THE NEWSLETTER OF THE UNIVERSITY OF TENNESSEE DEPARTMENT OF PHYSICS AND ASTRONOMY

CROSS SECTIONS

SPRING/SUMMER 2008

SPRING 2008 HONORS

Recognizing Exemplary Scholarship, Research Achievement, and Leadership

From the first year physics major to the university's Macebearer, the department recognized exemplary achievements at the annual Honors Day celebration on April 21. Students and faculty were honored for their outstanding contributions in the classroom and the lab, as well as for their leadership abilities.

Physics Professor Lee Riedinger gave the Honors Day address, tailoring his comments for students and pinpointing the increasing role of physics in today's world. Specifically, he highlighted the avenues opening with the "dominant importance" of energy research, and how the physical sciences will be a central component of the country's agenda in that area.

"Energy supply, use, and policy will shape many of your careers," he told the students, reminding faculty that a physics education should prepare students for their roles in this new era.

Riedinger himself is slated to teach two new courses on energy, including "Energy in the Modern World" for the Haslam Scholars program, demonstrating the dedication that garnered for him the distinction of 2008 Macebearer. The highest faculty honor at the university, the Macebearer Award is bestowed on a faculty member who has shown extraordinary service to students, the university, and the greater society. Distinguished careers like Riedinger's all start somewhere, and so the department takes pride each year in honoring top students for their excellent work. With Department Head Soren Sorensen as master of ceremonies, the 2008 awards began with the undergraduates.

Soren Sorensen presents the Outstanding First Year Student Award to Jeff Nicholas

Undergraduate Awards

Outstanding First Year Student: This award recognizes a student who has shown extraordinary acumen and performance in the first year of physics study. The 2008 award went to Jeff Nicholas.

Robert Talley Awards: The Talley Awards are made possible by the generosity of physics alumnus Robert Talley and his wife, Sue. The Talley Award for Undergraduate Research recognizes students who have complemented their academic work with outstanding research during their undergraduate career. This year the department recognized two students with this award, Jeff Tithof and John Hunt, both of whom have worked with physics research programs; Jeff in particle physics and John in nanomaterials. The Robert Talley Award for Outstanding Undergraduate Leadership recognizes undergraduate students who have shown outstanding leadership. The 2008 honor went to Alex McCaskey, president of the Society of Physics Students.

John Hunt was recognized with a Robert Talley Award for Outstanding Undergraduate Research

Douglas V. Roseberry Award: In 1959 the Phi Sigma Kappa fraternity established this award to honor their fraternity brother, physics major Doug Roseberry, who died unexpectedly five months before his graduation. As an undergraduate, Doug took on research and teaching duties in addition to his coursework, and so the Roseberry Award has traditionally been reserved for an upper-

(continued on page 3)

IN THIS ISSUE

A Vision for the Universities in the State of Tennessee

By Soren Sorensen, Department Head

Over the last year there has been a debate on the Knoxville campus, and to a lesser extent within the UT system, concerning the division of organizational responsibilities for several entities in Knoxville, like the athletic department, the agriculture enterprises, and the new Cherokee campus across the river from the main campus. For many people here on the Knoxville campus it seems natural that since these entities are located either on our campus or right next to it, they should be part of the University of Tennessee in Knoxville and report to the chancellor of the campus. However, for historical reasons (see below) another structure has been chosen for the UT system. The disagreement over these issues had the unfortunate consequence that Chancellor Loren Crabtree "decided to resign" in January, and since Provost Bob Holub will also be leaving UTK by the end of this academic year, we will start next year with interim leadership at the two top positions of our campus.

Very often the discussions concerning the issues of campus vs. system have been cast in personal terms of whether people favor Chancellor Crabtree or President Petersen. However, after having listened and participated in many of these discussions over the last 6-12 months, I have come to the conclusion that this is a problem that is much deeper than whether a particular chancellor or a particular president is right or wrong. It is caused by the flawed organizational structure of higher education in the State of Tennessee due to the special historical circumstances surrounding the creation of the University of Tennessee System and the Board of Regents.

The University of Tennessee was originally just the campus in Knoxville. In 1911 a medical campus was formed in Memphis and in several steps from 1927 to 1968 UT Martin came into being. In 1968 the UT system was formed in connection with the incorporation of the former University of Chattanooga into the system. Four years later the remaining higher education institutions in Tennessee formed the Board of Regents system, which eventually came to consist of Middle Tennessee State, East Tennessee State, University of Memphis, Austin Peay, Tennessee Tech, Tennessee State, 13 community colleges and 26 technology centers.

The fundamental problem for the UT system has been its imbalance. UT Knoxville has during all these years comprised around 60-70% of the students and the resources, and the UT system management has continued to reside on the Knoxville campus. As a result of this gradual growth from a single campus to an imbalanced university system, many historical vestiges have remained, like the UTK Athletic Department reporting to the UT system and the strange governance structure of the Ag campus, where the management reports to the president, but the faculty is considered part of the UTK faculty with membership in the UTK Faculty Senate. Many other areas have unusual management structures, where there have continually been frictions because the responsibilities between the campus and the system have either been only vaguely defined or have been cumbersome with indirect lines of communication. Over the years many chancellors and presidents have had conflicts over these issues and various presidents have come to different conclusions as to how to improve the structure. For example, President Wade Gilley decided to abandon the chancellor position and let the president take on the responsibilities of that office. However, a few years later President John Shumaker decided to reinstate the chancellor position. Later, due to the skills of Chancellor Crabtree and his presence during times when the presidency changed hands every few years, the influence of the chancellor's position slowly grew until this January, where the power structure changed once more after his resignation.

Another way of looking at the structural problem: if on one hand the UTK chancellor took over all the functions in Knoxville that normally are handled by a campus chancellor, there would not be much left for the UT president to do as compared to most other university presidents; and if on the other hand the president took over the chancellor's functions (as Gilley did), then the president would have way too much to oversee and would be in an awkward position of having to balance UTK's interest versus the other campuses in the system.

So is there a better way of organizing the higher education system in Tennessee? Yes! We can just look to the most successful of our neighboring states and also many of the largest states in the US. States like Georgia, North Carolina, Florida, Texas, New York, and California have large and flexible university systems consisting of 10 or more campuses with one or maybe two flagship campuses. The flagship campus is responsible for most of the advanced research programs and will usually have an extensive array of graduate programs and a very selective undergraduate program. The other

(continued on page 5)

Spring 2008 Honors (from page 1)

division student who exemplifies similar dedication and excellence. This year's honor went to Matthew Hollingsworth, who works with the high energy physics research group and graduated in three years with a perfect grade point average.

Nasrin Mirsaleh-Kohan won the 2008 Fowler-Marion Award

Graduate Awards

Robert W. Lide Citation: These citations honor Robert W. Lide, who directed and organized the undergraduate laboratories, a practice he continued even after his retirement. The Lide Citation recognizes students of like qualities and this year went to Christopher Smith for his outstanding work as head astronomy teaching assistant.

Outstanding GTA Award: This award for outstanding teaching performance in the undergraduate physics laboratories went to Amal Al-Wahish based on her stellar evaluations as a teaching assistant.

Paul H. Stelson Fellowships: The Stelson Fellowships are the legacy of Paul H. Stelson, who had a distinguished career in the ORNL Physics Division and was also an adjunct professor of physics at UT. He served as a mentor for many young physicists, and his family established these awards to support young scientists and continue the interaction between UT and ORNL. The Stelson Fellowship for Beginning Research went to James Alsup for his work in high energy theory, with the Stelson Fellowship for Professional Promise awarded to Jordan McDonnell for already distinguishing himself as a beginning student in the graduate program.

Undergraduates inducted into Sigma Pi Sigma were Brandon Byrns, Matthew Hollingsworth, Jeff Tithof, and Jacob Suggs

Fowler-Marion Award: Named for former ORNL nuclear physicist Joseph Fowler and his colleague Jerry Marion, this award honors a graduate student who excels in scholarship, research, and departmental citizenship. The 2008 honor went to Nasrin Mirsaleh-Kohan for her essential contributions to the chemical physics research program.

Wayne Kincaid Award: Honoring the memory of physics alumnus and research associate Wayne Kincaid, this honor recognizes a student who makes comparable contributions to educational technology, astronomy education, and scientific writing. The 2008 honor went to Jay Billings for his broad contributions to the astronomy program.

Colloquium Award: Saban Mustafa Hus won this honor for his outstanding participation in and reporting on departmental colloquia.

Graduate students inducted into Sigma Pi Sigma were Elton Freeman, Madhusudan Ojha, Roy Dar, Hua Chen, Shuhua Liang, Giordano Cerizza, Yeon Rim, Laurene Tetard and Amal Al-Wahish.

Additional Honors

Inductees into **Sigma Pi Sigma**, the physics honor society, were: undergraduates Brandon Byrns, Matthew Hollingsworth, Jacob Suggs, and Jeff Tithof; and graduate students Amal Al-Wahish, Hua Chen, Giordano Cerizza, Roy Dar, Elton Freeman, Shuhua Liang, Madhusudan Ojha, Yeon Rim, and Laurene Tetard.

Once again, the Society of Physics Students presented their **Teacher of the Year Award**, with the 2008 honor going to Soren Sorensen.

The department also recognized the students and faculty who took home **Chancellor's Honors** on April 9. Faculty members recognized were Lee Riedinger (Macebearer) and Pengcheng Dai (Research & Creative Achievement). Honored students were Usama Al-Binni, Songxue Chi, and John Hunt (Extraordinary Professional Promise); and Matthew Hollingsworth (Extraordinary Academic Achievement and Top Collegiate Scholar).

On a bus or in a lab,

Bennett Adkinson Takes on Some of Tennessee's Brightest Teenagers

Teaching, for Bennett Adkinson, has always come naturally. He might never have expected to hold class on a bus, or in a hotel, but luckily he's never been one to shy away from a little improvisation.

Adkinson is a physics instructor at the Tennessee Governor's Academy, a residential school where some of the state's brightest high school students are immersed in science and math. Governor Phil Bredesen championed the TGA, which opened in August 2007 with an inaugural class of juniors. The fall 2008 term will welcome a new class of 30 juniors, along with returning seniors.

Adkinson is one of several UT Knoxville graduates among the teaching staff. The Nashville native earned a bachelor's degree in 2004 through the College Scholars program, which allowed him to craft a pretty unique major.

"Mine didn't have a catchy name, but it was physics, theater, and secondary education," he says.

"The teaching came naturally," he explains. "I've always been good at talking in front of large groups and being spontaneous. But it took some deep soul-searching to figure out what I wanted to do with my life. It came down to either research or teaching."

Ultimately, teaching won out. Then it was a matter of settling on *what* he wanted to teach.

"I decided halfway through my sophomore year to be a physics major," he says. "I loved Dr. (Marianne) Breinig's optics class. I was utterly confused a lot of the time, but I had a blast, and I really feel like I learned something. That was a very lab-based class and I had a really good lab group."

Bennett Adkinson

"We have a lot to figure out when it comes to how to teach gifted kids well. It's not just giving them more work and making it harder."

His interest in theater provided a distraction from the rigors of physics, and eventually made its way into his teaching repertoire.

"I'm a very dramatic teacher," he says. "I don't act per se, but I'm definitely vocal and loud, and I keep their attention."

Adkinson went on to earn a master's degree in science education in 2005. He completed a teaching internship at Central High School and taught physics and theater for two years at Austin-East Magnet High School before the TGA came looking for him. His science education mentor, Matthew Perkins, recommended Adkinson for the physics instructor position, and the school contacted him about the job.

"It was a pretty awesome phone call," he recalls.

The plan for the academy was to start with a small class and build from there, beginning with the 2007-2008 school year. When the school was dedicated in August, Governor Bredesen was in attendance, and as a physics graduate from Harvard, he had a few challenges for the class.

"He actually posed two questions to our students," Adkinson says. "One was more of a mind game. The second one was a really hard physics electricity and resistors problem. He asked me how the class was going, what my expectations were, and how much we were going to get covered. He knew all the words that I was saying: kinematics, electricity, fluids, thermodynamics—I was very impressed."

Much of the school's curriculum is structured around modules, blocks of instruction that incorporate different academic elements. Adkinson timed a unit on rotational motion, for example, to coincide with a module on cars. Academy students also see science in action by visiting two very important neighbors. Every Wednesday this school year they worked with mentors at Oak Ridge National Laboratory, and they have access to faculty and facilities on the university's campus as well.

"UT has been incredible hooking us up with faculty and staff to come and give talks," Adkinson says. "We come to UT for our physics labs. Dr. (Jim) Parks has an amazing intro physics lab set-up."

Adkinson's graduate assistant, Sam McClure, is also a physics alumnus from UT Knoxville. The two have been working on adapting the physics labs to make them more inquiry-based, meaning the students have almost no write-up to work from.

"We give them the bare minimum amount of information, and then they figure it out," Adkinson says. "They hate us every once in awhile, especially for the first 30 minutes of lab."

But, as he says, the point of the exercise is to challenge students to think through the experiments scientifically rather than focus on getting perfect results.

"We don't care if they have errors," he says, "as long as they've thought about why they have those errors."

Field trips add another layer to the TGA experience, and the big one of the semester was the I-40 Road Trip, which started at the Smoky Mountains and went to the Mississippi River.

"We had physics class on the bus because we still had to get in our 180 school days," Adkinson says. At one point he held class in a hotel conference room at 9 p.m. ("The kids were not very excited about that.")

Adkinson is no stranger to blending teaching with traveling. He spent three summers teaching English at China's Tsinghua University through UT's Programs Abroad Office. He would love to repeat the experience, although there will be no program in 2008 because of the Summer Olympics in China. Finding the time might also present a problem, as he's set to begin a doctoral program this year, most likely in science education or curriculum development with an emphasis on teaching gifted students.

"We have a lot to figure out when it comes to how to teach gifted kids well," he says. "It's not just giving them more work and making it harder."

Adkinson says he's observed that many students are good at memorization and associate that with being smart, so he likes to work on their critical thinking.

Alumnus Profile

"It's great to be teaching physics in that regard, because physics concepts are one thing, but then figuring out how to apply the physics to the real world, or to a problem—it's not just plug and chug—you have to think; you have to reason out certain possibilities."

If his students take one thing from his teaching, Adkinson says he hopes it comes down to scientific curiosity about the world.

"I really just want them to look at the world through a critical eye and not accept things for how they were, or 'that's what my Mom told me,' or 'that's what my physics teacher told me.' I want them to investigate and try to figure it out on their own and question things."

For more information on the Tennessee Governor's Academy, visit http://tga.tennessee.edu.

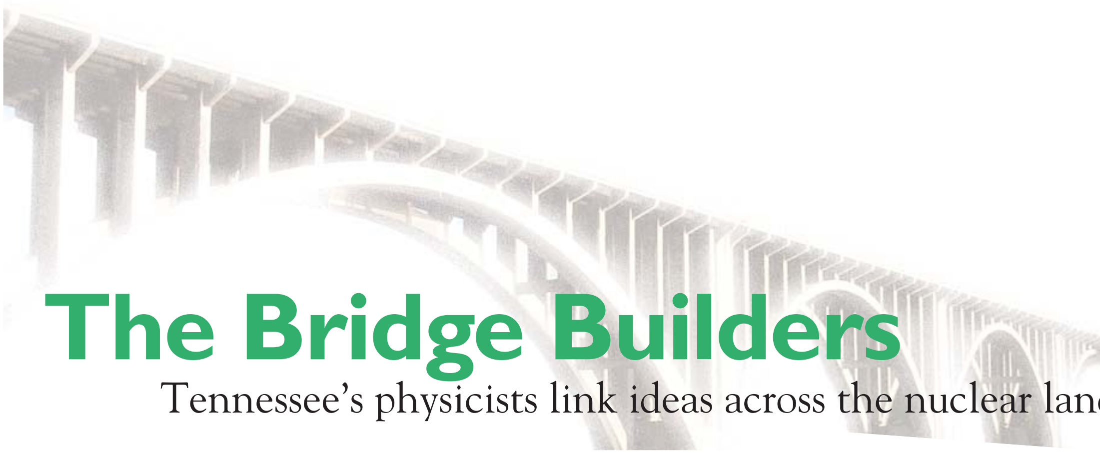
A Message from the Department Head (from page 2)

campuses will often focus on undergraduate education and only have selected graduate programs in fields that make sense for the particular campus. In some cases, as with Georgia and North Carolina, two flagship campuses have been developed with one focusing on technical disciplines (NC State and Georgia Tech) and the other focusing on traditional arts and sciences disciplines (University of Georgia in Athens and University of North Carolina at Chapel Hill).

Tennessee would be much better served with a university system inspired by these other states; incorporating all the current universities and 4-year colleges in our state and then consolidating the community colleges and technical schools into a separate system. The new University of Tennessee system would then have a president who could reside in Nashville and focus on coordinating and optimizing the research and educational opportunities between all these diverse campuses as well as the traditional task of creating income. It is in this optimization of programs that the main advantage of this new proposed UT structure resides, since it will enable each campus to focus on areas and fields where they have strength, and thereby avoid duplication of efforts. It would also allow for some interesting opportunities for flagship campuses: either we could choose to keep UTK as the only flagship campus and then allow UTK to strengthen core areas like the arts and sciences together with engineering, or we could choose to develop two flagships in Tennessee in Knoxville and in Memphis. This would better serve the western half of the state and would allow for a more productive synergy between UT Memphis and the UT Medical Center. Here in Knoxville, we would have a much simpler organizational structure, where once again after 40 years, the athletic and agriculture programs would report to the person in charge of the campus.

So if this is such a good idea, why has it not been done? Well, it has been tried several times. Professor John Quinn has informed me that a state committee headed by Richard Ray from Alcoa 15-20 years ago concluded that a comprehensive university system like the one proposed here would provide many advantages for Tennessee. But the political entrenchment in our state seems to make it nearly impossible to make the transition. Many of the current members of the Board of Regents will oppose such a move, since they feel they might lose influence in a larger UT system. Historically the Tennessee governors have also opposed the change, since they have a very large and direct influence on appointing the boards for the two systems and invariably the governor would have less influence over a larger system.

Nevertheless, it is my hope that we can keep the debate going and that eventually a sufficient number of influential citizens, politicians, researchers, and educators will realize that the best way to serve our state's needs for a dynamic and strong higher education system will be to merge the two currently sub-critical systems into one unified system.



The Bridge Builders

Tennessee's physicists link ideas across the nuclear landscape

Everything in the universe—the Washington Monument, the moons of Jupiter, and the nails on the tips of our fingers—is actually an arrangement of atoms. And inside each atom, amid a cloud of electrons, lies its command center; the nucleus.

Made from nucleons (protons and neutrons) bound together, the nucleus comprises nearly all of an atom's energy and mass. Its résumé includes fusion—the joining of lighter nuclei that fuels stars and holds potential for clean energy; and fission—the splitting of a heavy nucleus into two smaller nuclei, as in the generation of nuclear power. Medicine, energy, and defense are all areas that have benefited from this tiny workhorse's properties. Yet scientists have a manual for only a fraction of the thousands of nuclei that occur in nature or are brought to life in laboratories. Deciphering how they react to one another, how their individual components behave, and what might be expected of yet-to-be-discovered nuclei is the aim of the Universal Nuclear Energy Density Functional (UNEDF) collaboration.

Not Everyone in the Nuclear Family is Stable

The most popular model describing how a nucleus is built is the shell model, where protons and neutrons are arranged in concentric shells inside the nucleus, much like electrons fill shells in an atom. Any periodic table of the elements includes the atomic number, or the number of protons, for each element (helium has 2 protons, for example, while gold has 79). Within this scheme, there are certain numbers (called "magic numbers") that lend themselves to greater nuclear stability: 2, 8, 20, 28, 50, 82, and 126. Here the nucleons are bound tightly into complete shells, making it easier for them to resist decay. Nuclei with both neutrons and protons equal to one of the magic numbers are "doubly magic," and consequently are particularly well bound.

Slightly less than 300 proton-neutron combinations are stable enough to exist permanently in nature, but thousands more can be synthesized by scientists or created in stars. Assistant Professor Thomas Papenbrock is a theorist captivated by the architecture of nuclei. He explains how the shell model is challenged by the newer nuclei physicists are making in laboratories.

"Stable nuclei have more or less the same ratio of neutrons to protons," Papenbrock explains. Yet "experimenters have created nuclei with almost two or three times more neutrons than protons, and so this is a very extreme situation. The magic neutron and proton numbers tend to move, or go away, as we add neutrons to the system."

These nuclei venture farther and farther from what nuclear physicists call the "line of stability," the valley that lies between the nuclei that have too many protons to form a stable nucleus and those that have too many neutrons. These unstable nuclei—also called rare or exotic—are short lived and beta-decay toward their stable cousins on the chart of the nuclides. The goal of the UNEDF project is to improve and link existing theories, taking advantage of ever-advancing computer power, to develop a comprehensive description of all nuclei based on the fundamental interactions of their protons and neutrons.

From the Beginning

Papenbrock is one of the UT-Oak Ridge National Laboratory members of the UNEDF collaboration and works with his colleagues David Dean and Witold Nazarewicz on a variety of nuclear-structure problems.

"For very light systems we use what people call ab initio," he says. "We start from Hamiltonian."

Ab initio (Latin for "from the beginning") methods pay careful attention to how protons and neutrons interact; the Hamiltonian function provides the mathematical framework to express the system's total energy. Ab initio methods are quite successful, Papenbrock says, except for a significant hurdle: the quantum many-body problem. It's difficult to arrive at precise solutions for any system that has more than two bodies that interact with one another.

"This problem is so hard to solve, even with modern computers, that (ab initio) works well only for very light nuclei—up to mass 12 or 16, maybe; or for selected heavier nuclei, the so-called doubly-magic nuclei," Papenbrock says. "If we talk about thousands of heavy isotopes, there are just 20 or 30 where this works well."

To study nuclei outside this limited scope requires a different approach, and one such tool is density functional theory, or DFT, which describes a system in terms of its densities rather than its individual components.

"Basically we start from a density functional, but this is not ab initio because the presently employed density functionals are only an educated guess," Papenbrock explains. "It's a starting point that has a lot of hand-waving, and also a lot of good physical arguments, but we don't know this functional as well as we know the nuclear Hamiltonian.

"Starting from a functional is nice because basically you can solve the many-body problem very easily," he continues. "Compared to the ab initio method, it's absolutely simple … if you only knew the functional exactly. This whole business is built on existence theorems; we know there exists such a functional, but it's very difficult to construct this systematically. We know it's somewhere out there, but what does it look like? It should be computationally simple—we certainly want to make an approximation that we can still deal with in a simple way—but it should also be microscopically founded. We are investing much more time in thinking about what should be the form of this functional; how is it constrained by physics reasons."

Building Bridges

Ab initio methods involve a reliable starting point (the Hamiltonian) but are impeded by the technical difficulties to solve the quantum many-body problem, while density functional theory quickly dispatches the many-body problem but suffers from our limited knowledge of the functional. Ab initio methods work better for studying the lighter nuclei; DFT across the chart of nuclei and particularly for the heavier systems. And so the challenge is to narrow down one means to describe all nuclei.

"One functional should describe them all, and already the existing functionals do a very good job on the nuclei they have been fitted to," Papenbrock explains. "Now we basically want to bring those two (ab initio and DFT) together. We want to do calculations for a few nuclei that we can treat in both theories, or in both methods, and then see how well they agree. What can we learn from the way that they disagree?"

Better tools, including petascale computing and progress in nuclear theory, have helped create a scientific window of opportunity that makes this possible.

"We are now in a place where ab initio can really meet the density functional theory," Papenbrock adds. "I would say 10 years ago this was not possible, and if two approaches can't meet, it's difficult to patch them together. Now we are in a situation where we are able to validate one approach against the other. If we can link nuclear density functional to ab intio calculations, we have made another bridge, so to speak."

The more that's understood about nuclei and their intricate workings, the more predictive power scientists will gain. To make this universal functional a reality, however, requires the talent and hard work of scientists all over the country, and so was born the UNEDF project, which comprises more than 50 scientists from six national laboratories and eight U.S. universities.

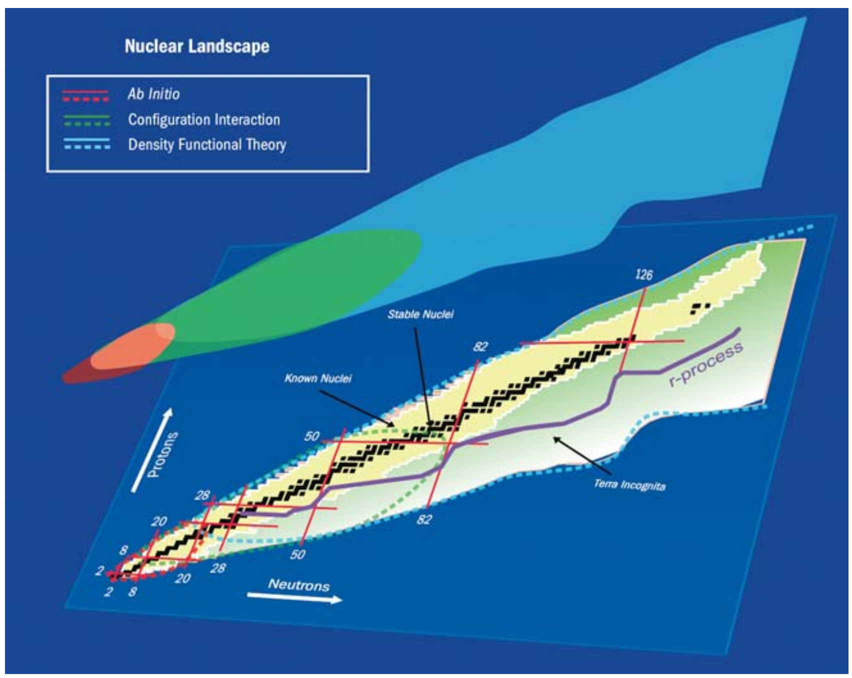
"There are people who perform ab initio calculations, people who apply density functional theory, and people who are much more concerned with just pure theory and computational science—all working together," Papenbrock explains.

The UNEDF collaboration is part of SciDAC—Scientific Discovery through Advanced Computing, a Department of Energy program (DOE). With an official start date of December 2006, the project is funded at $3 million/year for five years by both the DOE and the National Nuclear Security Administration.

"DOE is very interested in having a reliable description (of nuclei)," Papenbrock says, "and the National Nuclear Security Administration is interested in having a reliable description where no experiments can be done" (e.g., modeling of devices in the nation's aging nuclear weapons stockpile).

Papenbrock is one of several UT-ORNL scientists working on this initiative. Adjunct Associate Professor David Dean, who also directs the Office of Institutional Planning at ORNL, works with Papenbrock and ORNL staff scientist Gaute Hagen on ab initio calculations. Physics Professor Witold Nazarewicz, Post-docs Junchen Pei and Nicolas Schunck, and Research Associate Professor Mario Stoitsov are performing nuclear density functional calculations. The physicists also work closely together with computational scientists to use some of the nation's super computers. They keep in contact with their UNEDF colleagues via Internet, workshops, and an annual collaboration meeting. And for scientists like Papenbrock, the teamwork is part of the reward.

(continued on page 8)



The theoretical methods and computational techniques used to solve the nuclear many-body problem, with black squares representing stable nuclei and yellow squares indicating the unstable nuclei that have been produced and studied in the laboratory. The many thousands of these unstable nuclei yet to be explored are indicated in green (terra incognita). (Image credit: D. Dean & W. Nazarewicz, ORNL.)

"We work so closely together with other people; exchanging data, exchanging programs, writing publications together," Papenbrock says. "More senior people tell me that this is really the first time, basically in their lives, that such an effort has been undertaken. It has brought a good deal of excitement."

More information about the UNEDF collaboration, including a complete list of participating institutions, is available online at: http://www.unedf.org/.

For a popular description of UNEDF, see the SciDAC Review article (http://www.scidacreview.org/0704/pdf/unedf.pdf)

News from the Physics Family

Faculty

Professor Witold Nazarewicz spent the spring term on a prestigious Carnegie Centenary Professorship from the Universities of Scotland. Only one or two invitations are issued each academic year for this distinctive position, and Nazarewicz was the first person representing nuclear physics to hold the honor. His host was the University of the West of Scotland in Paisley, and he gave lectures, talks, colloquia, and seminars in conjunction with all 13 universities, including a public lecture on designer nuclei—rare atomic nuclei with characteristics adjusted to specific research needs. Nazarewicz also touched on that theme when he gave the opening plenary talk, entitled "Science of Rare Isotopes: Connecting Nuclei with the Universe," at the APS April meeting in St. Louis.

Professor Lee Riedinger has been invited to join the Howard Baker Center for Public Policy as a faculty associate. The Baker Center began operations at UTK in 2003 and is devoted to furthering the public's knowledge of governance and highlighting the importance of public service. Riedinger served as the former senator's science advisor in the mid 1980s. He is also working this summer with the university's Alumni Summer College July 16-20. This year's program is devoted to Energy, and Riedinger will give a talk on "Responding to the Country's Energy Problems" and will also help coordinate a tour of Oak Ridge National Laboratory. More information on the program is at http://www.utalumni.tennessee.edu/summercollege.

Students

Undergraduate **Jeff Tithof** placed first in the College of Arts and Sciences Natural Sciences category at the Exhibition of Undergraduate Research and Creative Achievement (EURCA) in April. He was also honored with a Phi Kappa Phi award for his work, "New Covariant Constraints for New Forces of Nature."

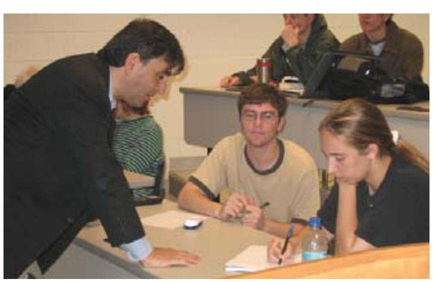
Shenyuan Yang, visiting graduate student from the Chinese Academy of Sciences, won the Silver Medal at the Spring 2008 Materials Research Society meeting in San Francisco for her thesis work on theoretical studies of hydrogen storage. She will graduate this year and has already decided to join a leading research group at Lawrence National Laboratory as a postdoc.

Graduate Student **Jordan McDonnell** has won a prestigious fellowship to pursue doctoral work in stewardship science. He is among the students honored with an award from the Department of Energy National Nuclear Security Administration Stewardship Science Graduate Fellowship (SSGF) Program. The fellowship includes a yearly stipend of $32,400, payment of all tuition and fees, and a $1,000 yearly academic allowance.

Alumni

Thomas Gadfort (B.S., 2001) is a postdoc with Columbia University's Nevis Laboratories in Irvington, New York.

"I see your point, however, …"

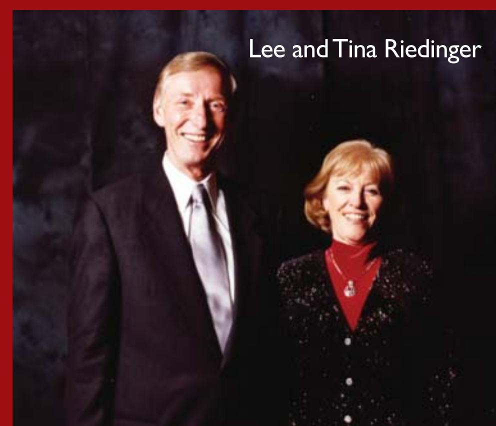


Eric Mazur (far left), Professor of Physics at Harvard University, visited campus in April as a Phi Beta Kappa Visiting Scholar. He demonstrated peer instruction to students in the department's introductory physics courses, posing questions to the class and asking them to answer individually using clickers. When he invited students to discuss their answers with their classmates and answer the questions again, there was a much stronger agreement of responses. The point Mazur wanted to make was that beginning learners are often the best qualified people to explain new concepts to their peers. The department will incorporate this and other approaches as part of a new physics education research program. As Mazur said, "You don't learn to play piano by watching someone else play."

New Endowments Thanks to Familiar Faces

It would be impossible to ignore the many contributions Bill Bugg and Lee Riedinger have made to the physics department. Both have served as department head. Both have taught classes, overseen research programs, mentored students, and even played a little softball at the annual picnic. Now their families have ensured their legacy for years to come with the establishment of two endowments: the Bill and Marian Bugg Physics Endowment and the Lee and Tina Riedinger Endowment.

The Bugg endowment, established with a $50,000 gift from Bill Bugg and his wife Marian, will allow the department to determine use of the fund's earnings for awards, technology upgrades, visiting scholars and lecturers, scholarships, fellowships, or other items depending on the department's needs. This endowment is separate from the William Bugg General Scholarship Fund, which was established by the physics faculty to honor Bugg's service and support undergraduate education.



The Lee and Tina Riedinger Endowment was established with a $25,000 gift from Lee Riedinger and his wife Tina, who guided many undergraduates through the finer points of astronomy during her years on the department's teaching staff. While the specific uses for the fund are still to be determined, it will ultimately support the goals and needs of the physics department.

Both endowments are part of the "Campaign for Tennessee," an ambitious, $1 billion fundraising endeavor for the university. The campaign has already met 70 percent of its goal.

Dane Gillaspie (Ph.D., 2006) is a staff scientist with the National Renewable Energy Laboratory in Golden, Colorado.

Jian He (Ph.D., 2004) is an assistant professor with the Clemson University Physics Department. He will soon be joined by **Hye Jung Kang** (Ph.D., 2005) who has also accepted an offer to join Clemson's physics faculty as an assistant professor.

Edwin C. Jones (Ph.D., 1992) has joined the Veterans' Administration Outpatient Clinic in Knoxville as a physician and physicist.

James O. Placak (B.S., Engineering Physics, 1959) is retired as president of Soroc Technology, Inc., in Anaheim, California.

Jason Smith (B.S., Engineering Physics, 2003) is with ICS Radiation in Oak Ridge, working in detector R&D.

James Wicker (Ph.D., 2006) is a postdoctoral researcher at the National Astronomical Observatory of China in Beijing.

New Additions

The physics family is happy to welcome Will Mahurin, who was born in January to graduate student **Rob Mahurin** and his wife Ellen; and Avani Spanier, who arrived in May. She is the daughter of **Assistant Professor Stefan Spanier** and his wife, Maha Krishnamurthy.

In Memoriam

The department mourns the loss of **Julia Taylor White**, widow of Physics Professor James White. She passed away on December 14, 2007. Born in 1914 in Winnabow, North Carolina, she was a graduate of Flora MacDonald College and taught school before her marriage to Dr. White in 1942. She served on the board of trustees for King College and was a board member of the Bount Mansion Association for 25 years, serving several years as president. She was also a member of the National Society of the Colonial Dames of America, serving as area president and on the state board. She was a board member and historian of the UT Faculty Woman's Club. Mrs. White is survived by a sister, a brother, her three sons and their families, and the many friends she made in our department.

Physics Colloquia Online

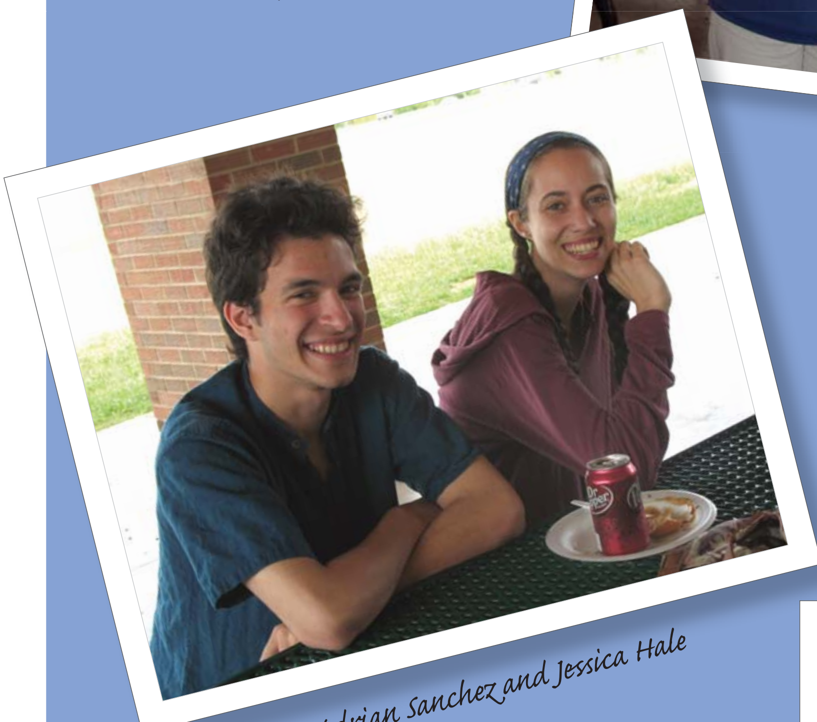
Can't make it to campus for the Monday afternoon colloquia? Not to worry. The department broadcasts the talks on the Web and keeps an online archive—just go to http://www.phys.utk.edu/colloquium.html and click on "Physics Colloquium Webcasts." Examples of previous colloquia include "The Global Energy Challenge" and "Teaching a SmartPET New Tricks: Medical Imaging with Semiconductor Detectors." The colloquium schedule will resume with the start of the Fall 2008 semester.

Chad Mitchell narrowly avoids the wicked Sorensen fastball

Marianne Breinig tries out a wave spinner wand

Soren Sorensen celebrates surviving Honors Physics

Ron Goans and Steven Boada



Adrian Sanchez and Jessica Hale

Spring 2008 Picnic

The Society of Physics Students hosted the department's annual picnic, held this year at Victor Ashe Park on April 26

Jeff Tithof, Rachael Ainsworth, and George Duffy

Thanks to our Donors!

The department gratefully acknowledges our donors for their kind support of our programs:

Pauline Abbott
Chang-Hyuk An
Kim An
Arthur Steve Bell
Chris Bell
Patricia Black
Marian Bugg
William M. Bugg
Antonino Carnevali
Chiong-Yiao Chen
Margaret M. Compton
Robert N. Compton
Dennis J. Erickson
Mary S. Ferry
Robert A. Ferry
Jo Ann Guidry
Michael W. Guidry
Sara W. Harris
Leigh H. Harwood
Christopher Ray Hawkins
Jackie T. Hill
Sandra J. Hinsdale
James S. Jarratt
Joseph Thomas Lewis
Josephine Anne Lewis
Lightcone Interactive
Ellen A. Macek
Joseph H. Macek
Dale W. Magnuson
Mary L. Magnuson
Beverly C. Martin
Richard M. Martin
Helen B. Mason
Brian J. McCarron
Kay R. McCarron
Witold Nazarewicz
Barbara C. Parks
James E. Parks
Chitta L. Rao
Audrey T. Schlafke-Stelson
Joshua S. Shimony
Rebecca Kramer Shimony
Ralph C. Simpson
Tina Simpson
George Siopsis
Dianna L. Sorensen
Soren P. Sorensen
Sue Williams Talley
Robert M. Talley
Dawn Thompson
James R. Thompson, Jr.
James Davis Trolinger
Evelyn Marie Wood
Jeremy R. Wood
Ming Zhang

(Gift records forwarded to the department from December 1, 2007, through May 30, 2008)

Giving Opportunities

The UT, Knoxville, Department of Physics and Astronomy has several award and scholarship funds to support our vision of excellence in science education at both the undergraduate and graduate levels:

UNDERGRADUATE SCHOLARSHIPS

- The William Bugg General Scholarship Fund
- The G. Samuel and Betty P. Hurst Scholarship Fund
- The Dorothy and Rufus Ritchie Scholarship Fund
- The Robert and Sue Talley Scholarship Fund

UNDERGRADUATE AWARDS

- The Douglas V. Roseberry Memorial Fund
- The Robert Talley Undergraduate Awards

GRADUATE AWARDS & FELLOWSHIPS

- Paul Stelson Fellowship Fund
- Fowler-Marion Physics Fund

OTHER DEPARTMENTAL FUNDS

- Physics General Scholarship Fund
- Physics Equipment Fund
- Physics Enrichment Fund
- Robert W. Lide Citations
- Wayne Kincaid Award

If you would like more information on how to make a donation or a pledge to any of these funds, please contact either the physics department or:

The College of Arts and Sciences Office of Development
2524 Dunford Hall
The University of Tennessee
Knoxville, TN 37996-4000
Telephone: (865) 974-2365
Web: www.artsci.utk.edu/development/index.asp

Address Changes

☐ Please remove my name from the *Cross Sections* mailing list.

☐ Please update my information as marked below:

Name: ______________________________

Address: ______________________________

City: ______________________ State: ________

Zip or Postal Code: ______________________

E-mail Address: ______________________

Return by mail to:
401 Nielsen Physics Building
The University of Tennessee
Knoxville, TN 37996-1200
USA

or

Send an e-mail message to cal@utk.edu

CROSS SECTIONS
is published twice each year by the University of Tennessee, Knoxville, Department of Physics & Astronomy.

Department Head: Dr. Soren Sorensen

Associate Department Heads: Dr. Marianne Breinig and Dr. James E. Parks

Publications Coordinator: Catherine Longmire

(865) 974-3342 phone (865) 974-7843 fax

physics@utk.edu

http://www.phys.utk.edu

Original photograph by Chad Middleton (Ph.D., 2005)

DEPARTMENT OF PHYSICS AND ASTRONOMY

CROSS SECTIONS

401 Nielsen Physics Building

The University of Tennessee

Knoxville, TN 37996-1200

Non-Profit Org.
U.S. Postage
PAID
Permit No. 481
The Univ. of Tenn.
Knoxville, TN

PA#E01-1060-004-08

A project of the UTK Department of Physics & Astronomy, (865) 974-3342, with assistance from the UT Creative Services Division. 6872