

## Department of Physics and Astronomy

# WAVES

<http://www.physics.utoledo.edu>

Number 10

June 2005

## Department Chair's Comments



Comments from the Chair—When I wrote for the *Waves* last year, I was looking forward with much anticipation and more than a little trepidation to starting a term as Chair of the Department. I must say that the past eleven months have sped by! The faculty, staff, and students have been very patient with me and somehow we managed to survive!

Over the past year we have had a very active SPS Chapter (mostly undergraduates) who engaged in a wide variety of activities, not the least of which was beating all the teams of engineers in the Rube Goldberg competition. (See article inside.)

We also had an excellent graduate student recruiting year just past and look to have another successful year this year. Our graduate student enrollment continues to grow, now 49 with seven more acceptances for the fall, as more of our students are supported on grants. We now have more RAs than TAs and easily have the highest RA/TA ratio of any department in the University. The number of Postdoctoral Fellows and Research Assistant Professors on grant support is the highest ever (12).

The consequence of all of these people engaged in research is that we have a serious space crunch, both for offices and for labs. (In some respects this is a wonderful problem to have.) For example I have had to give up my regular faculty office and now if I get tossed out, I'll really be out of an office! The very successful thin-film photovoltaics effort has been promised some space in a modern building acquired this year by the UT Foundation. The former National Tool and Die Center and then the EISC building is now known as the Research and Technology Building 1 or "R-1" for short. This is at the corner of Dorr and Douglas south of Nitschke Hall. R-1 is already serving as incubator space for several start-up companies and also for the Center for Photovoltaic Electricity and Hydrogen, a Wright Capital project funded by the State of Ohio.

During the fall semester of 2004 I was engaged, with the other natural science department chairs, in a study of research lab space. The Facilities Planning Council of the University has adopted guidelines for research lab space that are based on a review of the data from similar research universities. These guidelines recommend 500 sq. ft. per "researcher" (faculty, postdocs, and

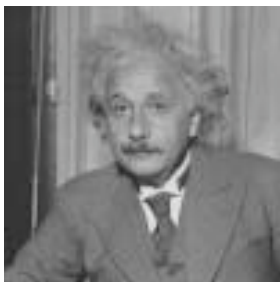
technicians, and fractions of the graduate and undergraduate researchers). Our survey data for UT show that Physics and Astronomy presently has 266 sq. ft. per assigned researcher (the lowest of the four natural science departments at UT). When our currently authorized faculty hiring (two new faculty hired this year and three more in the next two years) is finished in 2007, it will be down to 207 sq. ft. per researcher. Obviously we are pressing our case for additional research space, the squeeze is impacting our capability to accomplish the research we have promised on grants and contracts and crimping our ability to win additional federal funding.

One of the major departmental activities of the past academic year was to conduct the searches for one new faculty member each in astrophysics and in thin films / photovoltaics. This has involved a lot of diligent work by members of the two Search Committees: Chairs Karen Bjorkman and Rob Collins, and members Steve Federman, Adolf Witt, Song Cheng, Xunming Deng, Ale Lukaszew, Don Stierman (EEES), Dean Giolando (Chem) and Tom Stuart (EECS) and also the office staff, Willie Brown, Sue Hickey, Cheryl Sautter and Marcia Reau. We are really excited about the two new faculty who will be joining us next year—Sylvain Marsillac and Tom Megeath. The fact that both of these candidates were our first choices is a tribute to the excellent work of the committees and also to the growing maturity of our Department in being able to attract such outstanding candidates.

Finally, UT has launched a new Endowment Fund campaign. It has been in the quiet, large-donor phase for the past couple of months and is now expanding to the public phase where faculty, staff, former students, and friends of the university are being asked to contribute. So I would also like to ask each of you to give serious consideration to joining in support of the University and particularly this Department, which has been so successful and is gaining increasing attention and respect in the national and international community. We have several scholarship and fellowship accounts which need additional funds, particularly since their value has suffered with the weak stock market recently. In addition, a major goal of the department is to buy into a telescope consortium. See more discussion of these funds inside this newsletter.

We wish you all a productive year and encourage all of you to stop by when you are in the neighborhood. We are always looking for colloquium and seminar speakers and would love to hear of your experiences as well as receive feedback on what we can do to improve our instructional and research programs.

-Alvin D. Compaan



## THE WORLD YEAR OF PHYSICS 2005

The World Year of Physics is a worldwide celebration of physics and its importance in our everyday lives. The theme for the WYP celebration in the U.S. is “**Einstein in the 21st Century.**” The year 2005 marks the 100th anniversary of Albert Einstein’s “miraculous year” in which he published three incredible papers describing concepts that have since influenced all of modern physics: the photon (photoelectric effect), the existence of atoms (Brownian motion), and space and time (Special Relativity). This year provides the opportunity to celebrate Einstein, his great ideas, and his influence on life in the 21st century. TIME magazine recognized his impact on the Twentieth Century by selecting Einstein as their “Person of the Century.” In their words, “he was unfathomably profound – the genius among geniuses who discovered, merely by thinking about it, that the universe was not as it seemed.”

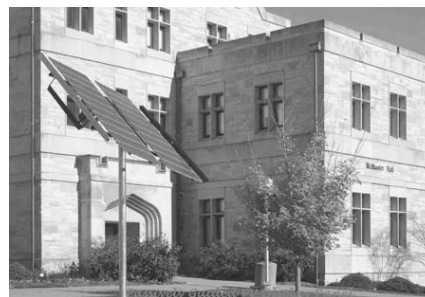
As the University of Toledo contribution to WYP, on April 21<sup>st</sup>, we hosted a major event for the Toledo community featuring a public lecture on Einstein’s contributions by one of the foremost Physics Historians, John S. Rigden. Dr. Rigden was the Editor of the **American Journal of Physics** during the 1980’s, Associate Director of the American Institute of Physics during the 1990’s, and is currently an Emeritus Professor on the faculty of Washington University in St. Louis. His is a noted author whose major contributions include a biography of Isidor Rabi, the American physicist and Nobel prizewinner--for the development of nuclear magnetic resonance--and eventually a senior 'statesman' of science. *New Scientist* reported that the biography “is a masterpiece, rich in anecdote and never losing the narrative drive.” Dr. Rigden has written a biography of Einstein, [Einstein, 1905: The Standard of Greatness](#), which describes the 1905 papers. This book was published in January by Harvard University Press.

In addition to a well attended public colloquium, Dr. Rigden interacted with faculty and students during his visit. He also gave a guest lecture in Dr. Curtis’s Atomic Physics course.

- Philip B. James

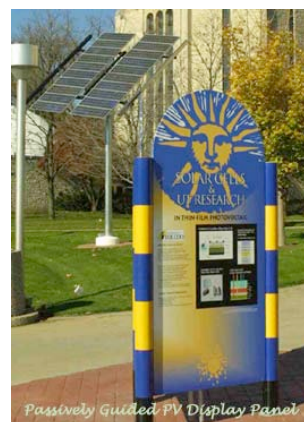
## UNRULY SUN PUT TO WORK

Reprint from the UT Alumni Magazine



Alternative energy shone at a regional conference held at UT in October 2004, with 150 researchers from UT, Bowling Green State University, Owens Community College and related local businesses pooling their expertise. The completion of a 1.2-kilowatt photovoltaic solar array added a figurative ribbon-cutting event to the conference’s schedule, and the structure stands on campus near McMaster Hall as an electrically kinetic reminder of solar energy’s potential.

This array, funded mainly by Northwest Ohio’s Partnership for Alternative Energy Systems, is made of 20 used solar panels donated by Ohio’s Department of Development Office of Energy Efficiency. Passersby can consult the array’s digital readout at a kiosk with information on photovoltaic usage and research. Two more arrays are planned on campus for this year.





## **Karen Bjorkman Named Master Teacher for 2005-07**

The Physics and Astronomy Department takes great pride in its commitment to instruction at both the undergraduate and graduate

levels. We are pleased to report that Prof. Karen Bjorkman has been named one of five Master Teachers in the College of Arts and Sciences for the next two academic years, 2005-2007.

Karen was chosen for this honor and responsibility for a variety of reasons. She has been highly successful in eliciting student participation in her classroom lectures, participation that is so important in engaging students in the learning experience. She has developed a wide variety of web resources as well as reading/writing assignments that help to promote class discussion. She has also developed a variety of in-class exercises in the large, introductory astronomy class (ASTR 1010). These classes of 100 to 150 are often exceedingly difficult to trigger student engagement and she has been very successful with this.

In addition, Dr. Bjorkman has been involved in many other instructional activities that extend well beyond the standard classroom experience. She has been involved in the training of new student observers through the Center for Teaching and Learning. She has attended workshops at local and national levels and has also been very active in engaging undergraduate students in research.

Master Teachers are selected for their commitment to undergraduate teaching, their performance as classroom instructors and their involvement in teaching-related scholarship and other activities. The responsibilities of the Master Teachers include instruction in large introductory classes; participation in College recruitment programs; involvement in the College FYI program; and participation on College award committees related to instruction. Another P&A faculty member, Scott Lee, has recently finished two successive appointments as Master Teacher.

- Alvin D. Compaan



## **Ale Lukaszew Named Cottrell Scholar**

*Reprint from The UT News*

The Research Corp. has named Dr. Rosa Alejandra Lukaszew, UT assistant professor of physics, one of 11 Cottrell Scholars nationwide.

Lukaszew was chosen from a pool of 96 applicants and was awarded \$75,000 to carry out research and teaching involving nano-magnets.

Cottrell Scholar Awards, named after scientist and Research Corp. founder Frederick Gardner Cottrell, are presented to faculty members in their third full year of their first tenure-track position. Applications must include research and teaching proposals.

"The award is generally a recognition that the corporation sees high potential," said Dr. Alvin Compaan, professor and chair of physics and astronomy and director of the Eitel Center. "Dr. Lukaszew's work supports growing work on campus in the area of thin films ... she also has established collaborations in many different places — another indication she has a very bright future."

Lukaszew's research focuses on the application and functional aspects of nano-magnets. "For the application component, there is magnetic recording, such as in hard drives to record data. The industry wants to make hard drives smaller and able to pack more information, but it is not very simple to get stable magnets so small," she explained. "There have to be ways to stabilize the materials such that they retain their properties."

The fundamental aspect of her research deals with the properties matter develop when made very small — i.e. quantum effects. She has already established herself nationally and internationally in the field of nano-magnetism and has been invited to present talks at prestigious meetings at Argonne National Laboratory (2004) and the International Materials Research Conference in Cancun, Mexico (2003 and 2004). Her previous research on nano-magnetics led to a U.S. patent in 2003.

For the teaching part of the award proposal, Lukaszew will have her graduate and undergraduate students help with the research and present results at meetings and conferences. She also will share her work with attendees of the Physics Summer Camp and the Saturday Morning Physics programs in 2005.

Lukaszew served as director of the camp and along with partner Dr. Larry Curtis, Distinguished University Professor of Physics, was director of the Saturday Morning Physics program.

For Lukaszew, the teaching and outreach is just as important as the research. "I think that we can no longer, as physicists, sit in a lab isolated from the outside world. That worked 50 and even 30 years ago, but I do not think that works today," she said.

Lukaszew believes that children need more exposure to science, as many people have no idea what physicists do. "We give a questionnaire to all the high school students attending the summer camp and the first question is 'What does a physicist do?' Most of the time, the students have no idea. We must change that."

Lukaszew has already begun work on aspects of the nano-magnet phase of the research. She went to Spain to prepare special thin films for the nano-magnets and has put a request in to use the advanced photon source at Argonne National Laboratory to further study the material. Lukaszew also plans to conduct measurements in the UT labs.

"I'm so proud," Lukaszew said of winning the award, "especially competing against big names." Other recipients of the award hail from Cornell University, Northwestern University, Purdue University and the University of Pennsylvania. "You always think you have less chance being from a smaller school. The bigger schools — they might have this tradition of research — but they may not emphasize education from the research," she said.

This year, Lukaszew also received grants from the Petroleum Research Fund, the National Science Foundation and the American Association for the Advancement of Science.

## *New Faculty to join Department*

### **DR. SYLVAIN MARSILLAC**

The Photovoltaics and Condensed Matter research efforts in our department will be greatly enhanced with the addition of Dr. Sylvain Marsillac as Assistant Professor of Physics. Dr. Marsillac's expertise is in ternary polycrystalline semiconductor materials (I-III-IV<sub>2</sub>) and thin film photovoltaic devices, and is presently a tenured Assistant Professor in the Physics Department of the University of Nantes, in Nantes, France. He is also the Assistant Director of LAMP, Laboratory of Materials for Photovoltaics, which he co-founded in 2004. His education includes a B.S. degree in Physics and Chemistry from the University of Nantes in 1992, and a Ph.D. degree in Materials Science also from Nantes in 1996. He became an assistant professor at Nantes upon receiving the Ph.D. and was tenured in 1998.

Dr. Marsillac has held several invited researcher positions including terms in the United States at University of Delaware's Institute of Energy Conversion (IEC), a Department of Energy Center of Excellence, both in 1997 and in 2001-2002, and at the Hawaii Natural Energy Institute, in 2003-2004. While at IEC, he achieved a world record efficiency solar cell (16.9%) based on the Cu(In,Al)Se<sub>2</sub> chalcopyrite system.

Overall, he has published over 50 articles on PV materials and devices, and has supervised two (2) M.S. and six (6) Ph.D. degree students while at Nantes. In addition, Dr. Marsillac has been teaching general physics, including tutorials, lectures, and laboratory to University of Nantes students for more than 12 years. Last but not least, he has contributed to the successful realization of 12 research proposals – 6 while in the U.S. and 6 while in Europe. Sylvain will arrive in Toledo on July 21 with wife Erika and three pets including two Rottweiler mixes. Erika will join the Ph.D. program in business at the University of Toledo.

## DR. S. THOMAS MEGEATH

The Department is pleased to announce the addition of Dr. S. Thomas Megeath to the astronomy faculty, beginning in April 2006. Tom Megeath has extensive experience with radio, millimeter, sub-millimeter, and infrared observational astronomy, specializing in star and planet formation, brown dwarf stars, and star forming regions. He joins us from the Harvard Smithsonian Center for Astrophysics, where he currently is employed by the Optical Infrared division as the Galactic Science Lead for the Infrared Array Camera (IRAC) instrument on the Spitzer Space Telescope. He was a key figure in the calibration and scientific planning for IRAC and played a leading role in many major discoveries arising from the cutting-edge research being done with IRAC and the Spitzer Space Telescope. Tom received his B.S. in Physics from the California Institute of Technology, and his Ph.D. in Astronomy from Cornell University. We are excited to welcome Tom to the department



**DR. R. ALEJANDRA LUKASZEW** was promoted from Assistant to Associate Professor with tenure. Dr. Lukaszew's main research interest is the study of magnetic properties of thin films. She is also interested in the applications of magnetic films to devices.

She was recently granted a patent for a spin-dependent tunneling device based on the magneto-crystalline properties of ferromagnetic layers. Dr. Lukaszew has also been very active in organizing department outreach activities such as a summer physics camp for high school students and a series of informal physics presentations by faculty to the public.

- Alvin D. Compaan

## DEPARTMENTAL PROMOTIONS



**DR. NANCY MORRISON** was promoted this year from Associate Professor to Professor. Dr. Morrison's research focuses on the spectroscopy of massive stars. Massive stars lose mass during their lifetimes by means of radiation pressure acting on

resonance lines of abundant ions in their outer atmospheres and forming a stellar wind. Dr. Morrison's research goal is to discover how the characteristics of the stellar wind depend on the properties of the star such as temperature, gravity, and chemical composition. She is the PI on a new NSF grant that expands the role of Ritter Observatory in the astronomy community. Dr. Morrison is Director of UT's Ritter Observatory and directs the Department's graduate program.



## ASTRONOMER HONORED FOR RESEARCH

*Reprint from The UT News*

Dr. Steven Federman is a star researcher. The astronomy professor received the Sigma Xi/Dion D. Raftopoulos

Award for Outstanding Research for studying interstellar clouds to find out how stars are formed.

He picked up a plaque and check for \$1,500 at the Sigma Xi annual banquet April 16th.

Federman uses spectroscopy to study the physical environment of interstellar gas clouds where stars are born. He makes many measurements with telescopes at the McDonald Observatory at the University of Texas at Austin, the Far Ultraviolet Spectroscopic Explorer and the Hubble Space Telescope. To help interpret data, he acquires lab data on atoms and molecules using the Toledo Heavy Ion Accelerator. He also investigates isotopic ratios to understand the sites

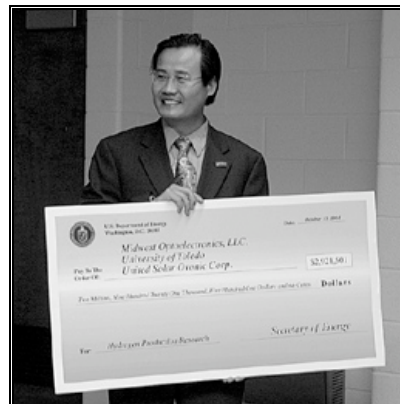
where elements are produced by nuclear reactions.

“Dr. Federman has studied atomic and molecular processes in interstellar space using high-resolution visible and UV spectroscopy for 25 years. The main recent interests in his observational program have been light element synthesis and chemical fractionation in carbon monoxide,” wrote one nominator. “The work on isotope ratios is clarifying the relative importance of various processes that synthesize the light elements.”

“This combination of original research in the distinct fields of theory, experiment and observation is very rare among active scientists,” noted another nominator. “In this way, Federman has been able to make significant contributions to our understanding of the chemical and physical nature of interstellar clouds, with decisive implications for theories of nuclear synthesis, star formation and planet formation.”

Since 1990, Federman has received grants totaling \$1.7 million for his research. He has written 85 papers for scientific journals and 38 for conference proceedings. He is the topical editor for atomic and molecular spectroscopy for the Journal of the Optical Society of America B and vice president of the International Astronomical Union’s Commission 14 on Atomic and Molecular Data.

In 2002, the native of Queens, N.Y., was elected a Fellow of the American Physical Society.



## **XUNMING DENG GRANTED \$2.9M TO WORK ON HYDROGEN PRODUCTION**

*(Picture from UT News)*

On October 13, 2004, Majida M. Mourad, senior adviser to Secretary of Energy Spencer Abraham and Pete Devlin, production research and development team leader of the DOE’s Hydrogen Program, held a press conference in the lobby of McMaster Hall to announce a \$2.9M grant from the U.S. Department of Energy. This grant was awarded to Midwest Optoelectronics LLC, a University of Toledo technology spin-off company founded by Prof. Xunming Deng, his wife, Dr. Liwei Xu, and Stan Rubini, a Toledo businessman. The University of Toledo, through the Department of Physics and Astronomy, is a subcontractor and will receive \$878,000.

In the Toledo Blade and UTimes coverage of the announcement, Prof. Deng described MWOE’s development of cost-effective photo-electrochemical (PEC) production of hydrogen from water and sunlight. In their research approach, a triple-junction amorphous silicon-based solar cell is immersed in an electrolyte or water. Under sunlight, a voltage is generated. When the voltage is sufficiently high, such as 1.6 volts, it splits water and generates hydrogen and oxygen. It turns out that the triple-junction amorphous silicon-based solar cells being fabricated at The University of Toledo are ideal for this application.

Developments from this research could be healthy for both the environment and the economy. The PEC technology has the potential to provide a renewable

source of hydrogen to power our fuel-cell vehicles and our economy in the future. Meanwhile we will reduce reliance on imported petroleum, improve our nation's balance of payments, and reduce the emission of greenhouse gases.

Xunming emphasizes that this research is a team effort. In addition to MWOE and UT, there are two other collaborators, the National Renewable Energy Laboratory in Golden, CO, and United Solar Ovonix Corp., which operates a 30 megawatt per year amorphous silicon photovoltaic production plant in Auburn Hills, MI.

The University of Toledo has major research and education programs in alternative energy, centered in the Department of Physics and Astronomy, that are providing a foundation for an emerging alternative technology cluster in northwest Ohio. Over the past three years, the University has brought in over \$8 million to support research on photovoltaic systems, fuel cells, and hydrogen programs from renewable energy sources.



### **Expanded Role for Ritter Observatory in US Astronomy**

In September 2004, Ritter Observatory received a major grant from the National Science Foundation Program for Research and Education with Small Telescopes (NSF-PREST), in exchange for which Ritter pledged to devote 25% of its usable telescope time to research and education activities on behalf of the professional astronomical community. With this award, Ritter became, in effect, a national facility.

This grant would not have been possible without decades of previous development, which enabled Ritter to maintain its capability for world-class astronomical spectroscopy, as well as education and public outreach. Since the founding of the observatory in 1967, it has been obvious that professional-level research is possible with the modest aperture of a 1-

meter telescope only if the telescope is equipped with state-of-the-art instrumentation. To this end, the echelle spectrograph was constructed in the late 1970's under the directorship of Adolf Witt.

Later, Bernie Bopp introduced the fiber optic coupling of the spectrograph to the telescope, designed and built the Low-Dispersion Spectrograph, and introduced electronic detectors, culminating with two CCD cameras in 1989 and in 1993. Bernie also made many infrastructure improvements and paid attention to the staff support side, obtaining funding for the Observatory Technician and Graduate Research Assistant positions. These highlights from the history of Ritter's development illustrate how it has established itself as a significant contributor to astronomical research.

Meanwhile, cuts in federal support for the national observatories forced them to close small telescopes, depriving the professional astronomical community of access to important sources of astronomical data and venues for training graduate and undergraduate students. In order to fill this gap, the NSF invited proposals to PREST in spring, 2004 from "organizations or consortia presenting an integrated program of research, student training, and educational programming."

The program provides funding "needed to make ... existing observing facilities reliable and productive tools for research and training."

Although Ritter is already "reliable and productive," it needs enhancement in order to play a role as a national facility. Accordingly, we requested funds principally for further automation of the telescope's control system, in order to make it more user friendly, and for an electrically cooled, large-format CCD camera for the echelle spectrograph (no more liquid nitrogen!). With the new camera, we will obtain much broader regions of the stellar spectra, making our data product more generally useful. In a future issue of this newsletter, we will report on progress with these hardware developments.

In return for the funding, we have committed Ritter to: perform service observations for community astronomers; maintain a public data archive; and provide training in telescope operation and in astronomical spectroscopy to students from other colleges and universities. Service observations have already begun. In fact, Ritter has provided spectra to

other astronomers for over a decade, but this activity will now be expanded. The public archive project is just beginning; grad students Greg Thompson and Dan Kittell are charged with transferring selected spectra from the present data archive (which is accessible only to people with accounts on astro1) to the public one. And the training program is still in the future, since we are just beginning the necessary publicity.

We are grateful to the NSF for this support and to all those who have contributed to the development of Ritter Observatory.

For more information, see our new Web pages: <http://ritter.astro.utoledo.edu/prest> and see also: <http://staging.noao.edu/catch/prest.html>

- Professors: Nancy D. Morrison & Karen Bjorkman

## BOB DEMPSEY NAMED NASA FLIGHT DIRECTOR



Dr. Robert Dempsey (UT Ph.D., 1991) has been named as one of NASA's nine new flight directors. Bob is fondly remembered as one of Ritter's dedicated and tireless observers during the late 1980's as early 1990's. He now joins an elite group at NASA with the responsibility for directing human space flights from Mission Control, Houston. Leading a team of flight controllers, support personnel and engineering experts, a flight director has the overall responsibility to manage and carry out Space Shuttle flights and International Space Station expeditions. A flight director also leads and orchestrates planning and integration activities with flight controllers, payload customers, International Space Station partners and others (think Ed Harris in the movie *Apollo 13!*).

According to the NASA press release:

“This is one of the most diverse classes of flight directors we’ve ever selected,” said Jeff Hanley, chief of the Flight Director Office. “These nine individuals represent the depth of talent we have among Space Shuttle and International Space Station flight controllers, as well as the changing nature of the flight control cadre. Since Christopher Kraft became the first flight director more than 40 years ago, only 58 men and women have had the privilege to guide U.S. human space flights.”

A student of Professor Bernie Bopp, Professor of Astronomy and Director of UT's Center for Teaching and Learning, Bob received his M.S. in Physics at UT in 1986 and his Ph.D. in physics with astronomy concentration in 1991. After working as a post-doc at the Joint Institute for Laboratory Astrophysics in Boulder, Bob worked for Computer Sciences Corp. as a resident astronomer on the Hubble Space Telescope from 1992 to 1997, and for United Space Alliance as a Command and Data Handling flight controller from 1997 to 2003. He joined NASA in 2003 as a Communications and Tracking Officer for the International Space Station.

- Dr. Bernie Bopp

## UT PHYSICS ALUMNUS '69, JUDGE ROBERT POLLEX APPLIES LAWS OF PHYSICS IN NEW ROLE



(Reprint with permission from the Toledo Blade)

With more than 20 years on the bench and 11 years in private law practice, Wood County Common Pleas Judge Robert Pollex is best known for his career in the courtroom.



What many don't know is that his first career was in a laboratory.

The Perrysburg resident received his bachelor's degree in physics from the University of Toledo, worked as an applied research physicist for Libbey-Owens-Ford for five years, and even received a patent for a device that measured the curvature of glass as it was being heated inside a massive furnace.

"I got a dollar for it plus my salary, but that's what I was being paid to do," he said with a laugh.

Appropriately, Judge Pollex was one of 20 Ohio judges named last week by the Ohio Supreme Court to take part in a national program that will train judges in the use of science and technology in the courtroom.

Two other northwest Ohio judges also were selected: Defiance County Common Pleas Judge Joseph Schmenk and Putnam County Common Pleas Judge Randall Basinger.

Over the next five years, the judges will receive advanced training in areas ranging from scientific method to the biology of mental disorders and then they will help train other judges in handling cases that involve scientific matters.

Ohio, Maryland, and California are working together on the project, known as the Advanced Science and Technology Adjudication Project. Ohio Chief Justice Thomas Moyer said their goal is to train 700 judges by the end of this decade.

"Today the boundary between courtroom and laboratory is blurred, challenging the role of judge as gatekeeper," Justice Moyer said. "These judges are making a serious commitment to help lead the way nationally to understand the scientific issues that impact our courtrooms."

Judge Pollex said judges act as "gatekeepers" in part by determining whether witnesses called as experts in particular fields are in fact qualified to testify. This occurs frequently in product liability cases as well as some criminal cases that rely on DNA evidence and other scientific questions.

"The judge's role is not deciding if you believe the person or not but deciding if their scientific method is reliable enough," he said.

Judge Pollex said he hopes the science and technology training will help judges filter out what he calls junk science, that is, methods and techniques not accepted by the scientific community.

During his 11 years on the common pleas bench and 14 as juvenile and probate court judge in Wood County, Judge Pollex has had the advantage of being able to understand scientific testimony that has come into play in a variety of cases.

He said his college coursework focused on physics and math, and it wasn't until he graduated in 1969 that he considered a nonscience career. He saw a news magazine piece about unemployed research physicists and decided he ought to have a backup plan. While he went to work at LOF, he enrolled in law school at UT because he could take all his classes at night.

After he received his law degree four years later, he was offered a job with the Ohio Environmental Protection Agency. The position would have enabled him to combine his background in science and the law, but he decided to stay close to home and opened a law practice in Bowling Green.

The two careers are not so different, he said.

"Law has a great deal of similarity to science because it's based on logic," Judge Pollex said. "You apply the law or the scientific principle to the facts."

In many ways, he has continued to rely on his background in science and the glass industry. In recent years, he has developed a serious passion for glass-blowing, displaying and selling his colorful vases and sculptures at area art festivals.

"People ask me how I got into glass-blowing," he said. "I got hooked on glass as a media when I worked at LOF."

*Dr. Robert Deck, retired faculty, related that he was his instructor between 1966 and 1968.*

## NEWS FROM RITTER PLANETARIUM



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The Ritter Planetarium / Brooks Observatory has maintained a reasonably successful year despite the loss of College budgetary support. In large part our success is due to the dedication of our one remaining full-time staff person, Associate Director Alex Mak. A full complement of public programming drew about 8000 visitors, and our continued high-quality school programming served about 20,000 children and teacher/parents during this year. We were not able to staff special events and workshops as we have in the past.

One small contribution to our continued survival was the institution of a required planetarium/observatory component in all the *Survey of Astronomy* (ASTR1010) sections. This component was treated as a text supplement, for which the students were charged an additional fee. As a result, together with contributions to printing and postage from the Department, we were barely able to cover our expenses.

We are continuing to work with the University Office of Development in the effort to secure funding from community sources to replace the monies lost from the College. Until we are successful, we are unable to expand our programming to meet the expanding needs of our schools and the community at large. Ultimately, we need an endowment of roughly one-half to one million dollars to provide the funding for re-hiring an Education Specialist and a part-time administrative secretary. If you wish to contribute to this goal, you may make a gift to the University of Toledo Foundation, with an annotation specifying the *Planetarium Progress Fund*. Your gift will be greatly appreciated. We are establishing a Wall of Stars to acknowledge our donors.

-Lawrence Anderson-Huang, Director

The Department of Physics & Astronomy was invited to participate in a mini-expo of materials science entitled "Strange Matters" on April 17<sup>th</sup> at COSI (*Center of Science Industry*). The UT-BGSU Chapter of the Materials Research Society facilitated activities in the Science Café which included:

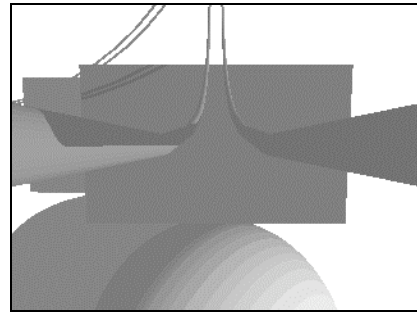
- Demonstrations of the physics of music by Prof. B.W. Bopp
- The Society of Physics Students exercising their winning entry in the Rube Goldberg competition
- Demonstrations of solar hydrogen by photoelectrochemical generation from water



Twelve students from UT's chapter of Society of Physics Students won UT's 17<sup>th</sup> annual Rube Goldberg competition. It was the first time a non-Engineering group participated in the UT competition. "A Night at the Movies" was the theme for their 28-step device that took about 30 seconds: ping-pong balls fell through the "Slinky Dog" from Toy Story, a cardboard Titanic rammed into a white sheet representing an iceberg, and Tarzan and Jane sliced off Darth Vader's hand and light saber, which launched a stuffed cow from behind a French castle *a la* Monty Python and the Holy Grail.

The national competition continued at Purdue University in April. At this competition, the Rube Goldberg method of changing batteries in a flashlight did not take a prize because the contraption aborted on each run – demonstrating once again that the laws of physics depend on longitude!

Kudos to the Rube Goldberg 12 and their advisor Professor Scott Lee. The students were: Nick Sperling, Jackie Must, Erin Hardy, Noel Richardson, Patricia Gallant, Dave Nero, Calley Blansett, Levi Gorrell, Paul Sell, Stephanie Torok, and Chris Wicker.



## Saturdays with Physics

During the summer of 2004 the Department of Physics and Astronomy hosted "Saturdays with Physics," a series of six morning outreach programs to explain the inner workings of the world to children in grades 5-12 and their parents and teachers. The program was organized with the support of a grant to Drs. Ale Lukasezew and Larry J. Curtis. This program is targeted at a broad audience, to showcase the research efforts at UT while demonstrating through hands-on experiences that science can be an exciting and enjoyable activity. The program also recognizes the importance of making parents and teachers well-informed so that they can help their children and students to make career decisions.

The free public programs were held in the McMaster Hall Lecture Room, with a complimentary breakfast reception from 9:30 until 10 a.m., followed by the presentation at 10 a.m. All of the programs were well attended, with 50-100 participants. The dates, presenters and topics were as follows:

- June 5 — Dr. Larry Curtis, discussed "What Is This Universe We Live in?" He explored the nature and behavior of the very small and the very large, using conceptual models and analogies to portray the modern world view held by scientists.
- June 12 — Dr. Lawrence Anderson-Huang discussed "Light and Color." The program examined what physicists and cognitive scientists are learning about how people "paint" the world in their minds.
- June 19 — Jim Solomon, Education Division of the American Vacuum Society, discussed "Vacuum Technology." Attendees explored technologies that use a low-pressure environment, such as space exploration, lighting, food procession and refrigeration.

- June 26 — Drs. Karen and Jon Bjorkman teamed up to discuss “Astronomy and Astrophysics.” They built a comet, turned the Earth into a peppercorn and the sun into a basketball, and walked all the way to Pluto during the course of the presentation.
- July 3 — Dr. Bernie Bopp covered “Music and Sound.” He demonstrated how sound, vibration and musical instruments work.
- July 10 — Dr. Al Compaan explored “Solar Energy: The 21st Century Power for Globally Connected Societies.” He explained how sunlight creates electrical power and discussed the local and global implications of solar power.

Feedback from the participants indicated that the program was very successful, and funds have been allocated to extend the series during the summer of 2005.

#### Summer 2005 Schedule:

- June 4: UT Physics Professor and Associate Dean of Arts and Science, Dr. Constantine Theodosiou will present: "Physics, what is it all about".
- June 11: UT Physics Professor Dave Ellis will present: “Albert Einstein, 1905-2005: Photons, gravitons, dark matter, and the accelerating universe.”
- June 18: UT Chemistry Asst. Professor Xuefei Huang will present: "Carbohydrates, sweet molecules of life"
- June 25: BGSU Physics Asst. Professor Bruno Ullrich will present: "Along the road-map of future communication systems: Photons replace electrons".
- July 2: WMU Chemistry Asst. Professor Sherine Obare will talk about "Nanotechnology: A big deal over small things"

-Larry J. Curtis

## CONGRATULATIONS!

**Dr. Nancy D. Morrison** was honored at the 19<sup>th</sup> annual Outstanding Women’s Awards sponsored by the University Women’s Commission and the Society of Engineers. Dr. Adolf Witt nominated his colleague for this recognition.

## FACULTY RESEARCH, GRANTS AND AWARDS

The Department currently is receiving more than 40 externally funded grants and contracts. Listed below are some of our faculty members receiving *new* grants and awards during this past year:

#### ▪ JACQUES AMAR

Grant awarded: “Effects of Steering and Shadowing on Nanoscale Pattern Formation in Oblique Incidence Epitaxial Growth”, **J.G. Amar** PI, \$80,000, 9-1-2004/8-31-2006. Petroleum Research Fund of the American Chemical Society.

Grant awarded: "Parallel Data Mining for Nanoscale Kinetic Monte Carlo Simulation Models", **J. G. Amar** Co-PI with co-workers at Kansas State University, UT contribution \$220,000, 10-1-2004 – 9-30- 2009. National Science Foundation.

Fellowship award: Emory University Emerson Center Visiting Fellows program, \$4000, 2-15-2005/4-15-2005.

**J. G. Amar** also gave invited talks at the International American Vacuum Society meeting in Anaheim, CA (November 2004) and at the American Physical Society Meeting in Los Angeles, CA (March 2005).

#### ▪ Xunming Deng

Grant awarded: U.S. Dept of Energy Award to Midwest Optoelectronics (co-founded by **X. Deng**) \$2,921,501 with subawards to U. Toledo (**R. Collins**, **A. Compaan** \$877,000), NREL (John Turner), United Solar, LLC (Jeff Yang). (project duration, three years)

- **Thomas Kvale/Ale Lukaszew**  
 Grant awarded: NSF-REU: “Research Experiences for Undergraduates”. (Grant # 0353899). PI: **Kvale**, Co-PI: **Lukaszew**. Grant amount: \$210,000. UT contribution: \$76,808. Total amount: \$286,808 (4-1-2004/31-3-2007).
- **Ale Lukaszew**  
 The Research Corporation named Dr. Lukaszew a Cottrell Scholar. [Research Corporation, Title: “Investigating the structural and magnetic properties of nano-magnets”. Grant amount: \$75,000. UT Contribution: \$91,465. Total amount: \$166,465 (6-1-2004/5-31-06)]  
 Grant awarded: NSF-DMR. Title: “Highly anisotropic nano-magnets”. Grant amount: \$130,184. UT Contribution: 85,792 Total amount: \$ 215,975 (June 1, 2004/May 31,2006)  
 Grant awarded: Petroleum Research Fund, ACS grant. “Magnetic nanostructures”. Grant amount: \$80,000. UT contribution: \$80,646. Total amount: \$160,646 (9-01-04/ 8-31-2006).  
 Grant awarded: American Association for the Advancement of the Science, WISC program. Title: “Magneto-transport studies on chemically ordered alloys”. Amount: \$4,000 (5-1-2004/30-6-2004).  
 Grant awarded: DOE subcontract through Wayne State University: Cormier, PI; Lukaszew is PI at UT. “Alternative use of photonic crystals to allow low loss of visible light”. Grant amount: \$40,000. UT Contribution \$20,804. Total amount: \$60,804 (7-1-2003 - 12-31-2004).
- **Nancy Morrison/Karen Bjorkman**  
 Grant awarded: **Nancy Morrison** (PI) and **Karen Bjorkman** (Co-PI) have been awarded an NSF PREST (Program for Research and Education on Small Telescopes) grant for Ritter Observatory (\$412K over 3 years).
- **Jon Bjorkman**  
 Grant awarded: **J. Bjorkman** (Co-PI) on new grant from NSF with Alice Quillen (Univ. Rochester), who is PI. This grant of \$150K/yr for 3 years is to determine observational signatures of planet formation to test theories of protoplanetary disks around other stars.
- **Larry Curtis**  
 Opening speaker for the 2004 UT Authors and Artists Exhibit at the Ward M. Canady Center for Special Collections, November 14, 2004.
- **Alvin Compaan**  
 Co-organizer with Daniel Lincot, Hans Werner Schock, Ayodhya Tiwari, Takihiro Wada, European Materials Research Society Symposium, “Thin Film Chalcogenide Photovoltaic Materials.” Strasbourg, France, May 24-28, 2004
- **Alvin Compaan/Xunming Deng/Rob Collins/Victor Karpov/Dean Giolando (Chemistry)**  
 Grant awarded: Ohio Department of Development, “Center for Photovoltaic Electricity and Hydrogen—Enhanced Activities,” \$99,200 to provide operating funds for enhanced activities related to an earlier grant of \$2M awarded by Gov. Taft on October 2003.
- **Sanjay Khare**  
 Grant awarded: URAF grant from UT for \$9900 for summer 2005.  
 Awarded computer time at the Ohio Super-computer Center and the National Center for Supercomputing Applications (NCSA).
- **Alvin Compaan/Rob Collins/Victor Karpov/Dean Giolando (Chemistry)**  
 “Fabrication and Physics of CdTe Devices by Sputtering”, NREL Thin Film PV Program, \$1,155,000 3 years, starting 3/1/05.
- **Xunming Deng/Rob Collins**  
 “Fabrication and Characterization of a-Si Based Solar Cells”, NREL Thin Film PV Program, X. Deng (P.I.) and R. Collins, \$1,183,000, 3 years, starting 3/05.

## Physics Summer Camp

Physics Summer Camp will convene June 20-24, 2005. This outreach program is a free to high school student experience at UT. Hands on activities, demos, trivia....

Pictured below are camp participants of a previous summer at the Heavy Ion Accelerator with Dr. Larry Curtis.



## SUMMER 2005 REU STUDENTS

Research Experience for Undergraduate Program  
funded by National Science Foundation.

DeMarco Camper	University of Toledo
Sherrif Ceesay	Wilberforce University
Miguel Cervoni	Virginia Military Institute
Zachary Ferraro	Earlham College
David Hunley	Morehead State Univ.
Andrew Larkoski	University of Washington
Christopher Muscatello	Case Western Reserve
Meredith Rogers	Marietta College
Stephanie Torok	University of Toledo
Jacob Warner	University of Wisconsin
Kevin Wells	Ohio Northern University
Randolph White	Francis Marion Univ.

Drs. Thomas J. Kvale and Ale Lukaszew are the directors of the NSF-REU program.

## *The UT Endowment Fund Campaign*

Alumni and friends of the Physics and Astronomy Department are urged to remember this department as they consider giving and pledging. The department has several established funds some of which are endowed and others that may not yet be endowed or may have dipped below the threshold required by the UT Foundation for returning spendable earnings that can be used, for example, for scholarships, honoraria for speakers, etc. These include:

### *John J. Turin Memorial Fund*

Established to honor former Department Chair and Dean of the Graduate School, John J. Turin. John Turin was most responsible for building UT's first Ph.D. program in the 1960's. 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. This fund has recently dipped below the endowment level due to the market drop.

### *Ritter Observatory Publication Fund*

This fund helps to support the cost of publishing the Ritter Observatory annual report as well as student papers when possible.

### *Reach for the Stars Fund*

This account has recently been set up to begin an endowment that will eventually be used to support the buy-in to an international telescope consortium and ancillary activities. This is a major goal of the Department.

**DAVID PEARSON** has successfully defended his Master's thesis September 2004. Dr. Ale Lukaszew, Advisor.

### ***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.

### ***Sigma Xi Dion D Raftopoulos Outstanding Faculty Research Award***

This is a perpetual memorial in honor of Dion D. Raftopoulos for support of the Sigma Xi Award for Outstanding Research at UT. This award remains one of few awarded by the faculty to peers in recognition of their outstanding contributions to the research enterprise at the UT. We are proud to note that 12 of the total 30 winners of this award through 2005 have been from the Department of Physics & Astronomy.



## **GRADUATE STUDENTS**

**ALICE NOREYAN**, co-advised by Jacques G. Amar (Physics & Astronomy) and Ioan Marinescu (MIME) successfully defended her Ph.D. in Mechanical Engineering, entitled "Molecular Dynamics Simulations of Nanoindentation and Nanoscratching of SiC" on May 18, 2005.

**GREG HODGES**, winner for the 2005 Physical Sciences and Engineering Oral Division of Sigma Xi research symposium. He also successfully defended his Ph.D. dissertation in May 2005. Thomas J. Kvale, Advisor.

**GUANGZHOU (ED) CHEN** has successfully defended his Ph.D. thesis entitled "Analysis and Design of Planar Waveguide Elements for Use in Filters and Sensors". Brian G. Bagley, Advisor.

## **DEPARTMENTAL AWARDS**

2005 Physics & Astronomy Outstanding Undergraduate Student Award  
**Levi Gorrell**

C.V. Wolfe Scholarship  
**Stephanie Torok**

Stollberg Undergraduate Academic Achievement Award  
**Paul Sell**

Elgin C. Brooks Memorial Astronomy Scholarship  
**Michael Stone**



The UT Alumni Association wants to hear from you! Check out their web pages at: <http://www.toledoalumni.org/>. The Alumni Association has enrolled more than 500 new members in the past three months! Join the movement.