THE UNIVERSITY OF TOLEDO **College of Natural Sciences and Mathematics**

physics.utoledo.edu DEPARTMENT OF PHYSICS AND ASTRONOMY

WAVES

Number 14 Fall 2011

DEPARTMENT CHAIR'S COMMENTS

Anderson-Huang

Greetings to all of our alumni, friends and supporters of the department! I hope this newsletter finds you well. I am sure you have noticed a change in the photograph accompanying this message. After a period of administrative study, the 100-year-old College of Arts and Sciences was divided into three independent colleges in the late fall of last year. The new colleges are: the College of Languages, Literature, and Social Sciences; the College of Natural Sciences and Mathematics; and the College of Visual and Performing Arts. The new structure became effective at the beginning of 2011. We are very proud that our own Dr. Karen Bjorkman, previous chair of the department, was selected as the founding dean of the new college of Natural Sciences and Mathematics. She brings to the college level a fundamental understanding of and respect for scientific research and education. If you have not done so already and would like to send her your congratulations and encouragement, her e-mail address remains karen.bjorkman@utoledo.edu. For those of you who may know them, the new deans for the other colleges are Dr. Alice Skeens (LLSS) and Debra Davis (VPA). More news on the restructuring may be found on the UTNews website at *utnews.utoledo.edu/index.php/01_10_2011/academic-reorganization-continues-at-university.*

After the loss of several faculty members to retirement (including Dr. Bernie Bopp and Dr. Nancy Morrison during the past year) as well as personal moves in their careers, we are welcoming three new faculty members in the coming fall. In order of appointment, we are very happy to welcome Dr. Nikolas Podraza as an assistant professor of physics in the area of photovoltaics, Dr. Michael Cushing as an assistant professor of astronomy and the new director of the Ritter Planetarium, and Dr. Yanfa Yan, awarded an Ohio Research Scholar Endowed Chair in Photovoltaics as a full professor. We are very pleased to have these well-recognized scholars join us. Dr. Podraza comes from the Materials Research Laboratory at Penn State and has an accomplished record in ellipsometry and other characterization methods of thin film materials. Dr. Cushing comes from NASA's Jet Propulsion Laboratory and has an accomplished record in the analysis of brown dwarfs, objects at the boundary between stars and planets. Dr. Yan comes from the National Renewable Energy Laboratory and has an accomplished record in current, emerging and future generation materials and device architectures for energy and related applications, electron microscopy techniques, and density functional theory of electronic structure modeling. All three scientists complement and add to our existing research efforts, and promise significant contributions to enhancing our profile.

In addition to these new appointments, we are happy to report that Dr. Rupali Chandar, an astrophysicist working on the evolution of stellar clusters, has been awarded tenure and promoted to the rank of associate professor, and Dr. Jon Bjorkman, an astrophysicist working on the theory of stellar disks, has been promoted to the rank of full professor. As the articles in this edition of Waves attest, our programs continue to attract interest locally, nationally and internationally.

Neither the University nor our department has avoided the economic downturn in recent years. As a result, we have lost the Secretary 1 position held by Ms. Nadine Hoffman, who in turn had replaced Ms. Suzanne Hickey when she retired at the beginning of the year. Fortunately for her, Ms. Hoffman is moving to a similar position in the College of Engineering. Meanwhile, both Ms. Willie Brown, our chair's secretary, and Ms. Stephany Mikols, our business services officer, have announced their retirements effective at the end of June. All three staff members have served our department well, and will be sorely missed.

Ritter Planetarium continues its excellent outreach efforts to the community, attracting more than 25,000 people a year to visit and learn about astronomy and the night sky. We are very happy to announce that University President Dr. Lloyd Jacobs has authorized funding to replace our venerable old Spitz A3P projector with a new Spitz SciDome XD Digital Projection System. The Spitz A3P served our needs well for 44 years. It was an analog-style projector consisting of a star ball with 1500 holes and an internal arc lamp, and a cleverly designed set of motor-driven mirrors to provide a geocentric view of the moon and solar system that could be advanced through time to show the changing view of the sky. All visual special effects were displayed using separate projectors. The new system will be fully digital, dividing the sky into more than 6 million pixels, each about 6 mm across at the distance of the dome. That size is comparable to the stellar images from the A3P star ball. All visuals will be programmed seamlessly into the projection, allowing the viewer not only to visit throughout the solar system, but also to travel through and outside our Milky Way galaxy. In addition, many other uses are

possible, from architectural rendering to zoological safaris. We already are planning coordinated displays with other departments on campus and the Toledo Museum of Art. The original authorization from Dr. Jacobs was enough to buy an earlier HD version, with half the resolution. The department chose to upgrade to the XD version described above. Ours will be the first installation of this version in the world! The opening will occur in the early fall semester of 2011 — watch our web pages for news of a more exact date. The upgrade, together with renovations to the lobby area, increase the cost by about $65,000. The UT Foundation Development Office is helping us to raise the additional funds.

We are proud of all these efforts and hope to develop even more in future years. If you'd like to help us grow and improve, including adding to the planetarium projector upgrade, there is information elsewhere in this newsletter about how you can contribute — there are several funds established to support various efforts within the department. The department is very fortunate to have strong supporters in the community and beyond, and we are grateful to all of you.

In closing, let me just say that we value all our supporters, friends, former students and colleagues. We' d love to hear from you, so please do drop us a line sometime and tell us what you're doing these days. If you happen to be in the area, do stop in and visit us.

Lawrence Anderson-Huang

NOTABLE FACULTY NEWS

RETIREMENTS OF PROFESSORS BERNARD BOPP AND NANCY MORRISON

Professor Nancy Morrison

Dr. Nancy Morrison, who joined the Department of Physics & Astronomy in 1978 and served for many years as the director of the Ritter Observatory and Brooks Observatory, and more recently as director of the Ritter Planetarium, retired June 1, 2010 through UT's Early Retirement Incentive Program.

Professor Bernard Bopp

Dr. Bernard Bopp, who joined the Department of Physics & Astronomy in 1974, and served as the Director of Ritter Observatory from 1976 to 1994, the director of the Center for Teaching Excellence from 1994 to 1999, and the director of the Center for Teaching and Learning from 2001 to 2008, retired June 1, 2010 through UT's Early Retirement Incentive Program. Dr. Bopp also developed the popular course, Physics of Music and Sound, and estimates that during his career he taught nearly 15,000 undergraduates in 1000-level astronomy and physics courses. Dr. Bopp and his wife report that they have moved to Eugene, Ore.

CONGRATULATIONS TO JON BJORKMAN AND RUPALI CHANDAR

Congratulations to Jon Bjorkman, who has been promoted to full professor, as well as to Rupali Chandar, who has been promoted to associate professor.

Bjorkman

Chandar

THE UNIVERSITY OF TOLEDO'S RESEARCH ON SOLAR ENERGY PROFILED IN THE TOLEDO BLADE

(adapted from The Toledo Blade, March 9, 2010)

The research in solar energy and specifically thin-film photovoltaics at The University of Toledo is a sense of pride on campus, a selling point for state officials to solar companies, and is recognized by many solar-industry insiders throughout the country. In a globally competitive solar industry in which state governments battle to craft the most enticing incentives for solar companies, universities are also fighting for a leg up on competitors. The goals are to attract big research dollars, hire the most decorated faculty, make the fastest technological discoveries, have those discoveries inspire new businesses, and create jobs in their regions. This is undoubtedly true for UT, which produced Xunlight Corp. and has raised $37 million in grants and contracts for solar energy research the last three years. Long a successful solar energy research institution, UT must work diligently to avoid falling behind in a crowded solar field. Nina McClelland, interim dean of UT's School of Solar and Advanced Renewable Energy, said the University recognizes it needs to continue to "beef up" research and further advance photovoltaics technology.

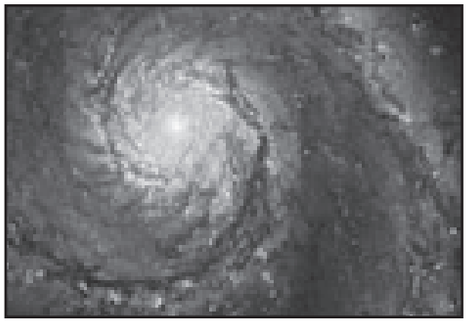
Graduate student Lila Daha. modifies equipment at UT's Clean and Alternative Energy Incubator.

Rosa Zartman a UT physics graduate, works with Photovoltaics in her job as a lab tech at UT's Clean and Alternative Energy Incubator.

The University of Toledo has 14 researchers dedicated to photovoltaics research and development and is one of three locations (Ohio State and Bowling Green State University are the other two) for the Wright Center for Photovoltaics Innovation and Commercialization, a consortium of universities and businesses formed with an $18.6 million grant from Ohio's Third Frontier Program. Peter Green, who directs Michigan's Frontier research center, said making renewable energy more efficient is a "significant problem" that likely won't be solved by any single institution. "The key thing is we have good work going on at a lot of places," Mr. Green said. Because of the high number of universities interested in solar research — some of them with deep pockets — The University of Toledo needs to make each and every dollar count, according to Megan Reichert-Kral, the University of Toledo's director of incubation, an initiative that includes the Clean and Alternative Energy Incubator. "We're a modest-sized research institution. We don't have Stanford-Silicon Valley money," Reichert-Kral noted. Tradition in solar research at The University of Toledo dates back more than 20 years, when Professor Alvin Compaan of the Department of Physics & Astronomy worked with Toledo glass manufacturing pioneer Harold McMaster and Norman Nitschke in developing cadmium telluride technology, the basis for First Solar's solar panels. Xunlight, a company started by UT Professor of Physics Xunming Deng that is developing flexible, lightweight solar panels, was also developed out of UT's incubation program. UT is also consulting with dozens of other companies looking for the next Xunlight. UT's cooperative efforts include working with the Ohio Department of Development, the National Renewable Energy Laboratory and the Toledo Regional Growth Partnership to fund research and grow fledgling companies.

UT ASTROPHYSICS RESEARCH PROFILED IN SPRING 2010 TOLEDO ALUMNI MAGAZINE

A hundred billion stars make up the pinwheel form of our own Milky Way galaxy in a universe estimated to hold a hundred billion more galaxies. "Even professional space gazers aren't immune to mind boggle when the numbers play out," admits Dr. Rupali Chandar, associate professor of astronomy. "Maybe we astronomers get used to being unable to grasp the immense size of the universe." As Chandar explains, "What we do here … is take elements that you might apply to rocket science — mathematics, physics, and sometimes engineering — and instead apply them to understanding our universe. One of the hard things about studying the universe is that you don't have a controlled laboratory. Our lab is the stars, galaxies and planets for which we take measurements and observe."



Hubble Space Telescope image of the Whirlpool M51 galaxy in infrared light. Credit: Infrared: NASA, ESA, M. Regan & B. Whitmore (STScI), & R. Chandar (U. Toledo); Optical: NASA, ESA, S. Beckwith (STScI), & the Hubble Heritage Team (STScI/AURA).

Both Chandar and Dr. JD Smith, assistant professor of astronomy, study the neighboring Whirlpool Galaxy, M51. Pointing to M51's companion galaxy, Smith says, "Eventually it will be consumed by the larger spiral, a pretty standard part of galactic evolution that's only recently been accepted as scientific fact." Dozens of smaller neighboring galaxies, he notes, are literally being ripped apart by our Milky Way spiral's gravitational pull, letting loose the "star stuff" that makes up the whole shebang, from hydrogen and helium to the fur on a kitten and the bones in our bodies. "When you're doing basic research, you're learning things that aren't directly applicable right now, but ten or fifteen years from now, they often are," says Chandar. "My first graduate project was working with a group of computer scientists on a way to automatically classify objects in space. Later, they adapted that same code to the medical field, where it could be used to help detect breast cancer." And there's no danger of ennui; take the matter of dark energy, the hypothetical stuff scientists are using to explain the mounting and startling evidence that the universe's expansion is accelerating. Karen Bjorkman, chair of the Department of Physics & Astronomy adds, "It amazes me whenever I think about how we dare to ask these questions; it amazes me even more when we can begin to answer some of them. As creatures who live on this rock, orbiting this insignificant star, it's something we can stand up and be proud of."

UT PARTICIPATES IN EFFORTS AIMED AT INCREASING WOMEN ON SCIENCE FACULTIES

(adapted from the Toledo Blade, May 11, 2010)

If a research project among half a dozen northern Ohio universities is successful, more women will attain higher-education faculty positions in science, technology, engineering and math. They are woefully underrepresented in all, a loss not only to the academic disciplines but also to young women who might be drawn to less-conventional study with female professors as role models. The three-year effort, named Institutions Developing Excellence in Academic Leadership (IDEAL) is supported by a three-year, nearly $1 million grant from the National Science Foundation awarded to Case Western Reserve University in partnership with five regional public universities: Bowling Green State University, Cleveland State University, Kent State University, the University of Akron, and The University of Toledo. Professor Karen Bjorkman, dean of the College of Natural Sciences and Mathematics and formerly chair of the Department of Physics & Astronomy, is part of the team looking at why there are so few women faculty members in sciences and engineering. "This is not just limited to The University of Toledo," Dr. Bjorkman said. "The broader picture is that in this day of competition around the world in technical areas and proficiency in science, we can't afford to throw away over half of our talent pool." The three-year study is intended to identify the factors contributing to the low numbers of female faculty members and put into place initiatives aimed at improving those numbers.

PROFESSOR TOM MEGEATH'S HERSCHEL SPACE OBSERVATORY PROTO-STARS PROJECT LEADS TO SURPRISING DISCOVERIES ABOUT THE WAY STARS FORM

(adapted from the Toledo Blade, May 17, 2010)

A team of international astronomers led by Dr. Thomas Megeath has made a surprising discovery that alters understanding of how stars are formed. Their finding — a hole within the cloud of gas and dust that surrounds baby stars in the Orion constellation — turns a previous scientific assumption on its head. Often referred to as "The Hunter," Orion contains one of the closest star-forming areas to Earth. Since at least the 1970s, astronomers believed the hole in Orion was simply a very dense section of cloud. But using an image from the European Space Agency's Herschel Space Observatory — a powerful new infrared telescope — Dr. Megeath and his team realized the black space they saw had nothing in it. "We got this image and we looked at it and we thought, 'Gosh, that's weird,'" Dr. Megeath said. "'What would cause a black shape like that?' It was just a striking feature."

Dr. Tom Megeath points to NGC 1999, the green cloud in this image taken by Herschel, the European Space Agency's far-infrared telescope. The dark spot to the right was thought to be a cloud of dust and gas, but Megeath discovered it is a hole blown in the side of NGC 1999 by the narrow jets of gas from young stars.

After conducting additional observations on telescopes in Arizona and Chile, Prof. Megeath and his team concluded that the shape was, indeed, a hole. The revelation is important because it helps unfurl a mystery about the "birth" of baby stars. Each star forms within a cloud, but scientists have been trying to understand how those "babies" eventually emerged. The new Herschel image shows the stars are clearing the cloud away by making a large hole in it. The forming stars, or protostars, make the holes by throwing out jet streams of material. "These holes are really starting to show this process in action," Dr. Megeath said. "We can now understand the process in a much more clear way than we have before." Eventually, Dr. Megeath and his team hope to put together a detailed picture of the different stages of star formation that will help scientists understand how our own sun and the planets, came about.

THE UNIVERSITY OF TOLEDO'S FOCUS ON SOLAR ENERGY FEATURED IN USA TODAY

(adapted from USA Today, June 15, 2010)

The Toledo area's focus on solar energy, including First Solar Corporation and the contributions of The University of Toledo were the focus of a recent USA Today profile. At least 6,000 people work in the Toledo area's solar industry, including First Solar, which makes solar panels and was founded here and employs more than 1,000 at its 900,000-square-foot plant. In addition, there are more than a dozen solar-related startup companies in the area. The University of Toledo is home to top solar researchers and has a business incubator that provides business services to solar entrepreneurs. It has graduated four solar companies and is working with six more.

The University has a School of Solar and Advanced Renewable Energy, a Center for Photovoltaics Innovation and Commercialization, and a team of nationally renowned researchers. Its Scott Park Campus is devoted to — and powered by — alternative energy, including the state's largest array of linked solar panels. Frank Calzonetti, [then] the University's vice president for research and economic development, says the seeds of Toledo's solar industry germinated in the late Harold McMaster's basement laboratory. McMaster, a physicist, founded Glasstech Solar in 1984, then Solar Cells, which explored with University of Toledo scientists ways to produce solar energy with thin, lightweight and flexible film. The raw materials used in thin-film solar products are cheaper and more versatile than those made from silicon. In 1999, McMaster's company was sold and became First Solar. McMaster's collaboration with the University, fueled by research grants and focused on thin-film technology, was the foundation for today's team approach to the solar industry here, says Al Compaan, a recently retired chair of the University's Department of Physics and Astronomy. "In the solar world, Toledo is a hot spot," says Dr. Xunming Deng, a physics professor on leave from The University of Toledo. He's developing Xunlight, the company he founded here in 2002 to produce thin, flexible solar panels. It has about 100 employees. Dr. Deng is also principal investigator of a university group that is using a $1.4 million Department of Energy grant to find ways to make photovoltaic energy more affordable.

XUNLIGHT PV MODULES POWER TIMES SQUARE BILLBOARD

Xunlight Corporation, a leader in the development and manufacture of thin-film silicon solar modules, announced that its flexible solar panels are now being used to power the first 100 percent solar-powered billboard in New York City's Times Square. The Ricoh Eco Board, located at the northwest corner of 7th Avenue and 42nd Street in New York, is powered by 24 Xunlight XR36 thin-film silicon photovoltaic modules and other solar panels. These products incorporate Xunlight's triple-junction thin-film silicon solar cells produced using its proprietary high speed 25MW wide-web, roll-to-roll PV manufacturing equipment. Xunlight worked with Ricoh Americas Corporation, Takara Media, Cooley Group and Lamar Advertising on this Ricoh Eco Board project. "We are

Khare

Deng

very pleased to have our flexible and lightweight PV modules incorporated into this innovative outdoor advertising application. This project highlights the flexibility of lightweight solar systems for a variety of markets and applications," said Dr. Xunming Deng, president and CEO of Xunlight. In addition to this solar powered billboard project, Xunlight has recently completed the production of solar modules for a 50KW system to be installed at the I-280 right-of-ways to power the lighting system for Toledo's Veterans' Glass City Skyway, along with another 50KW system supplied by First Solar. In addition. Xunlight Corporation announced on Jan. 7, 2011 that it had received certification under the requirements of IEC 61646 and 61730 standards. Xunlight currently has a European sales backlog of close to $60 million, and this certification allows the company to deliver initial quantities to its European partners for installation on commercial rooftops and other applications. "This is a major milestone in Xunlight's efforts to become a world-leading producer of low-cost, high-powered flexible and lightweight solar modules," said Dr. Deng.

NEW PROFESSIONAL SCIENCE MASTER'S DEGREE PROGRAM IN PHOTOVOLTAICS

(adapted from UT News, June 14, 2010)

The Department of Physics & Astronomy, in collaboration with the College of Business Administration and the Graduate College, has added a professional science master's degree with concentration in Photovoltaics (PV) to its other graduate degree programs, which include the M.S. and Ph.D. in physics. The new degree brings together both the science and business knowledge necessary for those interested in alternative energy careers, while the primary focus is the training of students in the fundamentals of PV science and technology as well as in management and the business aspects of manufacturing. In the two-year program, which began Fall 2010, students conduct a research project with UT faculty and participate in practical training in a local photovoltaic manufacturing company, rather than completing a traditional master's degree thesis. UT has already set up relationships with Xunlight and Xunlight 26 Solar for those experiences, and will be seeking new partnerships as well. The director of the program is Sanjay Khare, associate professor of physics & astronomy.

"The goal is to cross-train the students in academic expertise and workplace skills," said Dr. Patricia Komuniecki, vice provost for graduate affairs and dean of the College of Graduate Studies. "It's really a perfect fit," she added. "This is a growing trend not only in our region and state, but the nation. With the new School of Solar and Advanced Renewable Energy and the Scott Park Campus of Energy and Innovation at UT, we have the resources to provide students not only with cutting-edge science backgrounds, but also the business skills they will need." Both said the presence of a world-class photovoltaics research faculty in the Department of Physics and Astronomy, led by Professors Robert Collins, Al Compaan, Xunming Deng, Randy Ellingson, Michael Heben and Sylvain Marsillac, made this unique program a possibility. The new master's degree in photovoltaics builds on the existing master's degree program in physics with the addition of the business courses in place of electives and the industrial experience. It is targeted toward students with a bachelor's degree in physics, materials science or a related engineering discipline that has the components of technical training. Students pursuing this degree could be mid-career professionals or full-time students who have a passion for the science.

STRICKLAND ANNOUNCES NORTHWEST OHIO SOLAR ENERGY HUB IN TOLEDO

(June 30, 2010)

On June 30, 2010, Governor Ted Strickland announced the designation of the Northwest Ohio Solar Energy Hub as an Ohio Hub of Innovation and Opportunity to strengthen and create job opportunities in Ohio's solar industry. The Northwest Ohio Solar Energy Hub will focus on promoting entrepreneurship, economic development and commercialization in the solar industry by bringing together top solar researchers, entrepreneurs, manufacturers, education institutions, trade associations and training providers. "By pairing northwest Ohio's glass manufacturing legacy with its innovative research and university strengths, this hub will help accelerate the growth of Ohio's solar industry," Strickland said. Hub partners include The University of Toledo, Bowling Green State University, Owens Community College, Penta Career Center, Terra Community College and Northwest State Community College. A $250,000 state grant, administered by the Ohio Department of Development, will help support the hub. "We are excited about the collaboration with the Northwest Ohio Solar Energy Hub of Innovation. I know that this will be a great asset to the City of Toledo," said Mayor Michael P. Bell.

"The Northwest Ohio Solar Energy Hub builds upon key solar industry assets in the region," said Mark Barbash, assistant director of the Ohio Department of Development. "This hub complements our economic development strategy to help foster a concentration of companies and research that helps to grow jobs in Ohio's driver industries." "The University of Toledo has been a proud partner with Governor Strickland and the Ohio Department of Development, and has been a solar industry leader in Northwest Ohio for decades," said Lloyd Jacobs, president of The University of Toledo. "As UT's photovoltaic reputation continues to expand nationally and internationally, the designation of the Northwest Ohio Solar Energy Innovation Hub will help draw further attention to the great work and economic opportunities in the region.

GLOBAL LEADER IN ALTERNATIVE ENERGY VISITS UT, RECEIVES HONORARY DEGREE

(adapted from UT News, July 28, 2010)

The University of Toledo welcomed alternative energy expert Dr. Sultan Al Jaber to campus on July 31, 2010 to lead a green energy discussion and tour UT's efforts in that area. Al Jaber spoke to a crowded Doermann Theater about the Masdar Initiative — Abu Dhabi's multifaceted program to develop and commercialize renewable energy technologies. Al Jaber is chief executive officer of the Abu Dhabi Future Energy Co., which is mandated by the government to drive the Masdar Initiative. Since its inception in 2006, Al Jaber has been Masdar's chief executive officer and the creative driving force behind the Masdar Initiative. The centerpiece of the initiative is the well-known Masdar City, which is a carbon-neutral, zero-waste municipality. Al Jaber said Masdar is committed to Abu Dhabi's economic diversification from a fossil fuel-based economy to a knowledge-led economy, expanding its position in the evolving global energy market, and positioning Abu Dhabi as a leading developer of advanced technologies and as a major contributor toward sustainable human development.

Rosa Zartman, research associate at the Wright Center for Photovoltaics Innovation and Commercialization (PVIC), spoke with Dr. Sultan Al Jaber as, from left, Dr. Robert Collins and Dr. Frank Calzonetti listened. During his visit, Al Jaber toured several UT locations, including the PVIC labs.

"Academia is without a doubt one of the most crucial elements to the successful adoption of clean energy," Al Jaber said. "It is responsible for developing and advancing technologies while cultivating the required researchers, academics and leaders that will fuel the renewable energy sector's human capital requirements." Collaboration is another important element to support and drive innovation and development of clean energy technologies, Al Jaber said. Al Jaber received an honorary degree from UT during the event in recognition of his achievements in the support and promotion of renewable energy in the United Arab Emirates and globally. He said he was most impressed with the significant strides the University has taken in the development of solar energy. After the morning event, Al Jaber spent the afternoon with University leaders for a campus tour that visited the College of Engineering, the Wright Center for Photovoltaics Innovation and Commercialization, Xunlight Corp. and the UT Scott Park Campus for Energy and Innovation.

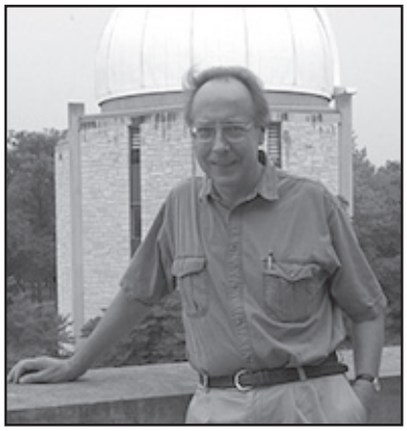
UT WIDENS ITS ROLE IN THE HERSCHEL SPACE OBSERVATORY

UT's role in exploring the coldest and most obscured regions of the universe with the Herschel Space Observatory continues to grow. Dr. JD Smith was awarded a major new Herschel Space Observatory program, which will open up the study of galaxies at the very longest wavelengths of infrared light (200-600 microns). His program — "Beyond the Peak: Resolved Far-Infrared Spectral Mapping of Nearby Galaxies with SPIRE/FTS" — was among the largest "open time" projects competitively selected during this award cycle. Together with a team he leads of nearly 30 astrophysicists from around the world, Dr. Smith will use these observations to reveal new details of how stars form in galaxies, and how the supermassive black holes within them shape their evolution. Professor Smith was also co-investigator on several other successful Herschel studies of gas and dust in the nearby universe. Observations using the space telescope — which houses the largest mirror ever launched — will commence this summer. Looking closer to home, Dr. Tom Megeath and graduate student Tom Allen received time with Herschel to perform 70 to 160 micron (terahertz) imaging of the CepOB3b Cluster. With these data they will examine the evolution of gas disks around low mass stars and study how the birth environment of stars affects the architectures of nascent planetary systems. In addition, Dr. Megeath was Co-I on Herschel programs to study outflows from young stars, to map the distribution of young stars and gas in molecular clouds, and to examine the evolution of protoplanetary disks. These programs pull together collaborators from around the US, Europe an. South America.

BUCKYBALLS DETECTED IN INTERSTELLAR SPACE

Fresh after finding buckyballs around an aging star (Science, July 2010, "Detection of C60 and C70 in a Young Planetary Nebula" by J. Cami, J. Bernard-Salas, E. Peeters, and S.E. Malek), NASA's Spitzer Space Telescope has now detected these intriguing, miniature-soccer-ball-shaped molecules in interstellar space for the first time. This work, carried out by UT Professor J.D. Smith and REU student Tim Carleton (visiting from University of Arizona) in collaboration with researchers from Ohio State, Caltech and NASA's Jet Propulsion Laboratory, is described in a recent paper published in the October 10, 2010 issue of The Astrophysical Journal Letters.

PROFESSOR EMERITUS ADOLF WITT HONORED BY A CONFERENCE IN HIS NAME: WITTFEST



Dr. Adolf Witt. Ritter Observatory is in the background.

For more than four decades, Dr. Adolf Witt has investigated the origins of the majesty of the universe by studying one of the most seemingly mundane substances in existence: dust. Dust is left behind when a star dies and, a few billion years later, may end up helping birth a new star, nebula or planet. Because of the important role it plays in so many processes, dust is an invaluable tool in helping to explain why the universe is the way it is. To celebrate Witt's contribution to the understanding of the universe, his important role in growing and developing the UT Department of Physics and Astronomy, and his 70th birthday, an international conference, "WittFest: Origins & Evolution of Dust — a Conference on Cosmic Dust" was held at The University of Toledo from October 10-12, 2010. The focus of the conference was understanding the origins and evolution of interstellar dust, and also highlighted the many techniques and astrophysical environments in which Adolf has pursued this topic throughout his career. "The University of Toledo has been very fortunate to have a thinker and teacher of Dr. Witt's caliber on its faculty. We have all benefited from the depth of his knowledge, the patience with which he conveys it, and his prominence within the international scientific community," said Dr. J.D. Smith, UT assistant professor of astronomy and chair of the local organizing committee for the conference. The conference was co-organized by Prof. Witt's former students Karl Gordon (now at the Space Telescope Science Institute), Tracy Smith (now at Space Sciences Institute) and Uma Vijh (U. of Toledo) along with colleagues at Louisiana State University, Princeton, Grand Valley State University, The University of Toledo and the University of Chicago, and included more than 70 participants from Australia, Canada, Denmark, France, Germany, Georgia, India, Ireland and South Korea as well as the United States.

MIDWEST CRITICAL MASS CONFERENCE ON RELATIVISTIC HEAVY ION PHYSICS HOSTED BY THE DEPARTMENT OF PHYSICS & ASTRONOMY

A workshop on relativistic heavy ions and physics at the Relativistic Heavy-Ion Collide. (RHIC) at Brookhaven National Laboratory was hosted at The University of Toledo by the Department of Physics and Astronomy from October 22-23, 2010. Participants included faculty from Wayne State University, Ohio University, Purdue University, Ohio State University, Kent State University, the University of Illinois at Chicago and Michigan State University. The primary focus of the workshop was the physics of relativistic heavy ion collisions and the quark-gluon plasma.

OTHER NOTABLE FACULTY NEWS

JACQUES G. AMAR

Awarded along with co-PI Terry Bigioni of chemistry, a National Science Foundation Award, for their project, "Interfacial self-assembly of nanoparticles and their interactions."

RUPALI CHANDAR

Professor Rupali Chandar's work on M51 was featured in NASA's Astronomy Picture of the Day. (January 26, 2011).

BO GAO

Professor Bo Gao has been elected a Fellow of the American Physical Society, for "contributions to the quantum-defect theory of cold atom interactions and the analyses of the associated mathematical special functions."

SCOTT HILL

Scott Hill, visiting assistant professor, reports that he recently published an article in Physical Review E (with co-author Daniel Braha) on "Dynamic model of time-dependent complex networks."

VICTOR KARPOV

Awarded a National Science Foundation Award for his project, "3D Multi-scale Simulation of Thin Film Photovoltaics."

TOM MEGEATH

Awarded, along with co-PI Judith Pipher of the University of Rochester, a National Science Foundation Award, for their project, "The CepOB3b Young Cluster: A New Laboratory for Studying the Role of Environment in Planet Formation and Cluster Evolution."

JD SMITH

Professor J.D. Smith's work on PAH emission in galaxies was selected as the Thomson Reuters Fast Moving Front paper in Space Science for July, 2010

GRADUATE STUDENT NEWS

Brian Bismack, a senior medical physics student, won the American College of Medical Physics Graduate Student Award in 2010. Brian received his award in May at the national ACMP meeting.

CONGRATULATIONS!

The following graduate students successfully defended their Ph.D. dissertations or received an M.S. based on a thesis or major peer-reviewed publication in 2010:

Dr. Jie Chen, Ph.D .
Dr. Jian Li, Ph.D.
Dr. Marco Nardone, Ph.D.
Dr. David Nero, Ph.D.
Dr. Megan Schwenker Smith, Ph.D.
Stephanie Rety, M.S.

NEWS FROM RITTER PLANETARIUM-BROOKS OBSERVATORY

THE RITTER PLANETARIUM AND BROOKS OBSERVATORY RECEIVE GRANTS TO EXTEND INTERACTIVE EXHIBITS

(adapted from UT News, May 21, 2010)

The Ritter Planetarium and Brooks Observatory have been awarded $16,000 to fund the creation of an interactive display area in the lobby of the planetarium. The museum-style display cases will have content designed to engage the imagination. The cases, each with large LCD monitors, stereo speakers and controls to be operated by guests, have four themes: "Toledo and the Infrared Universe;" "Ritter After Dark, The Secret Story of Starlight and Ritter Observatory;" "A Tour of Our Solar System;" and "Backyard Astronomy and the Night Sky." The 2010 grant awards are the third grant cycle for Women & Philanthropy at The University of Toledo, which now has contributed nearly $100,000 to UT. The group was formed in 2006 and awarded its first grants in 2008. It is committed to forging new relationships and building a community of thoughtful, effective philanthropists among women diverse in age, interests and backgrounds.

RITTER PLANETARIUM HIGHLIGHTED IN THE INDEPENDENT COLLEGIAN

(adapted from the Independent Collegian, November 15, 2010)

Simply looking up at the night sky isn't the only way of gaining an accurate view of the cosmos. UT's Main Campus is home to Ritter Planetarium. This 40-foot domed auditorium seats 92 and holds a vast amount of knowledge-enhancing programs geared toward all ages. About 120 public programs and 200 school programs are held per year to, according to department materials, "provide educational and entertaining activities for the dissemination of material related to astronomy, the sky and our place in the universe," as well as to "provide opportunities for the university community and the public to view celestial phenomena with medium-sized telescopes." Alex Mak, associate director of the planetarium, says that he especially enjoys working with grade school students, and seeing the "light-bulb going off in their heads."

The first Friday of every month, a new program is launched that repeats every Friday for the remainder of the month. Annual programs are held as well, such as "The Moonwitch" that occurs near Halloween, focusing on the face of a folkloric witch in the moon. An interactive lobby is located just outside the doors of the planetarium, and while it is mostly aimed at children, there is still plenty of information to be found within each display, including large scales estimating both your weight on earth and in space. For those interested in furthering still their knowledge, there are six workshops that can be found throughout the year on telescopes, amateur observing, astro-photography and other topics of similar interest.

The most integral part of the star and planet-based programs comes from the ability of the Spitz A3P central projector to reproduce the sky as it would be seen from anywhere on earth as well as to speed up time to show the progression of the sky as it changes. While seemingly just a mid-sized sphere, the projector impressively and accurately scales the stars down to make them viewable in the planetarium. The dome has brought other simple enjoyments to campus as well. While Mak matter-of-factly states that the planetarium is "basically a cheap date," Stephanie Horne, a graduate student and employee of the planetarium, notes that proposals and even marriages have even taken place under the stars.

The planetarium staff is also making preparations for another exciting teachers' workshop this summer called "Beyond the Solar System." The workshop is funded by an NSF grant awarded to Dr. Chandar and will work with up to 20 area teachers this summer. The focus of the workshops will be astronomy beyond the solar system, hands-on activities, and the use of pre-existing material produced by NASA, the Hubble Space Telescope and others. The planetarium has also taken the first tentative steps towards replacing our aging Spitz A3P star projector. Chandar and Mak have submitted a proposal to the Institute of Museum and Library Services to upgrade our projector to a new state of the art Spitz SciDome HD fulldome video system.

RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU)

The Summer 2010 NSF-REU program in Physics and Astronomy, directed by Dr. Richard Irving and Professor Thomas Kvale, gave enhanced research opportunities to 16 undergraduate students from 11 colleges and universities in 8 states spread from coast to coast. Student participants were chosen competitively out of 116 applications from students in 34 different states in all regions of the United States. The strong support of our faculty for the REU research program is evidenced by four students receiving support from faculty members' external grants and two students volunteering to participate in our REU program. One student received funding from the internal UT USRCAP (Undergraduate Summer Research and Creative Activity Program) and from the NSF-REU grant (at the level of support of fully NSF-REU funded participants). Deven Kelling and Matthew Korpela were the first cohort of participants in our program from the newly-forged UT-Itasca Community College collaboration. All of the participants were serious and talented young scientists who tackled substantial problems, participating in all stages of their projects, from formulation to conclusion, including oral and written presentations of their results. At least three abstracts by this year's undergraduate researchers have been accepted for presentations at national professional conferences based on research this past summer. It is anticipated that manuscripts are in preparation and will be submitted shortly to refereed journals.

Mentors and participants (boldface) in 2010 Summer REU:

Left to right. (front row): Tiffany Pewett, Rachel Arnold, Katie Hoepful, Julia Dietz, Matthew Korpela, Mandy Kilbourn, Marina Kounkel, Rupali Chandar. Left to right (second row): Al Compaan, Todd Skinner, Nathan Reaver, Tim Carleton, Ben Cermack, Devin Kelling, Andy Moore, Corbin Taylor, Karen Bjorkman. Left to right (back row): Tom Kvale, Lawrence Anderson-Huang, Rick Irving, JD Smith, Steve Federman.

PHYSICS AND ASTRONOMY SUMMER CAMP 2010

As part of this NSF program, REU students hosted an outreach activity for high school students, the Physics and Astronomy Summer Camp, which took place July 20-21. The summer camp activities were developed and supervised with the help of the REU team. Again this year, Jackie Kane, a St. Ursula high school science teacher, was extremely helpful in promoting the camp. We had in attendance 19 high school students representing the following five local area high schools: St. Ursula, Toledo Christian, St. Francis, Rodgers, St. Johns, Notre Dame. The first day of the summer camp dealt with alternatives for energy generation other than that produced from coal. To start this journey, the group did a tour of UT's own Scott Park Campus of Energy and Innovation, led by Chuck Lehnert, interim director for Scott Park Campus for Energy & Innovation and vice president of facilities & construction. During this tour, the students were able to visit a 1.2 MW solar and wind system at this campus. The project utilizes thin-film-on-glass photovoltaic solar technology and a 132-foot wind turbine. Both the wind and solar systems are expected to generate power equal to the amount of electricity used by 140 homes annually. Next, the students experienced similar technology at the homeowner level. This consisted of a tour and discussion by Dr. Alvin Compaan concerning his 4.3 kW CdTe rooftop PV system and his homemade electric truck. After a barbecue, the afternoon provided the students with hands-on activities to explore the concepts of the day. One activity involved building mini-generators to power LEDs. The students also really enjoyed testing their endurance to power up to four incandescent light bulbs (60 watts each) with a homemade bicycle generator. Between bouts of grunting (and laughing) during this physically laborious intensive activity, the students expressed the need for conservation by at least avoiding a phantom-energy-wasting lifestyle. The second day featured nighttime activities related to astronomy, including presentations in Ritter Planetarium by Alex Mak and Dr. JD Smith on infrared spectroscopy. The students enjoyed his interactive demos involving an infrared camera. Brad Rush also did a tour of the 1-meter Ritter Observatory telescope and a student activity on the scale of the solar system using the student campers as planets.

GRADUATE AND UNDERGRADUATE AWARDS CEREMONY

The Department of Physics and Astronomy's Tenth Annual Recognition Ceremony and Sigma Pi Sigma induction were held on April 29, 2010. The following awards were presented:

UNDERGRADUATE AWARDS

Elgin Brooks Memorial Astronomy Scholarship: **Tiffany Pewett**

Chad Tabory Memorial Award for Outstanding Undergraduate Research in Physics and Astronomy: First Place: **Nathan Reave** Second Place: **Corbin Taylor**

C.V. Wolfe Scholarship in the Natural Sciences: **Marina Kounkel**

Physics and Astronomy Outstanding Graduating Undergraduate Student: **Kyle Bednar**

A. Jackson and Sally K. Smith Scholarship: **Robert Jacobs**

GRADUATE AWARDS

David Turnbull Scholarship in Materials Science: **Amruta Newarange**

Physics and Astronomy Outstanding Service Award (Graduate): **Erin Kryukova**

THE 2010 SIGMA PI SIGMA INDUCTEES WERE:

Robert Jacobs
Yevgen Kryukov
Sean Lewallen
Robert Morgan
Zhaoning Song
Corbin Taylor

ALUMNI NEWS

Bruce Cantor (Ph.D. 2000) is the principal investigator of the Mars Atmospheric Global Imaging Experiment: a wide-angle, multi-spectral camera to provide global images of Mars in support of the first NASA/ESA joint mission to Mars

CONGRATULATIONS

Megan Schwenker Smith (Ph.D. 2010) gave birth to a healthy baby boy (Alexander Richard Smith) on February 2, 2011.

Faculty and classmates are interested in you and your career. Please update information on this form and return to the Department.

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PHYSICS AND ASTRONOMY FUNDS FOR EXCELLENCE

The Funds for Excellence supports scholarships and fellowships, acquisition of research equipment, special colloquia, etc. which are so essential for departmental excellence.

JOHN J. TURIN MEMORIAL FUND

Established to honor former department chair and dean of the Graduate School, John J. Turin. He was integral in building UT's first Ph.D. program in the 1960s. This endowment funds annual awards to physics students, based on merit (3.5 GPA or higher).

CHAD TABORY OUTSTANDING UNDERGRADUATE RESEARCH FUND

This account, founded in memory of Chad Tabory, a UT physics graduate and research lab technician, funds the outstanding undergraduate research award.

THE PLANETARIUM PROGRESS FUND

The purpose of the Planetarium Progress Fund is to hold the subscription donations of the Friends of Ritter Planetarium and all other gifts in support of our astronomy outreach programming. All funds are used for large capital expenses and the growth of an endowment portfolio, the interest from which will help cover operating expenses.

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COLLEGE OF NATURAL SCIENCES AND MATHEMATICS PROGRESS FUND

This fund supports the areas of greatest need for the College.

The UT ALUMNI ASSOCIATION wants to hear from you. Check out their web site at *toledoalumni.org*. Please join the movement.

Support the Department of Physics and Astronomy

Yes! I would like to make a GIFT/PLEDGE in the amount of:

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☐ Chad Tabory Outstanding Undergraduate Research Fund (1300483)

☐ The Ritter Planetarium Progress Fund (2400117)

☐ College of Natural Sciences and Mathematics Progress Fund (2401937)

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