the CU Foundation at http://aps.colorado.edu/giving.html or the APS website at http://aps.colorado.edu/. If you have questions or need further assistance, contact Barbara Perin, Sr. Director of Development, University of Colorado Foundation, at barb.perin@colorado.edu or (303) 541-1447.

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