

WAVES

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Department Chair's Comments



— Al Compaan

It has truly been an exhilarating year and a half since the last newsletter in June 2005! (So much so that we are delayed by about six months.) During the academic year 2005-06, we welcomed new assistant professors Sylvain Marsillac in fall 2005 and Tom Megeath in spring 2006. Both bring remarkable experience to our teaching, mentoring and research programs. Tom joins our astronomy and astrophysics group and Sylvain joins our thin-films and PV group. Both groups were selected for new positions through internal competitions for selective excellence. Midyear we were informed that The University of Toledo was going to merge with the Medical University of Ohio (formerly Medical College of Ohio). This merger was approved by the boards of trustees, the Ohio Board of Regents and the Ohio Legislature, and it took effect July 1, 2006. With the approval of the two boards of trustees, UT President Dan Johnson stepped aside and MUO President Lloyd Jacobs assumed the presidency of the merged institution.

During the year, we completed the search for the second of three new astronomy faculty authorized under the cluster hiring program. Rupali Chandar accepted this position and will have a delayed start in August 2007, allowing her time to complete several projects that she is leading at Johns Hopkins University. Now, in the academic year 2006-07, we are in the middle of three additional faculty searches. Two of them were authorized for the third year of the cluster-hiring program — the third new astronomer and the second of two positions in the advanced films and coatings (PV) area. The third position is a replacement for our former chair, Phil James, who retired in spring 2006. He continues to be very active in his Mars research program from his new home in Prescott, Ariz., where I understand he sees emeritus professor Bill Williamson frequently.

There were three other faculty retirements last spring. These came in the first of three years of a new faculty retirement incentive program. Larry Curtis, Dave Ellis and Adolf Witt had the seniority to retire the first year. Thus, with Phil, Larry, and Adolf, the department lost three Distinguished University Professors this spring! However, we fully expect our Toledo retirees to remain active in departmental affairs. They will have offices in the department, can participate as emeritus professors in teaching for three years, and will continue their research. This is a bonus for the department; we will not lose their sage advice!

More faculty changes are to come. After many strategic planning discussions over the spring and fall, the faculty has sent forward four proposals requesting that vacated faculty lines be filled. We feel we made compelling arguments for new faculty lines in atomic physics at surfaces, nano-photonics, astrophysics and medical physics. Allocations will be decided at the provost level.

Also during the past year, two of our faculty were chosen for new administrative positions. Lawrence Anderson-Huang was chosen to direct the Master of Liberal Studies Program, and Tom Kvale was chosen to be the new director of the Office of Undergraduate Research.

Our faculty continue to be active in research and successful in winning extramural funding. Several examples are highlighted inside. As a result of external funding support for graduate student RAs, our graduate student population continues to grow. It has now reached 50 students, with 23 TAs and most of the rest supported on RAs. I think we had a record number of Ph.D.s finish in the last year and a half. Several students won awards.

Two key staff people retired in August — Cheryl Sautter, our business services officer, and Robert Burmeister, our observatory and materials science lab technician. They made huge contributions to the success of our department during the years. After searches that lasted one to two months, we welcomed Stephany Mikols from the Department of Environmental Sciences as our BSO, and Troy Berchem from Wisconsin as our Ritter Observatory and McMaster Hall research lab technician.

We are extremely proud of our SPS chapter, which again won a best chapter award and went head-to-head with the nation's best student scientists and engineers to win second place in the national Rube Goldberg contest at Purdue University.

Stories on these milestones are in this newsletter, which has been skillfully edited again by Willie Brown. We are indebted to her for this diligent effort.

Again, we are always eager to hear from you. Please send an e-mail or surface mail note or call us!

— Al Compaan
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139 Years of Service

Excerpts from UT News May 15, 2006



The Department of Physics and Astronomy celebrated 139 years of leadership by Larry Curtis, Dave Ellis, Phil James and Adolf Witt during a retirement reception held in their honor on May 3, 2006. Larry, Dave and Adolf were hired by John Turin and were key faculty in building our Ph.D. program, which began in the 1960s. Phil led the department as chair for 14 years. They are irreplaceable! Excerpts below come from UT News:

Witt, Distinguished University Professor of Astronomy, joined our UT faculty in 1967. He is recognized worldwide as an authority on cosmic dust. "I plan to continue doing astronomical research at UT, only now full time," Witt said. "Working as an astronomer at UT has been good; I enjoyed every day of my time here."

Curtis, Distinguished University Professor of Physics, has been at UT since 1963. He is internationally known for his research on atomic structure and has held visiting scientist positions with universities in Sweden, Germany, Denmark, Norway and France. "I've worked in some of the most prestigious labs in the world with some of the field's most eminent scientists," Curtis said, crediting part of his success to the flexibility UT offered him over the years.

Ellis, professor of physics, has been a faculty member at the University since 1965 and chair for many years. He was a guest researcher at the University of Lund in Sweden, and he helped coordinate a summer research program funded by the U.S. National Science Foundation that brought top undergraduates in physics and astronomy from across the country to the UT campus. "The University has given me a terrific opportunity to do what I love to do, which is physics," Ellis said.

James, DUP of Physics and Astronomy, joined the UT faculty in 1990 and has been studying Mars for nearly three decades. He was selected principal investigator of a team that became the first to use the Hubble Space Telescope to study the Red Planet. One of their first images appeared on the cover of Life magazine in 1991. James also was involved with the NASA Pathfinder and Mars Global Surveyor missions.

DR. ALVIN D. COMPAAN NAMED DISTINGUISHED UNIVERSITY PROFESSOR

Excerpts from UT News June 6, 2006

Although the department lost three Distinguished University Professors due to retirement, we gained one when Al Compaan was named one of two new "DUPs" in spring 2006. "I am indebted to UT for strong support and encouragement ever since I transferred here in 1987," Compaan said. "This has been a very stimulating and supportive environment — department, college and University — with great faculty and staff and student colleagues. They all make it easy to succeed. It is exciting to be a small part of UT's contribution toward building a foundation for solar energy to change the world."

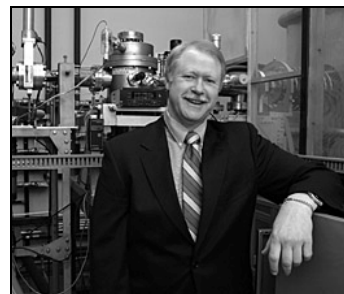
UT has 12 Distinguished University Professorships, which are renewable. The Academic Honors Committee selects professors based on exemplary teaching, research, scholarship and professional service. Each receives an annual grant of \$5,000 for five years. The grants are funded by the UT Foundation.

Since arriving at the University in 1987, Compaan has been a driving force in alternative energy research, receiving more than \$11 million in grants from the U.S. Department of Energy, the U.S. Department of Defense, the state of Ohio, First Solar and others, and publishing more than 140 articles in professional journals. His area of expertise: cadmium telluride photovoltaics, also known as thin-film, second-generation solar cells.

Dr. Thomas J. Kvale

New Director of the Office of Undergraduate Research

Excerpts from UT News March 28, 2006



"This position was created in order to showcase the inseparable relationship between faculty research and undergraduate teaching," said Dr. Carol Bresnahan, UT vice provost for academic programs and policies. "Tom Kvale brings a strong track record of involving his undergraduates in his own research, and we are confident he will be able to apply this experience more broadly across other disciplines on campus."

Dr. Frank Calzonetti, UT vice provost for research, associate vice president for development and chair of the search committee, said, "Dr. Kvale is someone who has some really good experience. He is committed to supporting research in his areas, as well as those across the institution."

Kvale's appointment as director begins May 15 and runs through June 30, 2009. "It's an honor," said Kvale of being named director. "I'm looking forward to seeing the breadth and depth of research here at UT. I know undergraduate research is vibrant and strong and has been for many years now. With the merger of UT and MUO, I'm confident that the breadth and depth will grow dramatically — maybe even in ways we haven't yet imagined."

Society of Physics Students Rube Goldberg Team Wins 2nd Place

Excerpts from UT News April 10, 2006



SPS Rube Goldberg Team after winning local competition (left to right) Erin Hardy, Adam Gray, Nick Sperling, Tricia Gallant, JT Laverty, Dave Nero, Paul Sell, Noel Richardson, and Josh Thomas.

The Society of Physics Students won second place at the National Rube Goldberg competition held at Purdue University on Saturday, April 1, 2006. Purdue's team, the Society of Professional Engineers, won first place and a team from the University of Texas won third. Other universities present at the national competition were Texas A&M and Ferris State.

The competition is based on Rube Goldberg's cartoons of machines that accomplished simple tasks in multiple complicated steps, much like the Milton Bradley game Mousetrap. This year's task was to cut five individual pieces of paper into strips using at least 20 steps. In addition, each machine was required to fit within a 5'x6'x5' volume.

Each competing team designed a unique machine with a theme. UT's theme was "Monsters," and SPS members designed their machine to look like a child's bedroom that had become infested with friendly monsters. The team completed the task by dragging a monster-shaped cart with three razor blades mounted underneath



"Shredder" the monster that rode the cutting cart across the 5 pieces of paper.

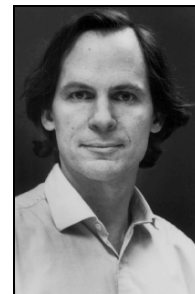
across five sheets of paper mounted on the "bed."

Students began constructing the machine in January, meeting twice a week for several hours at a time. The SPS team spent more than 500 hours working on the machine. The department provided them with an area under the large lecture hall to work on the machine, which they lovingly referred to as "The Bat Cave." The team's funding came from the SPS budget.

Prior to the national competition, our team won first place at the local competition held at the UT College of Engineering. The SPS team competed against Theta Tau chapters from The University of Toledo and the University of Michigan. The UT SPS students were the only physicists at the local and national levels of the competition; all other teams were made up of engineers.

Professor Scott A. Lee is the advisor to the SPS.

DR. LAWRENCE ANDERSON-HUANG NEW DIRECTOR MASTER OF LIBERAL STUDIES PROGRAM



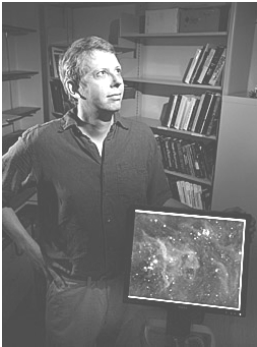
In addition to his position as professor of Astronomy and Physics, Lawrence Anderson-Huang was named the new director of the Master of Liberal Studies Program (MLS) in November 2005.

Established in 1989, the MLS Program is especially designed for the adult learner who seeks to combine the challenge of graduate work with the freedom to explore new fields of knowledge.

Lawrence has many interdisciplinary interests that range from serving as chair of the Curriculum Committee of the College of Arts and Sciences Council to his activities in the visual and performing arts as a painter and set designer.

TOM MEGEATH: RESEARCHER HUNTING FOR NEWBORN STARS IN ORION NEBULA

Excerpts from UT News August 14, 2006



Tom Megeath is our newest faculty member and began his position March 31, 2006. Soon after, he was in the news as one of the leaders on the Spitzer Space Telescope.

Megeath, assistant professor of astronomy and physics, used NASA's Spitzer Space Telescope to take an infrared image of the Orion nebula, and the hot shot was featured in the September issue of *Astronomy* magazine.

"This is one out of about 30 regions of star formation we're mapping," he said. "What's nice about this project is that it's a very famous object, the Orion nebula. What makes Orion great for studying star formation is that it's the closest region where massive stars are forming."

For two years, Megeath has worked on data using images from the Spitzer Space Telescope. While at the Harvard Smithsonian Center for Astrophysics in Cambridge, Mass., he was part of a team that built the camera for the telescope. Once the space-based infrared observatory was launched, Megeath led the observations of Orion.

The image that appeared in *Astronomy* magazine and on the Jet Propulsion Laboratory (JPL) Web site at <http://www.jpl.nasa.gov/news/news.cfm?release=2006-099> is just part of the whole Orion map. JPL, Pasadena, Calif., manages

NASA's Spitzer Space Telescope mission. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology, also in Pasadena. Read more on this project at the center's site.



Spitzer's Orion Tom Megeath, UT Physics and Astronomy

Visiting Scholar from China

Dr. Zhang Jingchao of Yanshan University's College of Sciences served as a visiting scholar in fall 2006. Professor Emeritus Robert Deck and Professor Brian Bagley hosted the visit and incorporated Zhang into their research group on photonics and optical sensors. The visit was facilitated by Dr. Martin Abraham, dean of the College of Graduate Studies, through the cooperative agreement between UT and Yanshan University.

\$3.6 MILLION FEDERAL RESEARCH AWARD TO START ALTERNATIVE ENERGY CENTER

Excerpts from UT News November 1, 2006



Congresswoman Marcy Kaptur and Legislative Assistant Richard Shordt, center, talked with Dr. Robert Collins, UT professor of physics and Nippon Electric Glass Endowed Chair in Silicate and Materials Science (left), and President Lloyd Jacobs (right) after a press conference in October.

U.S. Rep. Marcy Kaptur was on the Main Campus in October to announce a \$3.6 million award from the U.S. Department of Defense to establish a center for solar energy and hydrogen at The University of Toledo.

"This University is going to help lead America into a new day of energy independence," Kaptur said in the crowded McMaster Hall lobby. "In fact, this University is going to be a world leader. The Department of Defense joins as a new partner because it also understands that America has to change," Kaptur added. "The Army, Air Force, Navy and Marines know they can't depend on imported oil. They know we have to find new ways of powering the future."

UT President Lloyd Jacobs expressed the gratitude of the University community for Kaptur's efforts in securing the funding. "This is a celebration of perseverance," Jacobs said. "It's a big dream to think we can harness the energy of the sun, but it's actually not just our democracy but all of humanity that can benefit from this kind of work."

Establishment of a Department of Defense research center for alternative energy was UT's top federal research priority during the current federal fiscal year, and Kaptur, a senior member of Congress, championed the project from her position on the defense subcommittee of House Appropriations.

The announcement comes on top of five previous \$1 million federal awards to support the University's photovoltaic research. Within the past year, second-generation thin-film products have achieved commercial manufacturing success, but existing designs will not meet the projected needs of the U.S. military.

In her remarks, Kaptur acknowledged the contributions of the late Harold McMaster, namesake of the building where the press conference was held. She said McMaster was "a modern-day Thomas Alva Edison," an inventor and entrepreneur who saw the potential of glass not just for automobiles and building materials, but also for the production of energy.

FACULTY IN THE NEWS

DR. KAREN S. BJORKMAN has been elected to serve a three-year term (February 2006-February 2009) as a member of the Electorate Nominating Committee of the Section on Astronomy (Section D) of the American Association for the Advancement of Science (AAAS). She also is elected as an at-large member to the executive committee of the Graduate Council for next year.

DR. SYLVAIN X. MARSILLAC AND **DR. SANJAY KHARE** have been granted full membership on the graduate faculty.

DR. R. ALE LUKASZEW has been selected as a Master Teacher for the 2006-07 and 2007-08 academic years.

GRADUATE STUDENT ACCOMPLISHMENTS

MARS RESEARCH NOTICED



DAVID HORNE may not have discovered life on Mars, but his findings about Martian dust storms have scientists talking. Horne, a graduate assistant for Dr. Lawrence Anderson-Huang, presented an abstract with a method of observing Martian dust storms in colder weather near the poles of the planet.

David beat out researchers at Caltech University for a method of observing dust storms on Mars while using computer models to simulate results, which were then mirrored by his findings.

SIGMA-XI'S BLUE RIBBON AWARD

MICHELLE SESTAK won the coveted blue ribbon award for her presentation at the Sigma-Xi National Symposium at the Renaissance Center in Detroit. Much of her success and thanks goes to Jonathan Skuza for his efforts, too. Michelle is a graduate student advised by Dr. Lukaszew.

CONGRATULATIONS!

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

DR. BONCHO BONEV, Ph.D.

DR. JENNIFER DRAYTON, Ph.D.

DR. WENHUI DU, Ph.D.

DR. XIANGXIN LIU, Ph.D.

DR. OLEG POLOMAROV, Ph.D.

DR. YURIY SOSOV, Ph.D.

DR. JOHN WISNIEWSKI, Ph.D.

DR. UMA VIJH, Ph.D.

ERIN HARDY, M.S.

DAVID HORNE, M.S.

NOEL RICHARDSON, M.S.

FENG SHI, M.S.

VALERY BOROVNIKOV, M.S.

GIRIDHAR NANDIPATI, M.S.



IN MEMORIAM

George Robinson "Jud" Mather Jr., adjunct professor of physics, passed away July 2006.

Guenther F. Buening, master machinist emeritus for the Department of Physics and Astronomy, passed away September 2006.

Maj Rosander Curtis, wife of Dr. Lorenzo "Larry" Curtis, Professor Emeritus of Physics and Astronomy, passed away October 2006.

Darlene Tyson, retired Ritter Planetarium Secretary, passed away December 2006.

RESEARCH ON MAGNETIC MATERIALS

Excerpts from UT News December 1, 2006



Dr. Ale Lukaszew, left, worked on an experiment with Dr. Cecilia Sanchez-Hanke, center, and Dr. Raquel Gonzalez-Arrabal, right, at the National Synchrotron Light Source.

Dr. Lukaszew, associate professor of physics, worked with Dr. Sanchez-Hanke of the Brookhaven National Laboratory in Upton, N.Y., and Dr. Gonzalez-Arrabal, postdoctoral associate at the University Autónoma of Madrid in Cantoblanco, Spain, on research that has attracted national interest.

Their investigation, "Nitrogen Polarization in Iron Nitrides," was featured in the National Synchrotron Light Source's Science Highlight section on the Web at

www.nsls.bnl.gov/newsroom/science/2006/09-Sanchez-Hanke.htm.

The trio's research yielded an unexpected result.

This finding has major implications as iron nitrides have shown great potential for use in magnetic devices. "They could be used in the sensing heads for hard drives in computers," Lukaszew said.

Lukaszew, Sanchez-Hanke and Gonzalez-Arrabal submitted a proposal to test an iron nitride compound in thin-film form, and Brookhaven National Laboratory awarded them four days of beam time at the National Synchrotron Light Source, which is a national user research facility funded by the U.S. Department of Energy.

She believes the work is significant for its practical applications, as well as for boosting the University's research reputation.

"Being featured in the National Synchrotron Light Source's Science Highlight section is not only important because of the merit of the discovery, but also because it showcases UT's efforts in research at the national and international levels," Lukaszew said.

Research Experiences for Undergraduates 2006



The summer 2006 NSF-REU program in physics and astronomy at UT gave enhanced research opportunities to 13 undergraduate students from 11 colleges and universities in 10 states, from New York to Louisiana and Minnesota. Of these 13 students, nine were fully funded by the REU grant, one was fully funded by the department as its pledge of support to the REU grant, and three were partially funded by external grants. The NSF-REU grant supplemented the other funding sources for these three students so that their level of support was commensurate with the students fully supported by the REU grant. This policy of supplementing external grant support allows us to involve more students (and faculty members as mentors) in the program than we could do with just the REU grant alone.

Student participants were chosen competitively from the 102 applications from students in 30 different states in all regions of the United States. The participants were serious and talented young scientists who tackled substantial problems and participated in all stages of a project, from formulation to conclusion, including oral and written presentations of results. The initial Web announcement (with secondary links to additional material) can be found at:

www.physics.utoledo.edu/~wwwreu/reusummer2006/nsf-reu2006a.htm

2006 REU STUDENTS: **Marian Axente** (University of Tennessee, Chattanooga); **Brian Bismack** (Michigan State University); **William Booth** (SUNY, Fredonia); **Robert Davidson** (University of Louisville); **Anna Dupay** (Macalester College); **Amber Ferguson** (Mount Union College); **Christopher Galyean** (Louisiana Tech University); **Shellie Huether** (University of Missouri, Rolla); **Kristen Jones** (University of Wisconsin, Madison); **Mary Lin** (Northwestern University); **Daniel Moomey** (The University of Toledo); **Jason Owens** (The University of Toledo); and **Paul Sell** (The University of Toledo). 2006 GLENN-STOKES SCHOLARS also shown: **Kimberly Morton**, **Ahmed Giwa** and **Aaronica Bivins**, all from the University of Toledo.

ENERGY INNOVATIONS I



Excerpts from UT News

Al Compaan and his wife, Mary, are recipients of one of the Governor's Awards for Excellence in Energy Efficiency, awarded November 2005 in Columbus, Ohio. The awards honor individuals and businesses that have used innovative methods to improve energy efficiency, the environment and Ohio's economic competitiveness.

They had solar panels installed on the roof of their newly built house in Holland, Ohio. The solar panels provide the power for the house and a battery-operated electric truck that he uses to commute to the University, a round trip of about 20 miles per day. "The solar panels are connected through an inverter to the electric grid so that excess power not needed in the house will flow into the Toledo Edison power grid," Compaan said. "In the evening and on cloudy days, the house takes electricity back from the grid — just like a normal house."

Because of Ohio's net metering utility regulation, the Compaans pay Toledo Edison only for their net usage. "We sized our photovoltaic array at 4.3 kilowatts to be able to generate as much electricity as we use for the house and the truck," he said. "So far, after 24 months, our net electricity usage has cost \$200." And if the power lines go out, their system is designed so that the house can be plugged into the truck batteries for power.

To the Compaans' knowledge, their solar house and vehicle are the only such setup in the world. The Compaans moved into their home during December 2004. They estimated the solar home saves 11,000 pounds of carbon dioxide emissions each year and the electric pickup truck saves about 400 gallons of gas each year.

Al is particularly proud of the fact that the solar panels were manufactured by First Solar in Perrysburg, OH, using Pilkington (LOF) glass and CdTe thin-film coatings. UT has a long history of collaborations with First Solar and its predecessor, Solar Cells Inc., which was founded by Harold McMaster. Current and former First Solar employees include UT Physics and Astronomy graduates and postdoctoral students Upali Jayamaha, Akhlesh Gupta, Geoff Rich, Eugene Bykov, Dan Grecu, Yann Roussilon (chemistry), and Diana Shvydka. Professor Victor Karpov was formerly a senior scientist at First Solar.

More about their house and current performance can be found on Al and Mary's personal Web site:
<http://home.earthlink.net/~alcompaan>

ENERGY INNOVATIONS II

Excerpts from UT News



shingles.

Another faculty member practicing what he teaches is Rob Collins. He took a fully building-integrated approach to thin-film PV for his new home. Rob is ardent: "Every house built today without solar power is a missed opportunity." About a year ago, Collins and his wife, Linda, moved into their custom-built home, outfitted with 268 Uni-Solar roofing

The Uni-Solar photovoltaic shingles used on Collins' house in Maumee dispel several myths about solar panels. First, they are barely noticeable — gone are the days of large, bulky solar panel units in one's yard. "Developers who build with them like them because they blend well into the roof of the house," Collins said.

Second, they can work even when there is partial shade. "People ask why we have so many trees nearby the house," Collins said. Solar cells work best when picking up direct light from the sun. But the solar shingles are "effective at picking up scattered light — that is light that hits clouds or filters through the leaves on trees."

The third myth is the expense of solar equipment. "They are commercially available at a reasonable cost," he said. "There is assistance available ... a state of Ohio grant can pay \$5 a watt up to \$25,000 of the system's cost." Collins added there is a \$3,000 federal tax credit available for solar systems brought online in 2006. The Collinses' 4.5 kilowatt system cost \$37,460 total — but that was without an Ohio grant because "this system was too advanced" to fall under the current state guidelines. He believes the cost will go down as roofers and electricians become more experienced in installation and as advancements are made in the solar materials.

This solar technology also can work in conjunction with other energy-saving innovations. Collins' house is part of the Decker Homes' Energy Star Deer Valley subdivision, where each house conforms to specific energy guidelines. His home has argon-gas-filled wood windows with heat-reflecting glass; a high-efficiency gas furnace; fluorescent lighting; and high-performance insulation.

But that doesn't mean he and other members of UT's photovoltaic research team can hang up their lab coats yet. "The solar shingles are about 7.5 efficient, meaning 7.5 percent of the power in the sunlight that impinges on the shingles will generate electricity," he said. "But we're working to find ways to make them more efficient and at higher rates."

RESEARCH, GRANTS AND AWARDS

The Department of Physics and Astronomy proudly announces \$3.5 million in research grants for fiscal year 2006. Many grant titles are listed below, though some continuing grants may not be listed:

Investigator: R. Ale Lukaszew
Sponsor: American Chemical Society
Project Title: Magnetic Nanostructures
Award: \$8,000

Investigators: Xunming Deng and Robert Collins
Sponsor: National Renewable Energy Laboratory
Project Title: Fabrication and Characterization of Advanced Triple-Junction Amorphous Silicon Based Solar Cells
Award: \$330,000

Investigator: Philip James
Sponsor: NASA Goddard Space Flight Center
Project Title: Mars Water Ice Clouds
Award: \$26,800

Investigator: Steven Federman
Sponsor: NASA Goddard Space Flight Center
Project Title: Molecular Hydrogen in the Interstellar Medium
Award: \$50,636

Investigators: Alvin Compaan, Victor Karpov, Robert Collins and Dean Giolando
Sponsor: National Renewable Energy Laboratory
Project Title: Fabrication and Physics of CdTe Devices by Sputtering
Award: \$303,193

Investigator: Alvin Compaan
Sponsor: Dow Corning Corporation
Project Title: Evaluation of New Substrate Materials for PV
Award: \$10,302

Investigators: Thomas Kvale and Ale Lukaszew
Sponsor: National Science Foundation
Project Title: Research Experiences for Undergraduates in Physics and Astronomy
Award: \$70,000

Investigators: Alvin Compaan, Xunming Deng, Robert Collins, Sylvain Marsillac, Dean Giolando, and Victor Karpov
Sponsor: Air Force Research Lab — Kirtland
Project Title: Flexible and Lightweight Thin-Film Solar Cells Based on a Si and CdTe
Award: \$400,000

Investigator: Thomas Megeath
Sponsor: Jet Propulsion Laboratory
Project Title: Mapping the Structure of Dark Filaments in OMC3 with the IRS
Award: \$30,137

Investigator: Thomas Megeath
Sponsor: Jet Propulsion Laboratory
Project Title: A Fresh Look at Distributed vs Clustered Star Formation: IRAC and MIPS Imaging
Award: \$86,744

Investigator: Constantine Theodosiou
Sponsor: The Ohio State University Research Foundation with funding from NSF
Project Title: The Ohio Science and Engineering Alliance
Award: \$34,198

Investigators: Alvin Compaan, Dean Giolando, Victor Karpov and Robert Collins
Sponsor: National Renewable Energy Laboratory
Project Title: Sputtered II-VI Alloys & Structures for Tandem PV
Award: \$252,334

Investigator: Sylvain Marsillac
Sponsor: Ohio Board of Regents
Project Title: Improved Materials and Processing for High Efficiency Thin-Film Tandem Cells Based on Cu(In,Al, Ga)Se2
Award: \$12,000

Investigator: Constantine Theodosiou
Sponsor: The Ohio State University Research Foundation, with funding from NSF
Project Title: The Ohio Science and Engineering Alliance
Award: \$12,000

Investigator: Robert Collins
Sponsor: NASA Headquarters, with funding from Pennsylvania State University
Project Title: Integration of Quantum Dots into Protocrystalline Silicon Solar Cells
Award: \$25,000

Investigators: Xunming Deng and Alvin Compaan
Sponsor: MWOE, LLC with funding from Edison Materials Technology Center
Project Title: Development of Improved Materials for Integrated Photovoltaic-Electrolysis Hydrogen Generation Systems
Award: \$49,003

Investigator: Karen Bjorkman
Sponsor: U.S. Civilian Research and Development Foundation
Project Title: High Resolution Spectroscopy and Spectropolarimetry: Application to Stars at Critical Evolutionary Stages
Award: \$8,260

Investigator: Steven Federman
Sponsor: NASA Goddard Space Flight Center
Project Title: Oscillator Strengths for Ultraviolet Atomic and Molecular Transitions
Award: \$85,000

Investigator: Adolf Witt
Sponsor: National Science Foundation
Project Title: The Smallest Interstellar Grains: Optical/Near-IR Emission from Nanoparticles
Award: \$86,244

Investigators: Charlene Czerniak (Judith Herb College of Education), 23 Co-PIs including Bernard Bopp and Constantine Theodosiou.
Sponsor: U.S. Department of Education
Project Title: UToledo, UTeach, UTouch the Future (UT3)
Award: \$6,019,447 for 5 years.

Investigator: Robert Collins
Sponsor: NASA John H. Glenn Research Center at Lewis Field
Project Title: Quantum Dot Solar Cells
Award: \$20,000

Investigator: Robert Collins
Sponsor: National Science Foundation
Project Title: Real-Time Optics for Thin Film Materials Research
Award: \$45,594

Recent Awards!

"Simulating Non-equilibrium Processes over Extended Time-and Length-Scales using Parallel Accelerated Dynamics," Associate Professor **JACQUES G. AMAR**, PI, \$327,000, July 1, 2006–June 30, 2009. National Science Foundation.

"The Smallest Interstellar Grains: Optical/Near-IR Emission from Nanoparticles," Professor Emeritus **ADOLF N. WITT**, PI, and Dr. Uma P. Vijh of the Space Telescope Science Institute, co-investigator, \$296,000, Aug. 1, 2006-2009. National Science Foundation.

"Design and Manufacturing Process Technology for High Performance Polymer Nano-Composites", A. Afjeh PI, Associate Professor **JACQUES G. AMAR**, co-PI, and eight other co-PIs, \$900,626, Sept. 1, 2005-Aug. 31, 2006. Army Research Office.

Grand awarded: "Ultrafast Laser Study and Permanent Modification of Anisotropy in Ferromagnetic Thin Film." Associate Professor, **R. ALE LUKASZEW**, PI. This is collaborative grant with the College of William and Mary. The Total UT budget request for one year is \$85,840.00 including UT. This is a three year grant and the total UT award is \$268,792 from NSF starting date July 1, 2006.

Grand awarded: "Novel Sensors for chemical and bio-defense." Co-Investigators: **R. ALE LUKASZEW** and **SANJAY KHARE**. The total grant amount is \$970,000.00 for 13 months. The official notification date was December 12, 2006.

R. ALE LUKASZEW received a Summer 2006 Visiting Fellow award from the Office of Research to invite Professor Bruno Ullrich, Bowling Green State University. The total award was \$5,000.

Grant awarded: Saturday Mornings with Science, Prof. X. Huang; co-PI **R. ALE LUKASZEW**. This is a new Academic Excellence Award, amount \$4,500.

OBSERVING TIME, COMPUTING TIME AND BEAM TIME AWARDS

COMPUTING TIME:

- **J. G. Amar**, "Simulating Non-Equilibrium Processes over Extended Length- and Time-Scales using Parallel Self-learning Kinetic Monte Carlo and Parallel Accelerated Dynamics" at the Ohio Supercomputer Center.
- "Discharge Dynamics and Spatial Structures in Dielectric Barrier Discharge Systems." **CONSTANTINE E. THEODOSIOU**. Ohio Supercomputer Center. 10,000 units (~100,000 hours).

BEAM TIME:

- **S. A. Lee**, low-frequency DNA experiments at Jefferson National Laboratory.
- **A. Lukaszew**, "Polarization Studies on V-Fe-V Thin Films" at Brookhaven National Laboratory National Synchrotron Light Source and "XMCD Studies on Highly Ordered FePd Alloy Thin Films" and "Real Time Kinetic Studies of Phase Transformations in FePt Thin Films Under Annealing" at the Argonne National Laboratory Advanced Photon Source.

OBSERVING TIME:

- R. Gredel, **S. Federman**, D. Lambert, "The CO Abundance in the Interstellar Medium" at McDonald Observatory.
- D. Lambert, **S. Federman**, D. Knauth, "The Interstellar Rubidium Abundance and the Rb-85/Rb-87 Ratio" at McDonald Observatory.
- **K. Bjorkman**, J. Wisniewski, "The First Mid-IR Scattered Light Imaging of Protoplanetary Disks" at National Optical Astronomy Observatory.
- D. Lambert, **S. Federman**, K Walker "The Interstellar Rubidium Abundance and the Rb-85/Rb-87 Ratio" at McDonald Observatory.

ALUMNI NEWS

2006 JOHN J. TURIN AWARD FOR OUTSTANDING CAREER ACCOMPLISHMENT **JUDGE ROBERT POLLEX**, Ph.D. ('69) of the Wood County Common Pleas Court.

GERRY PETERS (M.S.'65) retired from the U. S. Department of Energy Office of High Energy after 38 years of federal service.

STACY AND MATT MILLER are now living near Minneapolis, Minn., where Matt is a solar installer and Stacy is the Renewable Energy Program manager for Minnesota. She designs and administers incentive programs for renewables, heading a team of three people.

ANDREAS FISCHER, Ph.D. ('96), has been employed at Lam Research Corporation in Fremont, Calif., for the past 10 years and is now heading one of their development groups, the Dielectric Etch

Product Line. Lam manufactures plasma etchers that make the chips in computers. Two other graduates also employed at Lam Research are **KONSTANTINE MAKHRATCHEV**, M.S. ('00) and **HENRY POVOLNY**, Ph.D. ('03)

ILVYDAS MATULIONIS, Ph.D. ('02) has moved from CeraMem Corp. in the Boston area to the Denver area where he is a research associate with MVSystems Inc. of Golden, Colo.

JENNIFER DRAYTON, Ph.D. ('05) has accepted a position with PrimeStar Solar Inc. of Longmont, Colo.

ALEX SHVYDSKY, Ph.D. ('02) has moved to the University of Rochester for Laser Energetics where he holds a staff position.

YURIY SOSOV, Ph.D. ('06) has accepted a staff position with Merck & Co. Inc. Pharmaceuticals.

UT LABORATORY ASTROPHYSICS

Laboratory measurements in our department in support of astronomical research have a long history. Experiments conducted by M.S. and Ph.D. students in physics and astronomy include Dan Beideck, Doug Furton, Roger Haar, Murray Henderson, Rick Irving, David Knauth, Tracy Smith, and Josh Thomas. Professors Steve Federman and Adolf Witt lead the current efforts in this field. Their work is highly regarded, and as a result, they now are representatives of the field to the larger astronomical community. Dr. Federman is the vice president of the Commission on Atomic and Molecular Data of the International Astronomical Union and will become commission president at the upcoming General Assembly. He also is serving as topical editor for Atomic and Molecular Spectroscopy for the Journal of the Optical Society of America B. Dr. Witt represents laboratory astrophysics for the Universe Working Group (UWG) of the Astrophysics Division in the Science Mission Directorate at NASA.

Our department had key roles in the recent NASA-sponsored workshop on laboratory astrophysics, which was held at the University of Nevada, Las Vegas. Dr. Federman was the chair of the Scientific Organizing Committee. In addition to Dr. Witt, Professor Song Cheng and M.S. student Josh Thomas participated in the activities. The result of the workshop was a White Paper, which presented a series of recommendations for NASA and other agencies, such as NSF, that fund laboratory work in atomic, molecular, and solid state physics for astronomical studies. Dr. Witt led a discussion on the recommendations at the most recent UWG meeting; Dr. Federman gave a similar presentation to the Astronomy and Astrophysics Advisory Committee of NSF. Such activities highlight the regard of others toward our department's efforts.



Ritter Planetarium

During spring 2006, Nancy Morrison was named the Director of Ritter Planetarium, replacing Lawrence Anderson-Huang who resigned to become the director of the Master of

Liberal Studies program. As director of the Planetarium, Lawrence helped to build an outreach program that now serves more than 25,000 students and individuals from the community each year. It is one of the major outreach efforts of the University. Nancy is committed to further improvements and expansion of services.

On Nov. 7, 2006, the College of Arts and Sciences and Ritter Planetarium hosted a lecture and book signing by best-selling author Dava Sobel, who was on tour promoting the paperback release of her latest book, *The Planets*. The book's publisher, Penguin Group Inc., selected our campus as a venue for a tour appearance because of the presence of an active planetarium. The event, held in the Law Center Auditorium, drew an audience of about 120 students, faculty, and members of the public.

MORE DEPARTMENTAL NEWS

UT SERVICE AWARDS recognize excellence in service. Congratulations to **DAVID ELLIS** for 40 years; **SUE HICKEY** for 30 years; **CONSTANTINE THEODOSIOU**, 25 years; **RICK IRVING**, **ALEX MAK**, **CHERYL SAUTTER**, and **PHIL JAMES** for 14 years; **SHAN AMBALANATH** for 10 years; and **MARCIA REAU**, **YARON SHEFFER** for 5 years.

The Department of Safety and Risk Management recognized **TERRY KAHLE** for his commitment to supporting a safe and healthy environment for the students and staff of The University of Toledo Department of Physics and Astronomy. For the past three years, Terry has been employed as a research laboratory technician for the department, specializing in technical support for photovoltaic and other renewable energy projects. Terry's passion for renewable energy and his commitment to safety of the students and staff have made him a valuable addition to the University and a great resource for the Department of Safety and Risk Management.

ROBERT BURMEISTER, observatory technician, retired after 18 years of service to the Department of Physics and Astronomy.

CHERYL SAUTTER, business service officer, retired after 15 years of service to the Department of Physics and Astronomy.

NEW FACULTY & STAFF

DR. RUPALI CHANDAR will serve as assistant professor, starting in August 2007 after she completes several projects at Johns Hopkins University.

The Department of Physics and Astronomy has two new visiting assistant professors as of August 2006: **DR. REVA KAY WILLIAMS**, Ph.D. Indiana Univ., is the nation's first black astrophysicist and does research in relativistic astrophysics. **DR. DAN de VRIES**, Ph.D. U. of Colorado, does research in physics pedagogy.

STEPHANY MIKOLS, business services officer from the Department of Environmental Sciences, began October 9, 2006.

TROY BERCHEM, observatory/research technician began November 20, 2006. He comes from Sheboygan, Wisconsin

KUDOS UNDERGRADUATES!

PAUL SELL is working under the direction of Dr. Adolf Witt, now Professor Emeritus, on the project "The Determination of Dust Opacities Using Color Asymmetries in Inclined Galaxies."

TOM DIXON won the Chad Tabory Award for Outstanding Undergraduate Research.

SCHOLARSHIPS dedicated in the names of Dr. Larry Curtis, Dr. Adolf Witt, Dr. David Ellis, and Dr. Philip James were presented to undergraduates Matt Weller, Jennifer Holt, Ryan Zeller and Stephanie Rety, respectively.

BREAKING NEWS

\$18.6 MILLION THIRD FRONTIER GRANT AWARDED TO THE UNIVERSITY OF TOLEDO

On December 15, 2006, UT received \$18,635,238 in Wright Center of Innovation funds to establish the Photovoltaics Innovation and Commercialization Center (PVIC). This grant follows a 2004 Wright Capital Project grant for \$2 million to support UT's photovoltaics program. The PVIC consortium, which includes The Ohio State University and Bowling Green State University, will focus on research for advanced materials used to improve existing solar cells, developing new types of solar cells, prototyping new PV module concepts, developing systems integration concepts that can reduce the installed costs of PV, and improving graduate level education and consumer awareness of PV.

Rob Collins is the principal investigator, along with co-investigators Al Compaan, Xunming Deng, and Sylvain Marsillac. Other collaborators on this project include Advanced Distributed Generation, Battelle, BGSU, Cornerstone Research Group, Decker Homes, DuPont, Edison Materials Technology Center, Green Energy Ohio, Innovative Thin Films, Lake Shore Cryotronics, McMaster Energy Enterprises, MetaMateria Partners, Midwest Optoelectronics, NewCyte Inc., OSU, Owens Corning, Pilkington, and SSOE Inc.

Further information can be found in Governor Taft's news release at www.governor.ohio.gov/releases/121506ThirdFrontier.htm.

The UT Endowment Fund Campaign

Alumni and friends of the Department of Physics and Astronomy are urged to remember our department and college as they consider giving and pledging. The department has several established funds, some of which are endowed and others may not yet be endowed. Other funds 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. He was integral in 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.

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 established to begin an endowment that will be used to support the buy-in to an international telescope consortium and ancillary activities. This is a major goal of the Department.



The UT ALUMNI ASSOCIATION wants to hear from you. Check out their Web site at www.toledoalumni.org.

Department of Physics and Astronomy
The University of Toledo
Toledo, OH 43606-3390

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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Address _____

Comments: