

# UNIVERSITY OF WYOMING

Greetings Alumni and Friends of UWyo Physics & Astronomy!

The most exciting recent news is that the department continues to grow, with our current expansion into condensed matter physics being the most prominent growth area. We were fortunate to lure away Professor Jinke Tang from the University of New Orleans, recruit Assistant Professor Wenyong Wang from the National Institute of Technology and Standards, and to receive the go-ahead to search for another condensed matter physicist this year; our next hire will be a computational condensed matter physicist, and we expect s/he will take great advantage of the next generation supercomputer (planned for 2010) that UWyo will share with the National Center for Atmospheric Research.

Wyoming's economy has been booming recently, and the impact here is palpable. There is a new campus conference center, a new School of Energy Resources, a new technology-oriented business incubator, and several other new and refurbished buildings. The generous Hathaway Scholarship program has made a definite impact on student recruiting. We have 50 undergraduate majors, including several McNair scholars and a Goldwater Scholarship recipient. We have 14 graduate students researching a large range of topics, from magnetic materials to black holes. Our first crop of Astrophysics Ph.D. students from the reprised graduate program will be finishing this year, and we wish them the best of luck as they move into the next stage of their careers. Our observatory is receiving a major control systems upgrade, and we are pursuing efforts to lead a new campus-wide materials lab. Finally, we also continue important outreach programs to the greater Wyoming and U.S. communities through programs such as AstroCamp and Launch Pad.

This truly is a time of growth, particularly for our program. As a result, we have developed a whole new outlook over the past few years. A lot of hard work by everyone has gone into the rebuilding of the program, and we especially appreciate the persistent efforts of Paul Johnson, who recently stepped down as department head. Thanks Paul!

More details are found in the following  
One new feature is updates from selected alumni. Email us at [physics@uwyo.edu](mailto:physics@uwyo.edu) if you would like to include an update in future newsletters, or if you simply want to send us a blurb on your current position so that we can update our alumni webpage. If you are ever in the area, please stop by -- we love seeing alumni and hearing stories from the good ol' days.

All the best,  
Danny Dale  
Department Head



Grad Students Andy Monson & Stevi Fawcett

Physics & Astronomy News

# Department News

## Alumni Updates

**Danny Gibbs** is currently working at the Harvard-Smithsonian Center for Astrophysics in the High Energy Astrophysics Division. I am currently working as an Information Technology Specialist with emphasis in Application Software. The software I work on supports the Chandra X-Ray Observatory. The current project that I have been participating in is called the Chandra Source Catalog ([cxc.harvard.edu/csc/](http://cxc.harvard.edu/csc/)). This has been a massive undertaking that will be the definitive catalog of all X-ray sources detected by the Chandra X-Ray Observatory. This has proved to be an excellent job and excellent environment to contribute to the knowledge of X-ray astronomy and science in general. If you are interested in a career here please see: [cfa-www.harvard.edu/hr/postings/](http://cfa-www.harvard.edu/hr/postings/) I can be reached via email: [dgibbs@head.cfa.harvard.edu](mailto:dgibbs@head.cfa.harvard.edu).

**Bill Ketzeback** graduated with an M.S. in Physics the summer of 1996. Following his interest in observational astronomy and with valuable experience gained at both WIRO and RBO, Bill has been a key support staff member at a variety of observatories since he left Wyoming. He has worked at the Very Large Array as an Array Operator, as an Optical Technician for US Naval Observatory on the Navy Prototype Optical Interferometer, and as an R&D Laser Metrology Engineer for Zygo Corporation. Bill currently works as an Observing Specialist at the Apache Point Observatory on the Astrophysical Research Consortium 3.5 meter Telescope. Besides his regular duties as a night assistant, Bill has contributed to a number of science, instrumentation and engineering projects in the six years since he has been at the observatory. His current research interest involves improving image quality through reduction of resonant frequency sources produced in the telescope. He has been using a high speed imager for the past 3 years to monitor frequency sources in the zero to fifty hertz range. The engineering staff and Bill then work to isolate, reduce or eliminate these noise sources. Bill lives in Carlsbad, NM with his wife, Lisa, and their three children, Ben, 19, Keegan, 17, and Maggie, age 2.

## Society of Physics Students

In 2006 SPS@Wyoming re-established itself officially as a local chapter of the national Society of Physics Students, taking a casual get together to a new level. Since then SPS@Wyoming has been bustling with activity. Apart from the social events (casual meetings, hiking, movie nights, and establishing an undergraduate common), SPS has proudly organized regular field trips and faculty seminars.

On average two field trips to professional and research facilities within 150 miles are organized per term. Among the visited facilities, the NREL national research center in Golden, CO and the Western Research Institute in Laramie stand out. Other field trips included the national APS spring meeting in Denver in 2007 and a visit to a hospital in Cheyenne to see a radiation physicist at work and to learn about career requirements and opportunities.

SPS organizes a lecture series where local faculty take the opportunity to present their research at a level fit for undergraduate student understanding. The seminars are well attended and have been successful in drawing in a diverse audience, from high school students to postdocs.



## Rebka Symposium

The department of Physics & Astronomy held a two-day symposium in honor of Professor Emeritus Glen Rebka. Many alumni and form faculty gave presentations on their research. The banquet included reminiscing by Dean Walter and former heads Tom Grandy, Lee Schick, Dave Hofmann and Paul Johnson. One of the conference highlights was a superb talk by Kip Thorne that included the impact of the famous Pound-Rebka experiment on Einstein's theory of relativity.

# Condensed Matter Physics Grows

The condensed matter physics program has been the focus of our recent growth. With the addition of Jinke Tang last year, Wenyong Wang this fall, and a computational physicist next fall, we are building a nationally recognized program. The computational physicist will not only interact constructively with the existing theorist and experimentalists, he/she will conduct research and teaching using the next generation supercomputer that UWyo will share with the National Center for Atmospheric Research.

The need for an excellent PhD program in condensed matter physics at UWyo is particularly acute for the state of Wyoming, which positions itself as a leader in energy and related science and technology, where condensed matter and materials physics play a critical role. Indeed, the expertise of the condensed matter physics faculty here at UWyo builds coherently around energy and electronic/magnetic materials, as described in the faculty bios. We look forward to serving and working with the students of Wyoming and anticipate that more promising students, nationally and internationally, will be attracted to the program.

## Wyoming NASA Space Grant Consortium

Wyoming NASA Space Grant Consortium sponsors both educational and research programs in the state of Wyoming in support of NASA's missions. We sponsor a number of scholarship, fellowship, and internship programs for undergraduate and graduate students enrolled at all Wyoming colleges. We also fund research initiation and education enhancement grants for faculty at any Wyoming college. Our two largest K-12 programs include the Women In Science Conferences, and the Space Trunk Educational Resources for Teachers. Women In Science is a daylong event held at UW and Central Wyoming College. During these events, young women in 7<sup>th</sup>-12<sup>th</sup> grade get to experience first-hand careers in science and math fields through interactive workshops, and get to meet professional women in those fields. The Space Trunk Program loans "trunks" of educational materials and lab equipment free of cost to educators around the state. The Space Trunk program currently covers the Planets and Solar System, Rockets, and Telescopes and Optics. Find us at [wyomingspacegrant.uwyo.edu/](http://wyomingspacegrant.uwyo.edu/) or [wsgc@uwyo.edu](mailto:wsgc@uwyo.edu).



## AstroCamp

Wyoming AstroCamp is a week-long living/learning community of practicing astronomers, school teachers, planetarium directors, graduate and undergraduate students, and middle/junior high school students who camp under the stars, observe at the telescope, learn in the classroom, and become generally engaged in the process of science. The WIRO visit is usually one of the highlights of Camp (along with scuba diving satellite assembly!). We have had multiple former AstroCamp participants enroll as freshman physics majors at UW, enticed in part, by their experience at AstroCamp. Chip Kobulnicky and Danny Dale have led AstroCamp since its inception in 2003, funding the venture using portions of their NASA and NSF grants that are earmarked for outreach.



UW Photo Service





## WIRO Celebrated 30th Anniversary

The University of Wyoming celebrated the 30th anniversary of its telescope on Jelm Mountain Thursday, October 18th, 2007. The UW Department of Physics hosted a free public presentation. Bob Gehrz and John Hackwell teamed to lead the construction efforts in the mid 1970's while faculty at UW, and Bob was our featured speaker for this celebration. The 2.3 Meter telescope, fully owned and operated by the university, is housed at the Wyoming Infrared Observatory (WIRO) about 35 miles west of Laramie. The University of Wyoming's 2.3 m telescope is receiving a makeover for its 30th birthday. Using a \$400,000 grant from the National Science Foundation with PI Chip Kobulnicky, we are replacing aging hardware that controls the 2.3-meter telescope, which is

housed at the Wyoming Infrared Observatory (WIRO) on Mt. Jelm. The UW Research Office is contributing an additional \$100,000. Vertex RSI, a division of General Dynamics, has completed the design and fabrication of the new control system over the last 9 months, and installation is scheduled for November 2008. The project is being overseeing by WIRO engineer James Weger, observatory staff Jerry Bucher, and Prof. Chip Kobulnicky.

## Launch Pad Astronomy Workshop

Fifteen science fiction writers participated in the second annual Launch Pad Astronomy Workshop, a NASA-funded educational program for established writers, July 30-Aug 6, 2008 at the University of Wyoming in Laramie. Workshop director, astronomer, and SF writer Mike Brotherton, writer and amateur astronomer Jerry Olton, and secondary education expert Jim Verley spent a week covering a myriad of astronomical topics ranging from stellar evolution and cosmology to back-of-the-envelope orbit calculations for writers. Visits to Red Buttes Observatory and the Wyoming Infrared Observatory capped a fascinating and enjoyable week for the writers in attendance. It was all part of a NASA program seeking to improve science literacy in the public by first improving science literacy among those who write stories that the public reads. A third workshop is planned for the summer of 2009. More information is at [www.launchpadworkshop.org](http://www.launchpadworkshop.org).



## Honor Roll of Recent Donors

Your generous donations allow us to continue to offer scholarships and research opportunities for our students. A special thanks goes to Wilbur and Margaret Bunch, who have endowed a fellowship for physics graduate students. The state match brings the total endowment for this fellowship to nearly \$330,000. Our recent donors include:

Brenae Bailey  
David & Dianne Bertsch  
Alfred Brophy  
Wilbur & Margaret Bunch  
Uwe & Jane Dahl  
Danny & Kim Dale  
Alena Davenport  
Kimberly Dupczak  
David & Jean Earnshaw  
John Eastwood &  
Kathleen DeGioia Eastwood

Robert Ellefson  
Terrence & Margaret Flower  
Rajib Ganguly & Michele Stark  
Danny & Deborah Gibbs  
Keith Goldman  
Craig Gullixson  
Paul Henry  
Robert & Julie Hermann  
Frank Jones & Sara Kortum  
W.F. & Janet Klawiter  
Chip & Carol Kobulnicky

Kenneth & Iris McCleary  
John & Evelyn Morrison  
Earle Rappaport  
William Roberts  
Samuel Schrinar  
Terry Scott & Jean Meyer-Scott  
Jinke Tang  
Ronald & Margaret Wilson  
William & Margaret Zakis

If you would like to contribute, please visit <https://uwsecureweb.uwyo.edu/giveonline>.

## Student News

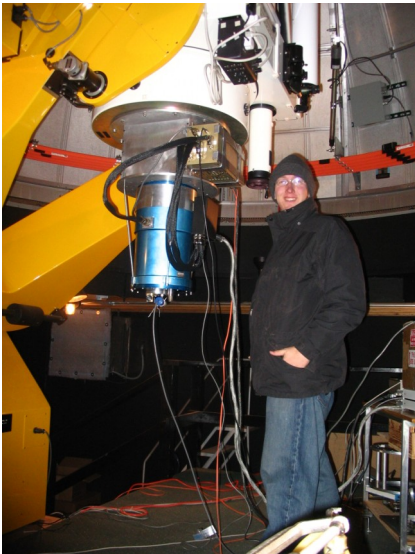
### Graduate Students & Their Hometowns

Mike Alexander	Woodbine, MD
Carlos Vargas Alvarez	Arecibo, Puerto Rico
Anirban Bhattacharjee	Calcutta, India
Sabrina Cales	Riverside, CA
Corin Chepko	Grand Junction, CO
Mike DiPompeo	Glendale Heights, IL
Dan Kiminki	Moreno Valley, CA
Pan Liu	Taian, Shandong, China
Andy Monson	Mankato, MN
Carolynn Moore	Sioux Falls, SD
Chris Rodgers	Casper, WY
Jessie Runnoe	Oakland, CA
Brian Uzpen	Gem Lake, MN
Liang Xia	Shanghai, China

### Graduation in the Arena Auditorium



### Graduate Student Andy Monson



Under the guidance of Mike Pierce, Monson has successfully built a test version of a 7-foot-long, 1,000-pound infrared camera that will study the brightest stars in the night sky, study the birth of stars, and help calibrate the scale of the universe. "When you look into the sky and you can't see anything, optically, that doesn't mean there isn't anything there," the third-year UW graduate student from Mankato, Minnesota, says. "You're only seeing the tip of the iceberg without infrared." To determine how to build the test camera, Monson had to understand what the large-scale camera would include. The design of the larger camera dictated the construction of the smaller one. Monson designed much of the software needed to control and monitor the temperature inside the 2-foot-long, 70-pound test camera. "It's been a great opportunity for me to learn everything about a camera. Most projects like this would usually entail many people, graduate students, undergraduates, postdocs, just a huge assortment of people with different backgrounds and technical skills," Monson says. "Being at a smaller university like this has given me the opportunity and responsibility to put this together largely by myself. That breadth of experience makes Monson a highly desirable candidate for jobs, and that explains the close attention he

and his work are getting from prospective employers. Adapted from UWYO Magazine

### Goldwater Winner

Astrophysics major Megan Bagley won a Goldwater Scholarship, which covers tuition, fees, books and room and board up to \$7,500 per year. The Goldwater Scholarship encourages students to pursue careers in the fields of math, science and engineering and is widely regarded as the premier undergraduate award of its type in these fields.

Megan plans to pursue a research career and hopes to work with NASA or as a university professor. "She seems to have a real passion for learning and I have no doubt she'll go on to graduate school, complete her doctorate degree, and find a position that interests her," says Chip Kobulnicky. "She's certainly a capable and motivated young woman and an example of somebody who's really making the most of the opportunities available to her here at the University of Wyoming." Since the first semester of her freshman year, Bagley has been working under Kobulnicky's supervision on a research project on galaxy evolution. Bagley is a member of the University Honors Program, the Cardinal Key National Honor Society, and the UW chapter of Delta Delta Delta. She was also chosen as one of two featured student speakers at the A&S Honors Convocation during October 2008. Adapted from UW News Services



UW Photo Service

# Physics & Astronomy Faculty

## Richard Barrans

Rich Barrans received his Ph.D. in chemistry from the California Institute of Technology, where he studied molecular recognition processes. He did postdoctoral work at the Los Alamos National Laboratory, followed by a stint as a staff scientist at Argonne National Laboratory. From there, he joined the PG Research Foundation, Inc., overseeing chemical research projects at several universities. In 2003, he abandoned employment in favor of pursuing an education degree and teaching certification. At the completion of his studies, which included a student-teaching stint at an urban high school in Cleveland, Ohio, he received his Master of Education degree from John Carroll University in 2004. Barrans has been teaching at UW since 2005. His fondest dream is to share his love of science with students.

## Michael Brotherton

Mike Brotherton came to UW in 2002 after receiving his Ph.D. at the University of Texas in Austin and doing postdoctoral research at the Lawrence Livermore National Laboratory and Kitt Peak National Observatory. Brotherton's research seeks to improve our understanding of active galactic nuclei (AGN), their evolution, and their relationship to their host galaxies. His work is primarily observational, mostly optical and infrared spectroscopy, but also employs the Hubble Space Telescope, the Chandra X-ray Observatory, and other space-based telescopes. He investigates both large samples that enable the phenomenology to be explored for the entire AGN population, as well as individual objects of special interest that may more clearly reveal important physics because of their extreme nature. Brotherton also promotes physics and astronomy through his novels. His first book, *Star Dragon* (Tor, October 2003), features a voyage to the cataclysmic variable binary star system SS Cygni. His second novel, *Spider Star* (Tor, 2008), showcases a dark matter planet.

## Yuri Dahnovsky

Yuri Dahnovsky has been at UW since 2000 and earned his Ph.D. from the Russian Academy of Sciences. Dahnovsky's research in molecular wires and devices is to theoretically characterize sub-nano-electronic devices, such as the current-voltage characteristics of an organic molecule placed between two gold electrodes. Dahnovsky's also researches electron transfer in photosynthesis. He studies coherent electron oscillations in a vitally important photosynthetic electron transfer system. Despite strong coupling to the environment, the electron oscillates between two states. Dahnovsky plans detailed numerical and analytical calculations along with experimental investigations for specific systems. He continues to involve a number of undergraduates in his research, and a number of them are published.

## Danny Dale

Danny Dale has been at UW since 2001. Dale received his Ph.D. from Cornell University and did his postdoctoral work at Caltech. Dale researches the characteristics and evolution of star-forming galaxies in both relatively nearby and fairly distant galaxies. His ground-based observing program has taken him to Hawaii, California, Arizona, New Mexico, West Virginia, Wyoming, Puerto Rico, and Chile. He has used the *Infrared Space Observatory* and the *Spitzer Space Telescope*, and will use the upcoming *Herschel Space Observatory*, and in the process has developed a phenomenological model for the spectral energy distributions of star-forming galaxies.

Dale's research team is also in the midst of a multi-year program to track the evolution of the volume density of the cosmic star formation rate, funded by a CAREER grant from the NSF. This research involves high school science teachers, so they can convey to their students the excitement of astrophysics, and it involves middle and high school students from across Wyoming.

## Paul Johnson

Paul Johnson received his Ph.D. from the University of Washington. Subsequently he participated in post-doctoral fellowships at the Jet Propulsion Laboratory and the Royal Observatory Edinburgh, and joined the faculty at the University of Wyoming in 1981. His current research centers on developing new technologies for detecting pathogenic . He has developed a technology, Fountain Flow Cytometry, in which specific microorganisms in fluid samples are tagged with a fluorescent antibody and are then excited with an LED and the fluorescence imaged as they flow toward a digital camera. Target cells are identified with image recognition software to determine cell concentration in real time. Johnson has an ongoing collaboration with the Museum of Natural History in Paris where scientists have developed a genetically modified tadpoles which fluoresce in response to low levels of endocrine-disruptive pollutants, such as estrogen and metals, in water. Tadpoles represent the simplest biological model for humans that can easily be measured in sufficient numbers in a short period of time, while undergoing rapid physiological development. Johnson also directs the NASA Wyoming Space Grant Consortium and Wyoming NASA EPSCoR programs which are charged with development of science education and NASA-related research infrastructure in Wyoming.



## Henry Kobulnicky

Assistant professor Henry “Chip” Kobulnicky joined the faculty in 2002 after 5 years of postdoctoral research positions at the University of Wisconsin and the Lick Observatory at the University of California, Santa Cruz. He received his PhD in astrophysics in 1997 at the University of Minnesota and his B.S. in Physics & Astronomy in 1991 from the University of Iowa. Kobulnicky has used the world's largest telescopes, the twin 10 meter Keck telescopes, along with the Hubble Space Telescope to study the chemical compositions of galaxies two thirds of the way across the visible universe. More recently, he is part of an international team using NASA's Spitzer Space Telescope to survey our own Milky Way Galaxy at infrared wavelengths to identify new regions of star and planet formation. Chip, his wife Carol, who is on the Pharmacy faculty, and their two children enjoy biking and hiking in the great outdoor spaces and big sunny skies of Wyoming.

## Edward Koncel

Ed Koncel is an assistant lecturer in introductory and general physics at the UW. He received his B.S. from Portland State University and his M.S. and Ed.D. from UW. Throughout his graduate work he taught courses in Instructional Technology in the College of Education. From 1992–1999 he taught introductory mathematics courses for the Laramie County Community College – University of Wyoming co-operative mathematics program in Laramie. He currently teaches general introductory physics lecture, discussion and laboratory sections. Koncel has twice received the Cap and Gown Chapter of Mortar Board “Top Prof” award and several times was voted one of the College of Arts and Sciences “Top Teacher” awards by graduating students of the college. Other teaching honors include a “Thumbs Up” award from the College of Arts and Sciences Student Council in 2002 and recognition from the John P. “Jack” Ellbogen Center for Teaching and Learning in 2001 for creating a “...classroom climate that exemplifies thoughtfulness, mutual respect, and academic excellence.”

## Rudiger Michalak

Rudy Michalak has been at UWYO since 2004. Michalak received his PhD from RUB in Germany. Michalak's research studies include exotic superconductors, low-dimensional magnetic structures, energy-gap phenomena in strongly correlated electron systems, NMR spectroscopy and MRI imaging. He conducted his research in the UK, the USA, and Germany and maintains research contacts there and in New Zealand and Poland.

In 1997 Michalak and his co-workers were among the first who presented a phase diagram of high temperature superconductors based on the pseudo-gap phenomenology, which exhibits the now well-known parabolic dependence of the critical temperature on hole density and a fundamental divide between an over-doped and under-doped regime each with distinctive physical behavior. Michalak et al. were also among the very first to demonstrate d-wave based superconductivity. Since then phase diagrams of this type and d-wave scenarios of non-BCS superconductivity have become very popular, if not common-place.

## Michael Pierce

Mike Pierce obtained his Ph.D. from the University of Oklahoma and has been at UW since 2001. He has built new instruments for the Wyoming Infrared Observatory: a visible-wavelength imaging camera and a modern, high-performance spectrograph. These two new instruments are operational and have greatly enhanced the research capabilities of both faculty and students. The new camera images the sky over a much larger area than was possible with the previous cameras available at WIRO. The new spectrograph is one of the first of its kind in the world. It uses an innovative optical component known as a volume-phase holographic grating, making it highly efficient. He plans to study the mass distribution within spiral-armed galaxies. Pierce is also nearly finished with constructing a world-class near-infrared camera. The approximately \$1 million in funding came largely from the NSF Major Research Infrastructure program.

## Jinke Tang

Jinke Tang obtained his PhD from Iowa State University. After spending 17 years as a faculty member at the University of New Orleans, he joined UW in 2007. His research interest is in the areas of experimental condensed matter physics and materials science. One area of his research focuses on materials for spintronic applications including magnetic semiconductors and half-metals. His group investigates the magnetic and electronic transport properties of nanostructured oxides and thin films. Various thin film preparation techniques are used in the labs, including pulsed laser deposition and magnetron sputtering. Another research area is novel thermoelectric materials that can be used for energy conversion, for example, generating electricity from car exhaust, waste heat and geothermal energy. They investigate the electronic and phonon transport in both nanostructured bulk and thin films and also work on energy efficient white light emitting diodes (LEDs) that will most certainly replace incandescent and fluorescent light bulbs in the future. Other research activities include x-ray studies of electronic, magnetic and crystalline structures of nanomaterials; spin-dependent transport; tunneling magnetoresistance and giant magnetoresistance; dielectrics, magnetic oxides and nanoparticles; highly correlated electron systems; electronic, magnetic, optical properties of transition metal/rare earth compounds/alloys.

Physics & Astronomy  
Dept 3905  
1000 E. University  
Physical Science 204  
Laramie, WY 82071

## David Thayer

David Thayer received his Ph.D. from MIT and had a postdoc position with the University of Texas, a staff scientist position at Lawrence Berkeley Laboratory, and later was a senior scientist in industry at SAIC. In addition to a continuation of his research on plasma and fusion physics with an emphasis on turbulent transport, as well as quantum mechanical foundation, interpretation, and a hidden variable theory of spin, Thayer collaborates with UW Computer Science faculty on the computational fluid dynamics analysis of chemical plume tracing which incorporates a swarm of mini-robots. Thayer also collaborates with Mathematics on non-thermal plasma reactor hydrogen production research. Thayer has recently focused on high quality education of the upper-division undergraduate physics students in all areas of theory (including classical mechanics, electricity and magnetism, quantum mechanics, statistical mechanics, mathematical physics, and plasma physics), as well as to assist them with a wide variety of research experiences (including wind power technologies and micro-fluidic analysis of individual droplet transport using kinetic theory approaches to such nanotechnology endeavors).

## Wenyong Wang

Dr. Wenyong Wang's research interest is in the fabrication and characterization of nanoscale electronic devices. He has received a Ph.D. degree in physics from Yale University in 2004, and before joining UW he has spent four years as a research associate at the Semiconductor Electronics Division of the National Institute of Standards and Technology (NIST). Dr. Wang's research areas include, for example, fabrication and charge transport characterization of self-assembled molecular junctions, spin-dependent transport study of novel magnetoelectronic devices, characterization of noise properties in nanoscale conductors, investigation of hybrid silicon-molecule integrated junctions, and electrical characterization of organic conductors and semiconductors. At UW he will continue the exploration of exciting physics in condensed matter nanosystems as well as other novel material and device structures.