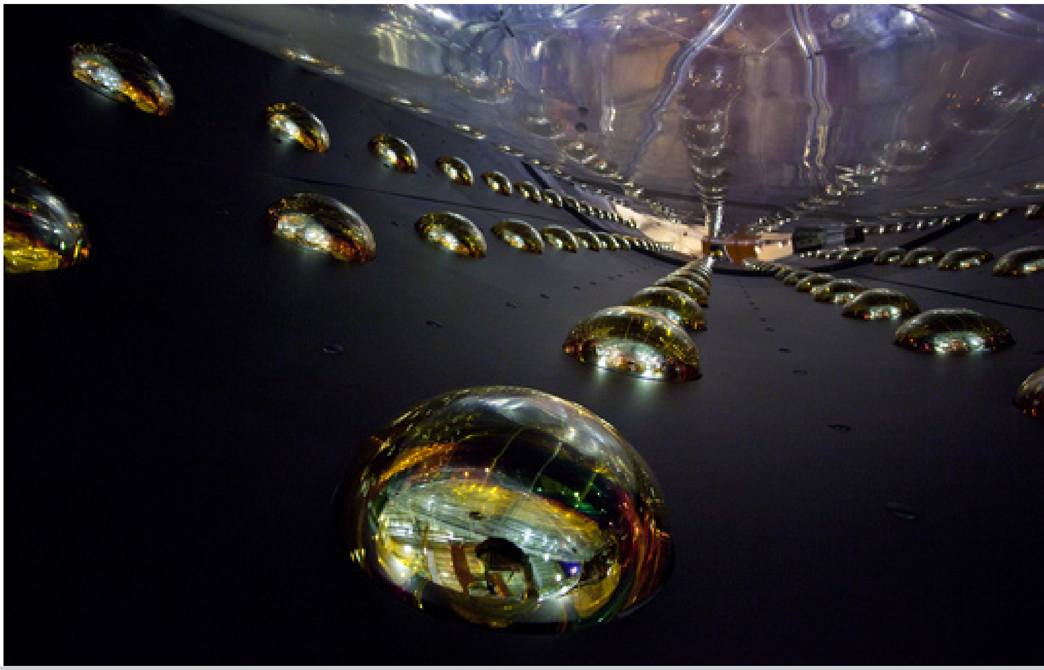
The Wisconsin Physicist



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On the Cover

Photograph of the Daya Bay antineutrino detectors built by the UW neutrino group. Image courtesy of LBNL. The Daya Bay Reactor Neutrino Experiment (Daya Bay) is a US-China collaboration to search for and measure the yet unknown neutrino mixing angle θ_{13}. The experiment is located at the Daya Bay nuclear power plant near Hong Kong, China. Data taking will start in Summer 2011.

For more information:
http://neutrino.physics.wisc.edu

View from the Chair

Greetings

A. Baha Balantekin

Eugene P. Wigner Professor and Chair, Department of Physics

There have been a great number of exciting developments in the Physics Department during the last year. Despite the difficult financial constraints, we were able to add an excellent experimentalist, Dr. Reina Maruyama, to our faculty roster. Prof. Maruyama works on neutrino and dark matter physics.

Our faculty successfully competed for the campus-wide awards:

- Professor Pupa Gilbert has received the Chancellor's Distinguished Teaching Award.
- Professor Karsten Heeger was awarded a Romnes Faculty Fellowship, funding of which comes from Wisconsin Alumni Research Foundation.
- Postdoctoral research associate Dr. Ian Woo Kim, collaborating with Professor Lisa Everett, was awarded Association of Korean Physicists in America (AKPA) 2011 Outstanding Young Researcher Award.
- Undergraduate student Daniel Lecoanet was named a Churchill Scholar. He subsequently won a five-year Fannie and John Hertz Foundation fellowship. Lecoanet was one of 15 winners in this year's competition, chosen from almost 600 applicants.

The Department congratulates these colleagues for their outstanding accomplishments.

High Energy experimentalist and former Chair, Professor Lee Pondrom has retired after many years of dedicated service to the Department. Lee will continue contributing to the Department as an emeritus professor.

Astrophysics Professor Hakki Ogelman has retired after many years of dedicated service to the Department. Hakki will continue contributing to the Department as an emeritus professor.

During the academic year 2009-2010 string phenomenologist Gary Shiu and high energy experimentalist Sridhara Dasu were promoted to the rank of professor. Also during this academic year, plasma physics theorist Stanislav Boldyrev and condensed matter experimentalist Robert McDermott were promoted to associate professor with tenure.

Culminating a decade of planning, innovation and testing, construction of the world's largest neutrino observatory, IceCube, was successfully completed on December 17, 2010. The construction, primarily funded by the National Science Foundation and coordinated by the University of Wisconsin-Madison and underway since 2005, was completed on schedule and within budget. This project was among the most ambitious scientific construction projects ever attempted.

The tenth Annual Awards Banquet was held in the Spring 2010. In addition to awards to outstanding students, Distinguished Alumni Fellow and Service Awards were presented. Distinguished Alumni Fellows were Gregory B. Jaczko and Steven Vigdor. The Honorable Gregory B. Jaczko is the Chairman of the U.S. Nuclear Regulatory Commission. Steven Vigdor is the Associate Laboratory Director for Nuclear and Particle Physics at the Brookhaven National Laboratory. Distinguished service awards went to

Mary Stapanian and Juliette Apkarian for their interest in, caring for, and exceptional philanthropy to the students of the Physics Department. They have generously endowed an undergraduate award in the memory of Maritza Irene Stapanian Crabtree, daughter and sister. We were especially moved by Juliette's description of her sister's life and achievements.

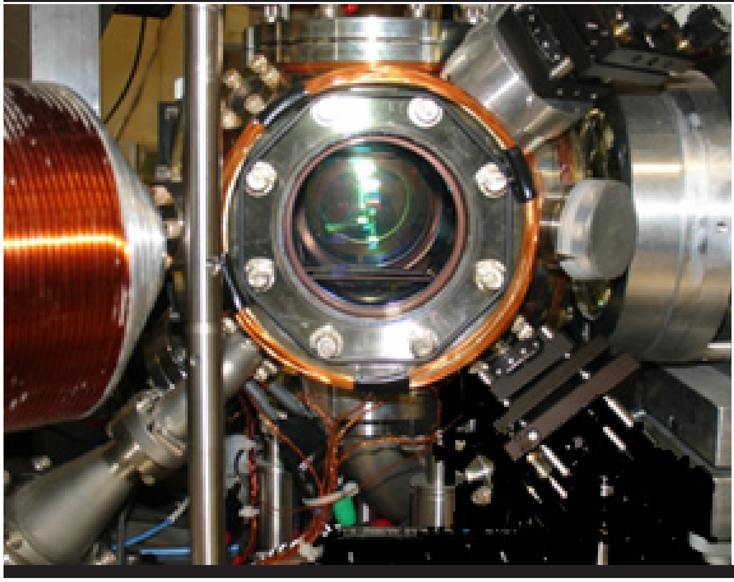
Whether you are an alumnus, friend, employee, or student, we appreciate your interest in and loyalty to the University of Wisconsin Physics Department. We would very much like to hear from you and consider your stories for publication in the next newsletter – your favorite memories of the Physics Department, the UW, Madison – please write to us (print or via email: info@physics. You can also donate to the Physics Department online by going to www.physics.wisc.edu/giving/index.html.

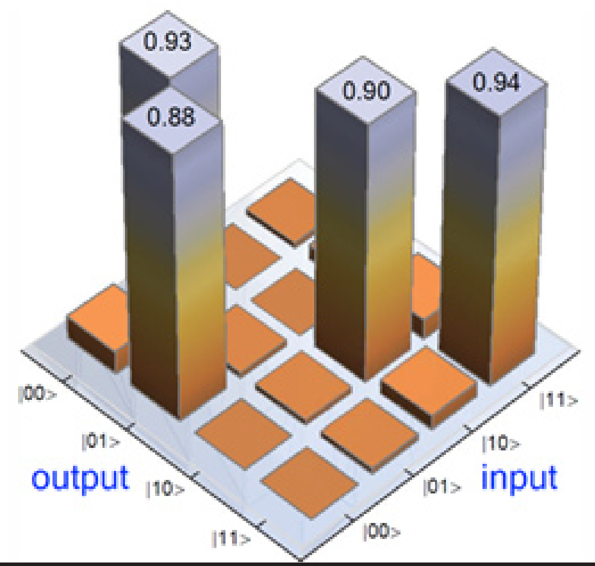
If you wish to consult with a UW Foundation development officer on future gifts or other options, including estates, trusts, gifts-in-kind, or planned giving please contact Chris Glueck, UW Foundation at 608/265-9952 or chris.glueck@uwfoundation.wisc.edu.

On behalf of the Department, I sincerely thank you, our alumni and friends, who have provided generous support to the Department. In these tough economic times you help us enormously to carry out our research, education, and outreach efforts.

Finally, my term as Chair will end this coming August. As I get ready to turn over my duties to my successor, I was humbled to find out that the Division of Nuclear Physics of the American Physical Society chose to give me its Distinguished Service Award.

Quantum Computing with Atoms, Semiconductors, and Superconductors





Vacuum chamber used for quantum gate experiments with neutral Rb atoms (left) and measured controlled-not truth table (right).

For more than 40 years the number of transistors that can be placed in an integrated circuit has doubled approximately every two years. This long term trend known as Moore's law has radically transformed society and ushered in the present information age where pocket sized electronic devices running on batteries are capable of worldwide communication while harnessing data processing power that outstrips the capabilities of machines that once filled large laboratories. Moore's law is expected to continue for not more than another decade. At that point transistors will have shrunk to the point where a single device contains but a small number of active dopant atoms, and further miniaturization will not be possible. From the perspective of classical computing the end of Moore's law will mean that further increases in information processing power are likely to proceed at a much slower rate than previously.

Remarkably, the final limit of Moore's law, where processing devices effectively contain single atoms, may turn out to be remembered, not as the end of 50 years of exponential technology development, but as the dawn of a new age of quantum information processing. Researchers in the Department of Physics are actively involved in developing this new type of information processing, both theoretically and by experimental demonstrations.

In contrast to classical computing, quantum computing holds the promise of a revolutionary approach that can solve certain computational problems exponentially faster than any possible classical machine. How is this possible? It is well known that quantum mechanical objects are inherently probabilistic. We can predict the evolution of a quantum dynamical system by solving the Schrödinger equation, but the calculation yields only relative probabilities for certain outcomes, instead of certain predictions. On the face of it a probabilistic result does not sound very useful for information processing where we normally require accurate and precise data.

There is, however, another important facet of quantum mechanics that is crucial for information processing. Quantum systems can be described as being in a superposition of more than one state at a time. In a classical computer data is stored in digital bits, each of which takes the value of either 0 or 1 at a given time. If a quantum system is used to represent one bit of data, the quantum bit, known as a qubit, can be both 0 and 1 at the same time, i.e. $|y\rangle = c_0|0\rangle + c_1|1\rangle$, where c_0 and c_1 are complex amplitudes. Of course when we make a measurement of the qubit the result is a definite value, 0 or 1, according to the probabilities $|c_0|^2$ or $|c_1|^2$ respectively.

A collection of N such qubits can then represent all 2^N possible data values of an N bit register simultaneously! This behavior is markedly different from a classical N bit register which can be used to store 2^N different values, but only one at a time. The use of qubits as opposed to classical bits thus leads to the possibility of powerful parallel processing since 2^N different values can be input to a quantum processor at one time. Although the power of a quantum computer stems in part from quantum superposition it is still true that the probabilistic nature of quantum mechanics renders the result of a quantum computation uncertain. Nevertheless there are certain computational problems where the probabilistic nature of the result is not problematic. These types of problems are characteristically asymmetric. The answer may be exponentially difficult to find, but given a candidate answer it is easy to verify whether or not the answer is correct. Such problems include finding the factors of a many digit number, which is important for cryptography, and searching in an unsorted database. Quantum algorithms which outperform any imaginable classical computer exist for both of these problems, as well as several others. In addition to solving numerical problems, quantum processors will enable the simulation of complex quantum systems, which will be an aid to the development of new types of materials and sensors. From a fundamental perspective quantum information science seeks to further our understanding of the foundations of quantum theory by putting strikingly non-classical aspects of the theory such as non-locality and macroscopic superposition states to stringent experimental tests.

The basic idea of data processing with quantum systems dates back to the 1980s but the field did not take off until the 1990s with the discovery of the factorization and search algorithms as well as the initial development of physical platforms which could be used for implementing quantum logic operations. Since then the field has grown explosively with many thousands of scientists worldwide now working on quantum information problems.

The UW Madison Physics Department is playing an active role in the development of quantum information science. Starting from nothing ten years ago there are now seven faculty and one scientist involved in a broad range of experimental and theoretical projects that are supported by external research grants totaling more than $5,000,000 annually. The leading candidates for implementing quantum computing hardware are currently trapped ions, neutral atoms, photons, semiconductor quantum dots and superconductors. UW Madison has strong experimental efforts exploring three of these five approaches. Professor Mark Eriksson works on quantum dots in Si heterostructures, Professor Robert McDermott is building superconducting circuits, and Professors Mark Saffman and Thad Walker are developing neutral atom qubits trapped by optical beams. In parallel with the experimental activities Professors Susan Coppersmith, Robert Joynt, and Maxim Vavilov, as well as Research Scientist Mark Friesen, are studying theoretical issues related to implementations as well as the development of new algorithms that can harness the potential of quantum hardware.

Development of a quantum computer that can outperform classical machines will require coherent control of a large number of qubits and is probably decades away. The current state of the art is limited to the coherent evolution of a small number of qubits, at most 14 in recent experiments with trapped ions from Rainer Blatt's group in Austria. Recent experiments from the Saffman-Walker collaboration were the first to demonstrate a fundamental two-qubit logic gate with neutral atoms, which they then used to deterministically create an entangled, non-classical state of two-atoms. A picture of the experimental apparatus and the CNOT gate results are shown in the figure. Neutral atoms in optical traps have great potential for scalability to larger systems and ongoing work is seeking to build a device with 50 or more qubits. The quantum dot and superconductor based approaches also being developed at Madison have the potential for very fast gates operating at GHz rates. Future quantum processors may rely on hybrid approaches that connect different types of qubits to take advantage of the best characteristics of each. The presence of strong efforts using several different approaches in Madison therefore bodes well for future advances in this exciting and active field.

For more information visit http://qc.physics.wisc.edu

What Neutrinos from Nuclear Reactors Tell us about the Early Universe

A US-China collaboration preparing for the next discovery in neutrino physics

Neutrinos are among the most abundant particles in the Universe. They have been with us since the beginning of time and continue to be produced in nuclear reactions both in the cosmos and on Earth. The Sun, cosmic rays, and exploding stars all emit copious amounts of neutrinos or antineutrinos that can be detected by experiments on Earth. Man-made neutrinos from accelerators or nuclear reactors complement the rich spectrum of naturally produced neutrinos. Neutrinos can be found all around us, and every second billions of them stream through our bodies and the Earth unhindered by matter. They are pointlike, weakly interacting particles that pass through most matter. The interaction of neutrinos is so small that roughly once every 30 years there is a chance of a neutrinos interacting in your body.

The weak interaction of neutrinos makes it one of the most elusive and most difficult to detect elementary particles. It took some 26 years after the theoretical postulate of the neutrino by Wolfgang Pauli in 1930 to establish experimentally the existence of this particle. In a groundbreaking experiment, conducted by Fred Reines, a nuclear reactor was used as the source of neutrinos. These neutrinos were detected in a large liquid scintillator detector very similar to the detectors used in modern experiments.

Neutrinos were long thought to be massless and with little influence on everyday world. They were found to come in three different types associated with the lepton (electron, muon, or tau) that they were produced with. This discovery that neutrinos have a small, yet finite mass by the Super-Kamiokande experiment in 1998 changed this picture dramatically. We now know that neutrinos have the ability to change from one kind into another through a quantum mechanical process called flavor change or neutrino oscillation. We have learned that all neutrinos in the Universe together have almost as much mass as all the stars we see in the night sky. Neutrinos are key to many fundamental processes. They are produced in nuclear and particle decays and play a key role in the supernova explosion of stars. Neutrinos carry most of the energy of a supernova burst and they are an advance signal of the supernova explosion before light can even escape from the star.

The discovery of neutrino flavor oscillation and neutrino mass has profoundly changed our understanding of the role of neutrinos in the Universe. The discovery of neutrino mass and oscillation is the first evidence for physics beyond the Standard Model of particle physics and next-generation experiments will measure neutrino parameters with unprecedented precision.

Many questions remain. The smallness of neutrino mass and the mixing angles of neutrino oscillation remain unexplained and cannot be explained in our current framework of particle physics. Neutrinos may be their own antiparticles in which case they would be Majorana particles. And yet the interaction and oscillation of neutrinos and antineutrinos may not be the same under the symmetry of charge and parity (CP). With these properties neutrinos may hold the clue to explaining the observed matter-antimatter asymmetry in the Universe. Understanding these fundamental neutrino properties and making precision measurement of the mixing parameters that describe the neutrino flavor oscillation are among the central goals of particle and nuclear physics and the goal of Professor Heeger's neutrino group in the Physics Department.

The University of Wisconsin is one of the US lead institutions in the Daya Bay reactor neutrino experiment, a new reactor neutrino experiment to measure the yet unknown neutrino mixing angle called θ_{13}. Knowledge of the value of this mixing angle will not only complete our knowledge of the neutrino mixing matrix, but will also significantly impact our quantitative understanding of astrophysics and cosmology. Discovery and measurement of the θ_{13} neutrino mixing angle is a prerequisite to studying the subtle difference between the behavior of neutrinos and antineutrinos and understanding matter creation in the Early Universe.

UW-Madison is the largest university group on the Daya Bayexperiment with primary responsibility for the design and construction of the neutrino detectors. The Daya Bay reactor neutrino experiment is a US-China partnership in high-energy physics with equal participation from scientists in the US and China. An underground laboratory with about 3 km of tunnels has been constructed next to the Daya Bay nuclear power plan near Hong Kong, China. Eight detectors are being built to measure the flux of (anti)neutrinos from the Daya Bay nuclear power reactors and determine the oscillation of neutrinos as a function of distance from the reactor source. The Physics Department at the University of Wisconsin together with the Physical Sciences Laboratory have overall US responsibility for the design and construction of the Daya Bay antineutrino detectors. Some eleven scientists including Professors Balantekin and Heeger, a dozen engineers and technical staff from UW are involved in the Daya Bay effort here in Madison and at the site of the experiment near Hong Kong. This spring the first detectors for the experiment were completed under Wisconsin leadership. Data taking is scheduled to begin in summer 2011 with first results expected later in 2011. With the results from Daya Bay we will learn whether tests of CP violation are feasible in the lepton sector and what role neutrinos may play in the early Universe. We are looking forward to reporting the first results in the near future.

Wisconsin scientists involved in the Daya Bay experiment include Baha Balantekin, Karsten Heeger, Henry Band, Tom Wise, Wei Wang, David Webber, Bryce Littlejohn, Michael McFarlane, Christine Lewis, and Paul Hinrichs.

UW Physics Undergraduate Students

Degrees & Awards

Bachelor Degrees Awarded

Astronomy–Physics

Fall 2009

Melania Riabokin

Spring 2010

Bradley Dober
Douglas Ryddner

Summer 2010

Ryan Birdsall

Physics

Fall 2009

Melania Riabokin
Benjamin Sturdevant

Spring 2010

Christopher Deviley
Bradley Dober
Jusuk Han
Alex Lang
Daniel Lecoanet
Lauren Levac
Matthew Noel
Dominick Rocco
Douglas Ryddner

Summer 2010

Hanna Jung Heo
William Raiford

Churchill Scholar

Undergraduate student Daniel Lecoanet was named Churchill Scholar. He subsequently won a five-year Fannie and John Hertz Foundation fellowship. Lecoanet was one of 15 winners in this year's competition, chosen from almost 600 applicants.

DOE INFN Fellowship

Physics undergraduate student, Benjamin Broerman, won a DOE INFN fellowship and worked at Gran Sasso National Laboratory on the CUORE experiment last summer.

Physics Undergraduate Awards

2010 Awards Banquet

Fay Ajzenberg-Selove Award
Victoria Hartwick (Astronomy)
Alexandra Schroeder (Physics)

Dr. Maritza Irene Stapanian Crabtree Award
Jake Covey
Alejandro de la Rosa
Craig Price
Aaron Swander
Ruxiu Zhao

Bernice Durand Undergraduate Research Scholarship
Megan Jones

Henry and Eleanor Firminhac Physics Undergraduate Scholarship
Jane Kaczmarek
Jake Miller
Alexandra Schroeder

L. R. Ingersoll Prize
Spring 2008-2009
Tyler Van Dyck (103)
Anna Jean Moreland (104)
Kexian Zhu (201)
James Mott (202)
Xiong Xiong (207)
Timothy Wendorff (208)
Ruxiu Zhao (248)

Fall 2009-2010
Tyler Van Dyck (104)
Alexander Diedrich (201)
Andrew Lang (202)
Li Xuan Tan (207)
Anna Pendleton (208)
Eric Katzelnick (247)

Albert Augustus Radtke Scholarship Award
Jonathan Bohn
Jonathan Jara-Almonte
Alex Lang
Lauren Levac
Jacob Swan

The University Physical Society

The University Physical Society, also known as the Physics Club, is a student organization for people interested in physics and related fields at the UW. The Physics Club organizes events such as seminars, tours, trips, and socials for its members. Physics Club volunteers also offer free drop-in tutoring to students in introductory physics classes. The club room (2328 Chamberlin Hall) is the place where members meet for events, and use as a study room and place to socialize between classes. The club room contains a bookshelf, computers, a couch, fridge, microwave, and many other conveniences for its members. Members are notified of events and opportunities in the physics department through the club email list and an announcements board in the club room, as well as through UPS's website (http://ups.physics.wisc.edu/). Popular events include movie nights, potlucks and game nights. Physics Club likes to have fun, and many life-long friendships are formed through members meeting in the club. Every spring, a big trip to either Fermi Lab or Argonne National Lab is arranged in which dozens of members attend. This year, we are looking to expand the variety of events and trips offered to our 100+ active members as to build off of our already successful start to the 2010-2011 school year.

UW Physics Graduate Students

Degrees & Awards

Master's Degrees Awarded

Summer 2009
Michael Brandt Anderson
Thomas Ervin Henage
Brett E. Unks

Fall 2009
Joshua William Henry
Teck Seng Koh
Jinlu Miao
Zhan Shi
Jeff Lawrence Waksman

Spring 2010
Blakesley K. Burkhart
Suli Yang

Summer 2010
Laura Elizabeth Gladstone
Ye Li

PhD Degrees Awarded

Summer 2009
James Raymond Braun
Postdoc, University of Maryland

Erik Gallup Brekke
Assistant Professor of Physics, Wheaton College

Marcel Paz Goldschen
Postdoc, Dept. of Medicine & Public Health, UW-Madison

Fan Jiang
Postdoc, Boston University

Ryan Leonard Miller
Postdoc, Center for Nanoscale Materials, Argonne National Lab

Erik Albert Strahler
Researcher, Vrije Universiteit Brussel

Boy Tanto
Postdoc, Rensselaer Polytechnic Institute

Erich Urban
Pursuing MS in Medical Physics at UW-Madison

Fall 2009
Christopher Shea Carey
MIT Lincoln Laboratory

Michael Christian Kaufman
Postdoc, Oakridge National Lab

Clark Stuart Ritz
Research Analyst, Center for Naval Analyses

Spring 2010
Yu Gao
Postdoc, University of Oregon

Larry Davis Isenhower
Postdoc, University of Wisconsin-Madison

Rebecca Ann Metzler
Assistant Professor of Physics, Colgate University

Hillary Dianne Stephens
Instructor - Physics and Astronomy Department, Pierce College

Timothy Daniel Tharp
Postdoc, Princeton Plasma Physics Lab

Carl Onni Vuosalo
Postdoc, Ohio State University

Summer 2010
Matthew Lee Palotti
Postdoc, School of Medicine and Public Health, UW-Madison

Jason M. Nett
Postdoc, Texas A&M

Daniel Joseph Clayton
Postdoc, Johns Hopkins University

Mathew Joseph McCaskey
Postdoc, University of Kansas

Gregory William Severin
Postdoc, School of Medicine and Public Health, UW-Madison

Ryan Orth Jung
IBM, Albany, NY

Eric Paul Nordberg
Postdoc, School of Medicine and Public Health, UW-Madison

Richard Cannon Hatch
Postdoc, University of Aarhus in Aarhus, Denmark

Physics Graduate Awards

2010 Awards Banquet

Fay Ajzenberg-Selove Award
Vikram Adhikarla

Elizabeth Hirschfelder Award
Karen Andeen
Amanda Gault
Laura Gladstone
Meghan McGarry
Chiu-Tien Yu

Karl Guthe Jansky and Alice Knapp Jansky Family Graduate Award
Claudia Cyganowski (Astronomy)

Emanuel R. Piore Award
Matthew Brookhart (Fall 2009)
Zack DeLand (Spring 2010)

Departmental Awards

Best TA
Valerie Plaus (Spring 2009)
Michael Wood (Fall 2010)

Rookie of the Year
Zack DeLand

Raymond G. & Anne W. Herb Wisconsin Distinguished Graduate Fellowship
Steven Hart

Campus-Wide Teaching Assistant Award

2010 Award

Innovation in Teaching
Dhananjay Dhokarh

UW Physics Graduate Students

Admissions

Fall 2010 Admissions

Total of 35 students

Christopher Anderson
University of California - Berkeley
(Astrophysics)

D. Austin Belknap
Rice University
(Particles/High Energy)

Zachary Billey
Linfield College
(Plasma)

Scott Douglass
George Mason University

Samuel Ducatman
Grinnell College
(Quantum Computing)

James Duff
Wittenberg University
(Condensed Matter/Solid State)

Matthew Ebert
Pennsylvania State University
(Atomic/Molecular/Optical)

Joyce Fan
Wheaton College
(Atomic/Molecular/Optical)

Jacob Feintzeig
Dartmouth College
(Astrophysics)

Derek Gardner
University of Wisconsin - Parkside
(Atomic/Molecular/Optical)

Zigfried Hampel-Arias
Rice University
(Astrophysics)

Yang Heng
Tsinghua University
(Particles/High Energy)

Alberto Hinojosa Alvarado
Inst Tec y de Estudios Superiores de Monterrey
(String Theory)

James Hostetter
Louisiana State University & A&M College
(Atomic/Molecular/Optical)

Weiwei Hu
Peking University
(Materials Science)

Antonia Hubbard
University of California - Los Angeles
(Particles/High Energy)

Joshua Isaacs
University of California - Santa Cruz
(Plasma)

Amy Lowitz
Brown University
(Astrophysics)

Timothy Lyon
University of Michigan at Dearborn
(Quantum Computing)

Cristian Martinez Villalobos
Pontificia Universidad Catolica de Chile
(String Theory)

Frank McNally
Carleton College
(Astrophysics)

Jared Miles
Wright State University
(Atomic/Molecular/Optical)

Lucas Morton
Carson-Newman College
(Plasma)

Frank Morton-Park
Reed College
(Astrophysics)

Zachary Pierpoint
Pennsylvania State University
(Particles/High Energy)

Richard Ruiz
University of Chicago
(Particles/High Energy)

Chien Yeah Seng
Tsinghua University
(Particles/High Energy)

Nicole Vassh
University of Wisconsin - Parkside
(Nuclear)

Anna Walker
Covenant College
(Nuclear)

Xiao Wang
Wuhan University
(Condensed Matter/Solid State)

Fuquan Wang
Peking University
(Particles/High Energy)

Ian Wisher
University of Illinois, Urbana-Champaign
(Particles/High Energy)

Hongtao Yang
Peking University
(Particles/High Energy)

Fang Ye
Wuhan University
(Particles/High Energy)

Fangzhou Zhang
Peking University
(Particles/High Energy)

UW Physics Faculty & Staff

Updates, Promotions, & Awards

New Faculty

2011

The Physics department welcomes Reina H Maruyama as an Assistant Professor.

Promotions

Fall 2009

String Phenomenologist Gary Shiu was promoted to the rank of professor.

High Energy Experimentalist Sridhara Dasu was promoted to the rank of professor.

Plasma Physics Theorist Stanislav Boldyrev was promoted to associate professor with tenure.

Condensed Matter Experimentalist Robert McDermott was promoted to associate professor with tenure.

Retirements

2011

High Energy experimentalist and former Chair Professor Lee Pondrom has retired after many years of dedicated service to the Department. Lee will continue contributing to the Department as an emeritus professor.

Astrophysics Professor Hakki Ogelman has retired after many years of dedicated service to the Department. Hakki will continue contributing to the Department as an emeritus professor.

Sabbaticals

2010–2011

Professor Albrect Karle
Professor Franz Himpsel
Professor Thad Walker
Professor Ellen Zweibel

Campus-Wide Awards

Gilbert

In January 2011 UW-Madison Teaching Awards Committee has selected Professor Pupa Gilbert to receive Chancellor's Distinguished Teaching Award. This award recognizes exceptional distinguished teachers on campus.

Heeger

In January 2011, the Graduate School Research Committee has awarded a H.I. Romnes Fellowship to Professor Karsten Heeger. Supported by the Wisconsin Alumni Research Foundation, the Romnes Award recognizes outstanding potential of those faculty who received tenure within the past four years. It includes an unrestricted cash award of $50,000 to be used in support of the award winner's program of research. Winners are chosen by a committee of the Graduate School and are recognized for exceptional research accomplishments. The award is named after H.I. Romnes, former chair of the board of AT&T and former president of the WARF board of trustees.

National Awards

Balantekin

Professor Baha Balantekin has been awarded the Distinguished Service Award by the Division of Nuclear Physics of the American Physical Society. This award is one of the handful given each year by the Division and is clear recognition of Balantekin's many years of dedicated service to the community. The citation for the award reads: "For his sustained and extensive contributions to the Division of Nuclear Physics over two decades that have enhanced its strength and vitality, especially in areas such as education and communication, while promoting its relationship with the American Physical Society."

Other Awards

Postdoctoral research associate Dr. Ian Woo Kim, collaborating with Professor Lisa Everett, was awarded Association of Korean Physicists in America (AKPA) 2011 Outstanding Young Researcher Award.

Physics Department Alumni Awards

2010 Awards Banquet

2010 Distinguished Faculty Fellows

Gregory Jaczko
Steven Vigdor

Distinguished Service Awards

Mary Stapanian
Juliette Apkarian

Dr. Maritza Irene Stapanian Crabtree Undergraduate Scholarship

Dr. Maritza Irene Stapanian Crabtree

The Dr. Maritza Irene Stapanian Crabtree Undergraduate Scholarship in Physics was established by William H. Crabtree* to honor his late wife Maritza and to encourage young scientists. An alumna of the UW-Madison, Maritza completed the Honors Degree and received her BS in Physics in 1971. After earning a PhD in Planetary Science with specialties in Nuclear Astrophysics and Cosmochemistry, she had a distinguished career as an officer in the Air Force. Before her death from cancer in 2001 at the age of 51, Maritza led an extraordinary life—a life of immense courage, integrity, and heart.

The UW always held a special place for Maritza. Born in Madison, she and her identical twin were "Badger babies." After serving a stint as a "Rosie the Riveter," their mother Mary Shahinian Stapanian received her degree from UW (BA '46). Their father Myron Stapanian ('49 BA, '50 MS), a returning WWII-vet, was continuing his studies there when the twins were born. Through the example of her parents, both educators, Maritza would come to develop a profound belief in the humanizing mission of education.

After the birth of Maritza's brother and younger sister, the family moved to Ohio. Maritza grew up in Cincinnati, where she graduated from high school as class valedictorian ('67) and member of the National Honor Society. President of the women's athletic association and an award-winning musician, Maritza also had earned a scholarship in engineering at Northwestern University for a summer program for gifted high-school students. Since a young child, the science of space held particular fascination for Maritza; and when time came to select a college, Maritza and her twin unhesitatingly chose the UW.

To her great excitement, Maritza's path at UW led to an undergraduate research assistantship in the UW Space Physics Lab, then located in the basement of Sterling Hall. The lab was headed by Professor William Kraushaar; and Professor Dan McCammon—then a graduate student in the lab—helped to supervise Maritza on a range of projects. Work with this stellar team had a life-long impact on the young physicist. At the encouragement of Professor Kraushaar, Maritza became one of the first women admitted to the graduate program in Planetary Science at the California Institute of Technology, where she defended her PhD in August, 1980. (*INDUCED FISSION TRACK MEASUREMENTS OF CARBONACEOUS CHONDRITE THORIUM/URANIUM RATIOS AND THORIUM/URANIUM MICRODISTRIBUTIONS IN ALLENDE INCLUSIONS*, Feb. 1981.) Although aspects of her doctoral work defied conventional wisdom of the times, Maritza stayed true to her painstaking findings. Only years later and shortly before her death, her dissertation advisor wrote that the field had come to recognize that Maritza was long "right and the world was wrong."

While a graduate student, Maritza investigated techniques to analyze the surface composition of Apollo program lunar samples, supported work on geological photo-interpretations of NASA photographs of the Moon and Mars, and pioneered techniques to chemically map meteorites in order to test theories about the formation of the solar system. After defending her doctoral thesis, Maritza was commissioned at the Air Force Officer's Training School.

*William H. Crabtree (PhD and Colonel, US Air Force, retired)

Her work included key management positions with the MILSTAR Communications Satellite Systems and the Peacekeeper ICBM program. She was also assigned to the Pentagon in Washington, DC, where she served as an analyst in the Air Force Studies and Analyses Agency. In her final assignment she was responsible for all the sensors on the nation's military weather satellites. Major Maritza Crabtree's military honors included Distinguished Graduate of Squadron Officers School, the Air Force Commendation Medal with oak leaf cluster, the Meritorious Service Medal with two oak leaf clusters, and the Air Force Space and Missile System Center's "Up and Comer" award.

A person of exceptional perseverance and dedication, Maritza never took the easy way out. Although attitudes toward women have changed dramatically in academia and the military, Maritza forged a career when the going was notoriously tough for women in the physical sciences and in the officer corps. But whether in the science laboratory, on the military obstacle course, or at the helm of a multi-billion dollar project, this dynamic 'slip of a gal' would come to earn the respect of many an initial skeptic.

Petite in size, Maritza was a giant in moral stature: her integrity as a scientist and as a citizen was impeccable. In a legal case between the military and a defense contractor with a substandard product, Maritza refused to yield to relentless pressure from big corporate lawyers and representatives. Ultimately the contractor conceded, saying "I can't fight such honesty."

Maritza's decision to join the Air Force was a highly unusual one for the time, but Maritza was always motivated by principle and a keen sense of responsibility. Protecting others too was something Maritza had always done. Even when diagnosed with cancer, she worked to promote prevention and early detection of the disease in others.

Wonderfully creative and insatiably curious, Maritza viewed science from a broad embrace of life. Along with a wide range of interests, she was an active supporter of the arts and of environmental and humanitarian causes. A generous and inspiring mentor. She coupled her bright intellect and wit with special grace and vision. Maritza was a person of great heart and great spirit. As her life demonstrates, humility, integrity, and courage are tools too of great science.

UW Physics Department

In Memoriam

Saul T. Epstein

February 25, 2010

Saul T. Epstein, Emeritus Professor of Physics, died February 27,2010, in Madison, WI at the age of 85. Born June 14, 1924, in Southampton, NY, he earned the PhD in physics from the Massachusetts Institute of Technology in 1948. Following an appointment at the Institute for Advanced Study (Princeton) , he was an Instructor in Physics at Columbia from 1948 to 1951. After one year at Stevens Institute and Boston University, he became an Assistant Professor at the University of Nebraska (Lincoln) in 1954 and was promoted to Professor by 1963. In 1963 he was recruited to UW-Madison with a joint appointment as Professor of Physics and a member of the Theoretical Chemistry Institute. He retired in 1988.

Saul was an accomplished theoretical physicist and was the author of more than 100 scientific papers. His early work was on quantum field theory and he was proud of having attended as an unofficial observer the Shelter Island Conference (1947) where quantum electrodynamics became a coherent research area. In that period he published with J. R. Oppenheimer and A. Pais. His later work evolved to topics of atomic physics. A major part of Saul's scientific career from the early 1960s to 1990 was in the field of quantum chemistry. As a scholar known for his keen intelligence and clarity of thought, he played an important role in keeping the field of quantum chemistry from bogging down in confusion. He was able to keep track of the subtly different approximations used by the quantum chemists and what was included, approximated, or neglected in the various approaches. He gave a connected account of his work in his book ``The Variation Method in Quantum Chemistry."

Saul was a very active and careful reviewer of scientific papers. He appreciated a letter forwarded to him by an editor about a paper Saul had refereed. The author was disputing the review and asked ``Why don't you get someone who knows the subject, like Saul Epstein?"

As a teacher, Saul was known for his clear and concise explanations of difficult topics. He was major professor for four PhDs at UW-Madison. Two of them have had very distinguished careers, J.D. Garcia, Dept of Physics, University of Arizona, and Michael F. Barnsley, for a long time at Georgia Tech and now at the Australian National University, Canberra. Saul also assisted several young theorists in Chemistry and Physics and helped other graduate students over hurdles in their research projects.

He was a Fellow of the American Physical Society and was awarded a Guggenheim Fellowship in 1971.

He was pre-deceased by his wife of 58 years, Jean Epstein, in 2006. He is survived by three children, Joanne Weinstein and Peter Epstein of Madison and David Epstein of Chevy Chase, MD, and by seven grandchildren and three great-grandchildren.

Albert Erwin

April 6, 2011

Albert R. Erwin Jr. age 79, passed away on Tuesday, April 5, 2011, at Select Specialty Hospital in Madison. He was born on May 1, 1931, the son of Albert Sr. and Lois (Lee) Erwin in Charlotte, N.C. Albert graduated from Concord High School in 1949 and Duke University, Summa Cum Laude, in 1953 with a B.S. in Physics. He was a member of Phi Beta Kappa. He earned his doctorate from Harvard University in 1959. He joined the faculty at the University of Wisconsin in 1959 and became a full professor in 1965. He spent his entire professional career at Wisconsin. He retired in May 2005.

Erwin's research has been in the field of experimental high energy particle physics. He has carried out a number of experiments at national laboratories over the 40 year span of his activities. Early experiments used the bubble chamber technique, in which photographs of particle reactions in the chamber liquid were analyzed by film scanning and measuring machines at Wisconsin. The bubble chambers were located at Brookhaven, Argonne, and later Fermi National Laboratories. Erwin's collaboration with W. D. Walker was particularly fruitful in the early period, in which the most famous paper was the discovery of the ρ meson in 1961. As the bubble chamber technique became more laborious with too many photographs, his research at Fermilab moved into electronic detection methods, which were able to handle higher event rates. His last 30 years of research covered many interesting aspects of particle physics at the frontier of knowledge. At his retirement, Erwin was working on a Fermilab based neutrino experiment.

Erwin trained 13 PhD graduate students, many of whom have had very active research careers themselves. The include Thomas Patrick Wangler (1964); James Wayne Waters (1969); James R. Bensinger (1970); Jerome William Elbert (1971); Gus A. Hoyer (1972); Ronald N. Diamond (1972); John Thomas Lynch (1972); Gary Phillip Larson (1975); Clara E. Kuehn (1984); Kenneth Scott Nelson (1986); Theo Alexopoulos (1991); Casey Durandet (1995); and Ashkan Alavi-Harati (1999).

He was a Fellow of the American Physical Society, a member of its Division of the Particles and Fields, and a member of Fermilab and Brookhaven Lab Users Organizations. Albert was also a member of Stokes Masonic Lodge, Concord, N.C.

Albert is survived by his wife, Denise Morchand-Erwin; his daughter, Christa Erwin; grandchildren, Neva, Byron and Cora; and nephews, Nathan Lee Sweet and Jon Sweet. Albert was preceded in death by his parents; his first wife, Mary Jane; and a sister, Emily Sweet.

Gerson Goldhaber

July 19, 2010

Gerson Goldhaber, who after a long career studying the innermost particles of matter turned his attention to the outer reaches of the universe and found, with others, early evidence that dark energy was pulling it apart, died on July 19 at his home in Berkeley, Calif. He was 86.

Gerson Goldhaber was born to Jewish parents in Germany on Feb. 20, 1924. After moving to Egypt shortly after the Nazis came to power, he received a master's degree in physics from Hebrew University in Jerusalem in 1947. He earned his Ph.D. from the University of Wisconsin in 1950.

Dr. Goldhaber gained American citizenship while teaching at Columbia University in 1953, he then become a professor at the University of California, Berkeley, where he embarked on a series of collaborations in particle physics and joined the staff of the Lawrence Berkeley laboratory. Although it had been predicted that every particle had a counterpart of equal mass and opposite charge, the negative counterpart of the proton was elusive until a team led by Emilio Segrè at Berkeley discovered the antiproton in 1955. The discovery of the antiproton earned Mr. Segrè and his colleague Owen Chamberlain the Nobel Prize in physics in 1959.

In 1969 he married Judith Margoshes Golwyn, who served for many years as lead science writer at the Berkeley Lab and who collaborated with him on many projects during their 41-year marriage, including two books of sonnets illustrated with his playful watercolors. In 1974, as part of a collaboration led by Burton Richter at the Stanford Linear Accelerator Center, Dr. Goldhaber helped to discover the "j/psi particle," the first of a new family of quarks, elementary particles from which other particles are built.

Besides his wife and son, Dr. Goldhaber is survived by his daughters, Michaela and Shaya, and three grandsons who are triplets, all of Berkeley, Calif. Many other surviving relatives are physicists, including Maurice Goldhaber, now 99, who once had a $500 bet with a colleague that the antiproton did not exist. He lost.

Paul J. Kaseberg

December 24, 2010

Paul J. Kaesberg, age 87, died on Friday, Dec. 24, 2010, surrounded by his family at his home in Madison.

He was born on Sept. 26, 1923, to Peter and Gertrude (Mueller) Kaesberg in Engers, Germany. Paul emigrated from Germany when he was 2 years old and settled in West Bend. He attended Holy Angels grade school and graduated from West Bend High School. In 1948, Paul received his PhD in physics from the University of Wisconsin. He then joined the faculty of the University of Wisconsin, rising to become the W.W. Beeman Professor of Biochemistry. In 1975, he received an Honorary Doctorate from the University of Leiden in the Netherlands.

Paul was a fellow of the American Academy of Microbiology, and a past president of the American Society of Virology. He received international recognition for his pioneering research on small viruses. In 1991, Paul was elected to the National Academy of Sciences. He was also honored by Professor Paul Ahlquist, who took the title Paul Kaesberg Professor of Biochemistry.

In his later years, Paul had an interest in cosmology and the origin of the universe. He loved playing euchre with his grandchildren as well as playing bridge. Paul was a UW basketball season ticket holder for 69 years.

Paul is survived by his wife, Marian L. Kaesberg; his three sons, Paul R. (Helen Marie Rice) Kaesberg of Sacramento, Calif., James K. (Kathryn) Kaesberg of Cleveland Heights, Ohio, and Peter R. Kaesberg of Madison; two grandchildren, Julia Loomis Kaesberg and Eric Joseph Kaesberg; as well as many cousins and extended family living in both Wisconsin and Germany. He was preceded in death by his parents.

"He was a wonderful husband, father, and grandfather and will be missed very much."

UW Physics

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