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

CROSS SECTIONS

FALL 2006/WINTER 2007

Department Upgrades Astronomy Program

New Telescopes & Labs Put Astronomy Students in the Driver's Seat

by Suzanne Parete-Koon

IT'S A CLEAR NIGHT ON THE ROOF OF THE PHYSICS BUILDING, where a group of novice astronomy students have just been given control of nine brand new $3000 Meade LX 200R telescopes. Graduate teaching assistants Phil Evans and Dwayne John pass in and around the students offering instructions and making sure that nothing is being damaged. This is the first week that mandatory hands-on telescopic observing labs have ever been implemented for the general astronomy students at the University of Tennessee.

In the red LED glow of the telescope's control pad, freshman Meghan McLendon is typing in the commands to point the telescope to M31, the Andromeda Galaxy. The telescope's automatic guidance system grinds to life with a sound that closely resembles the churning of an ice-cream maker. Its computer automatically calculates how to slew the telescope to the galaxy. McLendon looks in the finder scope, a small wide field telescope attached to the main scope, to see if her target is reached. She uses the control pad to center the galaxy in the cross hairs and then takes a look through the main eyepiece. Her lab partner waits to write down her description of our nearest galactic neighbor by the light of an open cell phone.

The Andromeda Galaxy in an image made using UT's new astronomy equipment (courtesy of Jay Billings).

"It's a fuzzy blue blob," McLendon says.

Because the human eye can only see an instant's worth of light, even the light collecting power of the telescope's 8-inch diameter primary mirror cannot reveal the delicate spiral arms of the galaxy against the streetlight washed Knoxville evening sky. To see more detail McLendon will have to wait for the next telescope lab, where she will use a CCD camera in place of the telescope's eyepiece to collect and add several seconds' worth of the galaxy's light.

A few weeks later the Andromeda Galaxy is again in the cross hairs of the same finder scope, but the telescope, this time operated by students Genny Petschulat and Laura Pfounts, is armed with a CCD camera in place of its main eyepiece. Pfounts controls the camera using a laptop, which is displaying a fuzzy image of stars that she hopes are near the galaxy. Every second the camera sends an updated image to the screen so Petschulat can focus the telescope and search for the galaxy.

Even with the telescope's guidance system, finding and centering a target in the small field of view of a camera without using the main eyepiece is a study in patience and trial and error. Students at the neighboring telescope have already spent 20 minutes searching a patch of sky for the Ring Nebula only to determine that their telescope must have been previously bumped out of alignment, putting its guidance system a few billion miles off the mark.

Petschulat and Pfounts are having better luck. A few adjustments bring them a sharp centered image of the Andromeda Galaxy. Pfounts sets the camera to take 10, 10-second exposures. As the camera works it sends images to the laptop screen that reveal a brilliant galactic core, the ghosts of spiral

(Continued on page 3)

IN THIS ISSUE

A Message from Soren Sorensen, Department Head

Planning for the Future

BEING ADMINISTRATOR OF A WONDERFUL AND COMPLEX ORGANIZATION like our department of physics and astronomy is a lot like being the captain on a big ship: most of the time is spent just trying to get the ship to sail and to avoid all the obstacles and mines placed in our path. But once in a while we have to figure out what course to take, and for us the map that tells us what direction to sail in is our strategic plan. This strategic plan is developed by the department's planning committee, which consists of professors selected based on their expertise, experience, and field. Currently the chair of the committee is Witek Nazarewicz. The other members taking part in the development of the strategic plan were: Bob Compton, Elbio Dagotto, Yuri Efremenko, Geoff Greene, Mike Guidry, Yuri Kamyshkov, Joe Macek, Ward Plummer, Soren Sorensen and Hanno Weitering.

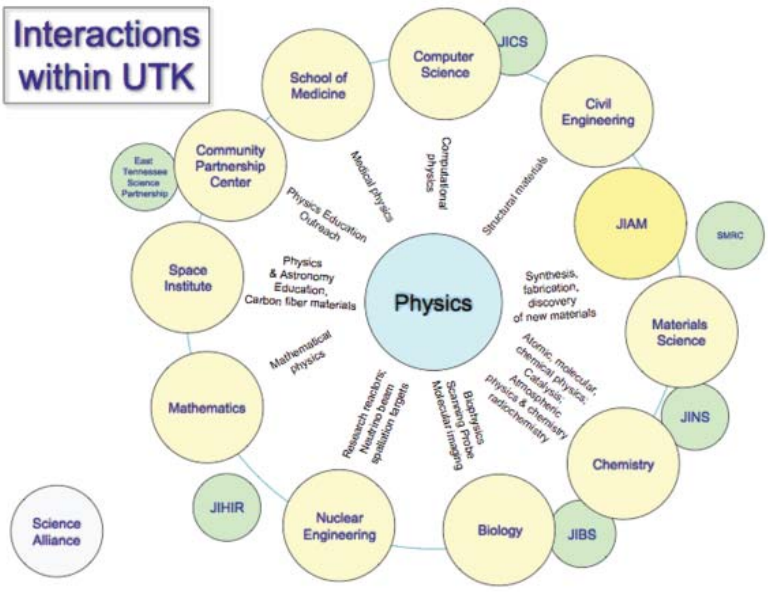


Figure 1: Schematic diagram illustrating the UTK Department of Physics and Astronomy's interactions with other UTK units.

Over the last academic year this committee has solicited input from all the various groups and faculty members in the department and based on this input a new strategic plan was developed and eventually approved by the faculty in September. I have been very impressed with how well the committee and our faculty developed this plan. It is my subjective impression that many other departments, both at UTK and at other universities, have severe internal conflicts when trying to determine where to place emphasis and which areas might or might not receive new positions as faculty lines open up due to retirements or people leaving. In contrast, in physics we have developed three strategic plans over the last decade and both the development and subsequent implementation of these plans have been done in a very civilized and professional manner that really serves the reputation of our faculty well. The unity and coherence of the department is really a great example of old phrase: "United we stand, divided we fall."

The main reasons for developing the new plan were that large parts of the previous plans had been implemented and at the same time the landscape around our department has been rapidly changing. The four new Joint Institutes between the university and ORNL in Advanced Materials, Neutron Science, Computational Science, and Biological Sciences are now a reality and in particular the Joint Institute for Advanced Materials (JIAM) will have a huge impact on our future development. The funding climate is also changing with potentially large increases in federal funding for projects devoted to improving and protecting our nation's competitive edge.

During the development of the plan a lot of emphasis was placed on identifying areas where the physics department has strength and uniqueness. One aspect is the exceptionally large amount of external interactions with other departments within our college, with other UTK colleges, and with other institutions, like Oak Ridge National Laboratory. Figure 1 illustrates many of our interactions with other UTK units.

The first part of the strategic plan describes the fundamental guiding principles for the three main areas of our mission: teaching, research, and service/outreach, whereas the second part describes the hiring priorities derived from these guiding principles. The full text of the strategic plan is available on the physics department's Web site.

Naturally it is impossible to discuss all the guiding principles here, so I have selected a few; not because they are more important than many of the other principles, but because they are unique for our department and potentially of special interest to our newsletter readers:

Develop JIAM into a world center for materials research – The new Joint Institute for Advanced Materials and the associated

(Continued on page 9)

(Department Upgrades Astronomy Program, continued from page 1)

arms and faint dust lanes weaving in and around the galaxy's stellar matter. While the images are not Hubble telescope quality, they are a revelation compared to the fuzzy blue blob offered up by the human-eye view through the same telescope. Later Pfountz and Petschulate will use software to add the images together and screen out some of the Knoxville city sky glow.

Professor Kermit Duckett, who wrote the new telescope lab exercises and UT's astronomy lab manual, says, "The telescope labs are going very well. Of course, typical Knoxville weather has not always cooperated. But what has been learned is that the new Meade telescopes and the cameras have provided a path around much of the overall light pollution of Knoxville. Adobe Photoshop software, in conjunction with the images obtained, is offering a way to remove much of the undesirable background lighting to obtain very respectable results."

Currently, there are five new telescope exercises written. Three of those have been tested and all are being corrected for addition to the astronomy lab manual update. Over the summer Duckett had graduate teaching assistants test the new labs to see if they were student friendly and achievable in hour-long lab sessions.

Duckett says, "All teaching assistants that have been involved with astronomy labs this semester have been most enthusiastic and responsible in their duties. Their contributions have been the bridge to a successful semester. The leadership of [head astronomy GTA] Jay Billings and the effort of all the lab assistants is the source of the success!"

Funding for the new telescopes, cameras, and control systems was provided by a $60,000 instructional equipment grant from the College of Arts and Sciences. Laboratory specialist Paul Lewis, who has run extra credit observing sessions for UT astronomy students since 1987, worked with Director of Undergraduate Laboratories James Parks to obtain the equipment grant.

Lewis says, "Some students have commented to me that there seems to be something magical about astronomical images. Now that students can take their own images and process the information for themselves, they have a personal sense of accomplishment."

With the observing sessions packed even on clear Friday nights, students do actually seem to be enjoying the new labs.

As astronomy student Meghan McLendon says, "The telescopes make this course more interesting than other science that I've had. It is so different and so hands-on."

Suzanne Parete-Koon (M.S., 2001) is a Ph.D. candidate in physics.

New Astronomy Concentration

by Suzanne Parete-Koon

The University of Tennessee has proposed a new astronomy concentration designed for undergraduate physics majors who wish to do graduate work in astronomy or astrophysics. The concentration was approved at the September meeting of the College of Arts and Sciences Natural Sciences Curriculum Committee and should appear in the undergraduate catalog by next year.

UT Astrophysics Professor Mike Guidry says, "We were motivated to create the new concentration because many of the undergraduates are interested in astrophysics. We also believe that it is a recruiting issue because of the large number of incoming students who ask about options in astrophysics."

Guidry played an instrumental role in developing the new concentration while chairing UT's Taskforce for Astronomy and Astrophysics Education.

The courses in the concentration will consist of enhanced versions of preexisting astrophysics courses. Students will enter the sequence with Honors Astronomy 217 and 218, a mathematically rigorous survey of astrophysics that carries a laboratory component with an emphasis on astronomical observing. For this series the students will utilize the physics department's new eight-inch aperture Meade LX200R telescopes to do basic astrophotography and photometry. Students entering the course must have a background in college level algebra and some calculus or be able to work up to the equivalent during the course. The remaining courses in the concentration will be lecture-based and delve more deeply into specific topics. Astrophysics 411 is slated to be an introduction to the stellar astrophysics and galaxies, with Astrophysics 490 as an undergraduate intro to general relativity, black holes, and cosmology.

Guidry says, "We hope at some point in the future to add a 300 level observing course At the moment we can't do that because we don't have sufficient faculty to teach a new course."

With the recent additions of theoretical astrophysicist Christian Cardall and experimental nuclear astrophysicist Katherine Jones as research assistant professors, UT's faculty is growing to meet the needs of an expanding astrophysics program. The physics department has adopted a five-year strategic plan that includes priorities to add one-to-two new faculty members in astronomy and astrophysics. This addition would strengthen the astronomy concentration and perhaps allow the department to add an astronomy major.

For now, aspiring undergraduate astrophysicists can satisfy their advanced observing needs by registering for undergraduate research credits and allowing the available faculty to help them develop their own projects using the telescopes. UT first year physics major Meagan White hopes to take advantage of this option later in her college career to earn some credits doing solar observing research. White may be one of the first students to tackle the new astronomy concentration.

"I want to study astronomy in graduate school," White says, "so hopefully this concentration will give me a leg-up on the people who just studied physics."

All in the Family

Ed and Holly Deeds Make Teaching Physics a Family Affair

FAMILIES PASS DOWN ALL SORTS OF THINGS from one generation to the next—photographs, heirlooms, long-held traditions and well-loved stories. In the Deeds clan, you can add to that legacy an innate curiosity about the natural world and a love for sharing discoveries.

In nearly 40 years on the physics faculty, Ed Deeds guided many students toward graduate degrees. His daughter Holly, an alumna of the department, is now a member of the science faculty at the McCallie School in Chattanooga. Their respective paths to the classroom were quite different, with father working for the Manhattan Project and daughter starting out in studio art, yet they share an obvious love for teaching that indicates both ended up right where they should have.

"A Ringing in My Ears"

It's a Friday afternoon in early October, and Ed Deeds has just come from the Science Forum at Thompson Boling Arena. Retired from the physics faculty since 1990, the now-professor emeritus still keeps up with the goings-on in science and research at the university, a trademark of the inquisitiveness he has known all his life.

"I've always been interested in how things work," Dr. Deeds says with enthusiasm. "I was curious about things."

That curiosity propelled him to a bachelor's degree in physics and math at Denison University in 1941. The Ohio native then headed west to Caltech for a graduate assistantship and a teaching fellowship in physics. But just six months after his arrival, Pearl Harbor was bombed, and before long he was part of a wider national initiative.

"Essentially, they assigned all the physics students in the country to work on science projects," he says.

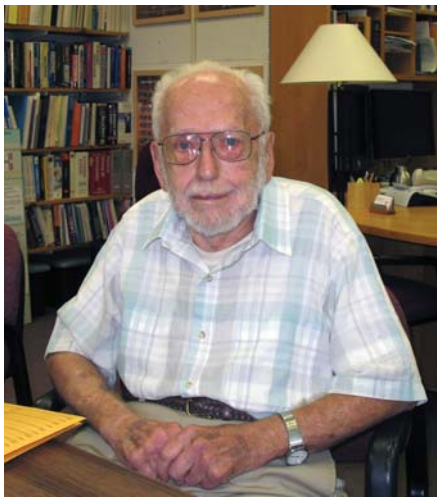
His particular project turned out to be measuring acoustic shock waves from all sorts of things—shotguns, rifles, cannons, and rockets—for the National Defense Research Council. Ever the professor, Dr. Deeds automatically gets up from his chair and makes his way to a white board, where he starts sketching out an illustration of how shock waves originate and how they can be measured.

"We were the U.S. experts on sound waves," he says, quickly writing out equations with a blue marker.

When Bell Labs developed a quartz microphone that could detect sounds of up to 125,000 cycles per second, Caltech scientists tested the device by mounting it on a telephone pole and then shooting bullets past it. It fell to the young graduate student to record the data as they went whizzing by.

"I was under the telephone pole in a dugout with my oscilloscope and a camera, (and) they would shoot these things by," Dr. Deeds recalls. Sometimes, he says, the bullets would accidentally hit the pole. And although the microphone escaped damage, on a couple of occasions it came crashing down into the sand.

"And ever since I've had a ringing in my ears," he says with a chuckle.



Physics Professor Emeritus Ed Deeds

Still, refining a method to make measurements like these (although a little unnerving at times) proved to be an important part of the U.S. war effort. Dr. Deeds began working with W.K.H. Panofsky. The Panofsky group was later recruited by physicist Luis Alvarez to work on the Manhattan Project at Los Alamos to design and build instruments to measure the yield of atomic explosions.

"They took our spheres with the microphones and radio transmitters in them and installed the receiving equipment in a B-29," he says. "It turns out that our measurements of the shock wave were the only good measurements they have of the Hiroshima bomb."

On to Academe

Dr. Deeds completed a master's degree at Caltech and then headed back to Denison after the war ended. He taught there for a couple of years and went on to Ohio State to finish his Ph.D. in 1951. Then it was time to look for a new position.

"At that time, teaching jobs were not very numerous," he says. "I got an offer from Bell Labs to work on the research staff and an offer from Tennessee to come and teach. I knew I wanted to teach, so I decided to come here."

He signed on as an assistant professor in 1952, teaching primarily graduate courses in theory. He worked on rocket research with Redstone Arsenal and served as principal investigator on a DARPA project involving missile defense. He was also quite a specialist in eddy currents; one of his papers on the subject has been cited 198

times. But teaching was his great love. "I had 23 Ph.D. students and 36 master's students," he says. "Physics is nice to teach because people don't take physics unless they're interested in it."

As it turns out, two of his four children shared that interest in physics. Son Dean earned bachelor's and master's degrees in physics at UT and a Ph.D. at UC-Irvine. He now works in satellite communications. ("He was like me, curious about everything," Dr. Deeds says.) Holly followed suit in the sciences. "All the children were National Merit Scholars," he says. "I never helped them with their homework at all. I don't ever remember having to force them to do it. They were eager to read everything." Son Eric went into archeology and has written computer-based courses in algebra, geometry, calculus, and physics. Daughter Amy is a writer for Kenyon College.

Ultimately, he says, he wanted for his own children what he wanted for his students, to pursue what interested them the same way he chose physics.

"I went into it because of curiosity," he says. "I wanted to find out why things are the way they are. That's what science is to me."

The Accidental Teacher

On a rainy Tuesday afternoon, Holly Deeds answers the phone with a smile in her voice. She has finished another day at McCallie, a private all-boys school in Chattanooga, where she has taught since 1990. She is cheerful and witty; exactly the kind of person who could make physics a little less daunting to a roomful of teenage boys. Although early on, teaching science was not at all what she had planned.

"It was almost accidental," she says of her transition to education. She graduated from UT in 1982 with a degree in studio art, but wasn't really inspired by the job opportunities she saw at the time. After spending six months working for a food vendor at the World's Fair, she decided to explore some other options. A little fatherly advice came in handy.

"My dad suggested that I take some computer science classes," she says. But because she wasn't enrolled in a degree program, she wasn't categorized as a priority student, and the computer science classes were wildly popular and hard to get. Dr. Deeds suggested she enroll through the engineering program, so she signed up for engineering science and mechanics, which required physics and math.

Holly Deeds

"I'd never had physics before at all," she says. Yet she ran the gauntlet and completed coursework in physics, calculus, and electrical engineering. "The physics was most logical to me, and the most creative," she says. "Physicists were interesting."

She finished a bachelor's in engineering physics and went on to complete her master's in 1987. But while she was working toward a Ph.D., she found the long hours in the lab a little isolating. That's when a family friend suggested that she would be a good teacher. Before that, she says, she never would have considered it.

Ms. Deeds arrived at McCallie as a mid-year appointment and has been teaching there ever since. She teaches seniors in general senior physics and advanced placement physics B. She's also an advisor for 17 students, monitoring their academic, social, and emotional well-being. "In some ways, it's more work, and in some ways, it's more rewarding," she says.

Teaching science can be a serious challenge, especially at the middle and high school levels. But Ms. Deeds insists that good equipment for hands-on learning and an engaging presentation can inspire even the most wary students. They don't mind the work or even the math if they can see where you're leading them, she says. "If you give them a pattern, they love it."

"I think we were brought up to appreciate education and to enjoy learning for the sake of learning."

Evidently the approach has worked. At a reunion just the weekend before she learned one of her first students had taught physics at a small school in Jackson, Mississippi. And over the years she has heard from students who have majored or minored in physics—including some she never would have imagined would take that route.

"Every once in a while you hear about one who has taken this unexpected path . . . and that's gratifying," she says. Students often let her know when they're taking college courses in physics and how they're doing—and thank her for preparing them.

"I enjoy the collaboration with young minds," she says. "The energy of it appeals to me. They still come up with new and interesting ideas."

Given her background, perhaps it's not that surprising that she became a teacher.

"I think we were brought up to appreciate education and to enjoy learning for the sake of learning," Ms. Deeds says, adding that there was never any pressure from Dad to choose a particular profession. With one exception, perhaps.

"The only thing he didn't want me to do," she says, laughing, "was to go into acting."

Like Father, Like Son

Physics is the Family Business for Robert and Michael Childers

A YOUNG MAN WITH DARK AND RUMPLED HAIR, his necktie loosened just a bit, walks slowly to the front of Michael Childers' classroom. He presents his teacher with a sheet of paper, politely asking for help on a physics problem that has momentarily stumped him. As the two begin to talk it through, the student's frustration gradually gives way to a spark of recognition. "I have to solve for *v*," he says, almost to himself, as if he has discovered something he hadn't noticed before.

"Yes, yes, keep that thought going," his teacher says with genuine enthusiasm. "You're on it—you're on it!"

This is a snapshot of learning physics in Mr. Childers' classroom at Webb School in Knoxville. There is an enormous periodic table on the wall facing the door. There are physics articles and brochures on the bulletin board, including a *Knoxville News Sentinel* story about Physics Professor Marianne Breinig and teaching the physics of football. And there is a contagious energy from the man in front, a 1993 UT physics graduate, who sees teaching physics not so much as a job, but as a way to make a positive mark on the world. He also happens to be the son of physicist Robert Childers, who spent more than three decades teaching physics on the faculty at UT. Yet it wasn't his father's work that drew him to the sciences.

Michael Childers

"In fact," Mr. Childers says, "I probably avoided physics for a long time." At age 18, he says, "I wanted to blaze my own trail, do my own thing. I wanted to do something different. My father is a theoretical physicist, so there weren't gadgets lying around. It was just a slide rule and paper. That's what physics was to me; I had no clue as to what it was."

The younger Childers began college as a music major, but then tried computer science, accounting, and math.

"When I was a math major, I had to take a lab science," he says. "So I thought, 'I'll take physics.' And when I (did), just to fulfill the lab requirement, I thought, 'This is the most beautiful subject I've ever seen. This is what I want to do with my life.' I always credit physics for teaching me how to think."

Even though he decided on physics, teaching wasn't part of the picture—at least not at first.

"I thought I would do research," he says. "I can remember talking to my father and we were contemplating experimental versus theoretical physics and what I thought I might like better."

It was the inspiration from a young woman named Angela that added the educational component to Mr. Childers' career.

"I was dating a girl—who I ended up marrying—and she was in social work," he explains. "I felt like she was making such a difference in people's lives. I thought I'd really like to do something where I could do physics, because that's so much fun, and also have some hope of impacting somebody's life. That's how I happened upon teaching."

So while finishing his bachelor's degree in physics, Mr. Childers also earned his teaching certification in both math and physics. But while he always got a job teaching math, he says, he would have to wait at least a year in any school before he could teach physics. After 12 years in the public school system, his wife told him there was a physics-only teaching position opening at Webb, a private school in Knoxville. He is now in his second year there. He teaches courses in advanced placement and conceptual physics. He also sponsors the physics and engineering club, which gives him an opportunity to talk about science outside the classroom.

"Some kids just hear the word physics and it's frightening," he explains. "You don't want to make physics into something that it's not, but you want to present it in a way that doesn't scare off somebody." The key, he says, is to convince students that "you don't have to be a genius in math to have success at some level in physics. It's not an untouchable subject for anybody."

When asked how he would advise a student who might one day want to teach physics, his initial response is simple: "Find a grader." But in more serious tones, he adds, "You need a lot of energy. You need to have that social work heart to help somebody along. I think that's the only advice I would give somebody."

The Artisan Scientist

Unlike his son, Robert Childers ended up in physics partly *because* of a little fatherly advice. He had intended to major in philosophy and minor in art at Howard Payne College (now university) in his native Texas. But on a visit home, he says his father was reading the newspaper and announced, "I just don't see any job ads for philosophers."

As an undergraduate, Dr. Childers already had a passion for math, and he knew someone from Berkeley was coming to teach physics at

Howard Payne. So he decided to give physics a try. He went on to graduate in 1960 with a bachelor's degree in physics and math and a minor in art.

When it came to choosing a graduate program, however, he says he had one caveat: no equipment.

"I like ideas," he says. "I would be an utter disaster as an experimentalist. Give me a pencil."

So when Vanderbilt University offered him a fellowship that meant no lab instruction, he accepted. But, he says, he also knew that once the fellowship ended, he might very well end up with an assistantship, showing undergraduates the finer points of experimentation.

"The money was for three years," he says. "Normally it takes five years to get a Ph.D. I doubled up on courses; I finished in three years."

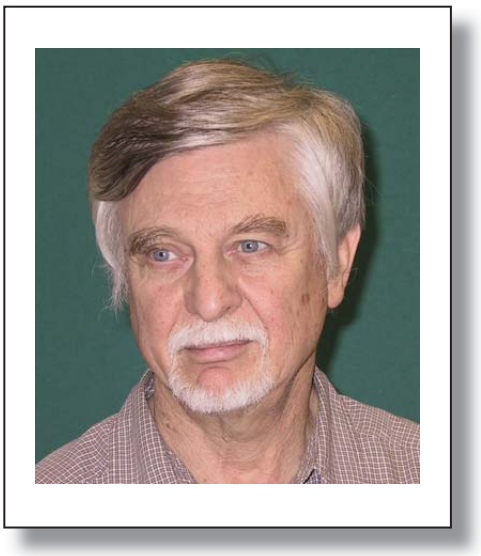
After two years as a post-doc at Argonne National Laboratory, Dr. Childers came to the physics department in 1965 as an assistant professor, retiring in 2001. He started out teaching graduate courses and some engineering physics classes. He went on to teach physics for pre-med majors for several years, and physics for architects as part of a post-retirement agreement with the university. The biggest difference between the latter two groups, he says, is that "pre-med students study. Architecture students hope."

That sense of humor came in handy when he would find mystifying problems in physics textbooks. He describes one that showed a picture of a patient with ropes wrapped around his broken leg and instructed students to calculate the proper torque. He once asked a physical therapist about the need for this and she explained that in reality you simply pull on the ropes until the patient asks you to stop.

"I am a teacher, really. I love to teach anything I know enough about to teach."

"I decided that if I were ever in that sort of situation and a nurse came in with a calculator to figure out the torque, I would say, 'Don't touch the ropes; just go away,'" Dr. Childers says. "I like to focus on the intuitive of physics, rather than the formal," he explains.

"Intuition is more reliable, to me, than mathematical detail."



Dr. Robert Childers

Intuition and creativity also drive his avocation: painting. (As his son says, "I'm bias; but he's a fantastic artist.") For awhile Dr. Childers took on portrait commissions for an art gallery, and he spent the summer of 1982 at the Art Students League of New York. Giving up the pay he normally earned teaching summer courses was a difficult decision to make, but it turned out to be a good one. New York was where he really learned to paint, he says. "You take classes until you learn what you need to learn, in your opinion."

He also lucked out when fellow Physics Professor Ed Hart mentioned that he had a cousin in Queens with a spare room she was willing to rent for $275 a month. She even picked him up at the airport, holding a sign that read, "Is that you, Bob?"

Since his retirement, Dr. Childers has had more time to devote to artistic pursuits, sometimes even offering lessons to other painters. "I am a teacher, really," he says. "I love to teach anything I know enough about to teach."

It makes sense, then, that two of his children ended up in the academic world as well (daughter Cindy teaches computer science at Pellissippi State). However, Dr. Childers says that he advised them to do whatever they wanted to do professionally. "I love physics," he says, but, "I did not suggest that (Michael) go into physics. I didn't care what he did, so long as he liked it."

And every once in awhile, he says, he still gets to be the professor when one of the kids calls to ask for some help with a math problem.

"I get a kick out of that."

"Research shows that a child who has teachers with the knowledge and skills needed to teach mathematics and science effectively in precollege grades is more likely to be able to close the achievement gaps that he or she experiences and be prepared as an individual for success in work and life."

—From *America's Pressing Challenge—Building a Stronger Foundation (A companion to Science and Engineering Indicators 2006)*

The Brightest from Across Tennessee

The physics department continues to recruit outstanding students from across the state to enroll in our undergraduate program. The following first-year students were awarded academic scholarships for the 2006-2007 academic year.

Andrew Binder
Johnson City

Bugg Scholarship

Photo Unavailable

Michael Roberts
Knoxville

Physics General Scholarship

Rachel Kuchar
Seymour

Hurst Scholarship

Adrian Sanchez
Nashville

Physics General Scholarship

Alex McCaskey
Memphis

Talley Scholarship

Meagan White
Athens

Physics General Scholarship

Caitlin Paquet
Thompson's Station

Physics General Scholarship

John Whittingham
Oak Ridge

Talley Scholarship

A Little Family Get-Together

Professor Jim Thompson and his wife Dawn joined in the physics festivities.

Christabel and the Jons provided the evening's musical entertainment.

Graduate students Te-Yu Chien and Kenji Fuchigami were among the many students in attendance at the annual gathering.

Faculty, students, staff, alumni, and friends got together on December 5 for the annual holiday party. Christabel and the Jons provided the music as the physics family celebrated the last day of classes and another great year.

(Planning for the Future, continued from page 2)

building provides a unique opportunity for our department and the university. We will place strong emphasis on capitalizing on this opportunity in every way possible to build JIAM into a world-leading facility.

Develop JIHIR into a world center for rare isotopes science – The Joint Institute for Heavy Ion Research is the oldest of the Joint University/ORNL Institutes. Together with JIAM, it is "partly owned" by our department. The new initiatives in rare isotopes science, both in experiment and theory, uniquely position JIHIR to become the intellectual world center for this research.

Fully utilize all aspects of the SNS – The Spallation Neutron Source at ORNL will be the world's best source of neutrons for the next 5-10 years. We are strongly committed to providing leadership within several areas associated with the SNS; like neutron diffraction on solid and soft materials, fundamental neutron studies, and neutrino based research. We are also committed to finding new and innovative utilizations of the facility for the future, like a potential Rare Isotope Accelerator Facility, a Muon Beam Facility, or other novel ways of using the SNS.

Increase the annual graduation rate for the undergraduate program to at least 20 – It is of vital importance to the perceived relevance of the department of physics, both within the university and among the political leadership of the state of Tennessee, that we have a strong and vital undergraduate program that can make a substantial contribution to the education of researchers and teachers, who in turn will benefit the state. It is therefore our aim to more than double our output of undergraduate physics majors to at least 20 annually over the next five years.

Take full advantage of the new funding opportunities within the STEM fields – Due to the needs of our state and the nation there are strong political indications that substantial amounts of funds will be allocated over the next 5-10 years for education of students in STEM (Science, Technology, Engineering, and Mathematics). We will have to take full advantage of these opportunities to attracting the best and brightest of Tennessee's students to UTK Physics.

The strategic plan contains a fairly long list of various hiring priorities and once again I will just highlight a few (the order of mention here is not related to the level of priority):

- A Governor's Chair JIAM position in experimental transport and functionality in complex and/or nano-structured materials
- A Governor's Chair associated with the expansion of the ORNL Center for Nanophase Materials Science
- A junior level position in Fundamental Neutron Science
- A junior level position in Physics Education
- A junior level position in NanoBio theory
- A junior level Joint Faculty positions in Single Molecular Imaging

As you can see from this abbreviated list of hiring priorities, strong emphasis is placed on fields like nano- and bio-physics, areas related to strengths at ORNL, and to the possibilities for a strengthening of our undergraduate program through a program in physics education.

So now we have the map. Now we need to use it to navigate through the narrow financial passages out to the open sea of new opportunities.

Stephen Wilson Wins GMAG Student Dissertation Award

Stephen Wilson

Physics graduate student Stephen Wilson has been honored for his efforts to understand the basic principles driving high-temperature superconductivity.

The Topical Group on Magnetism and Its Applications (GMAG), a sub group of the American Physical Society, has named him a winner of the 2006-2007 GMAG Student Dissertation Award. The accolade includes a $500 prize and an opportunity to present an invited talk at the APS March meeting in Denver.

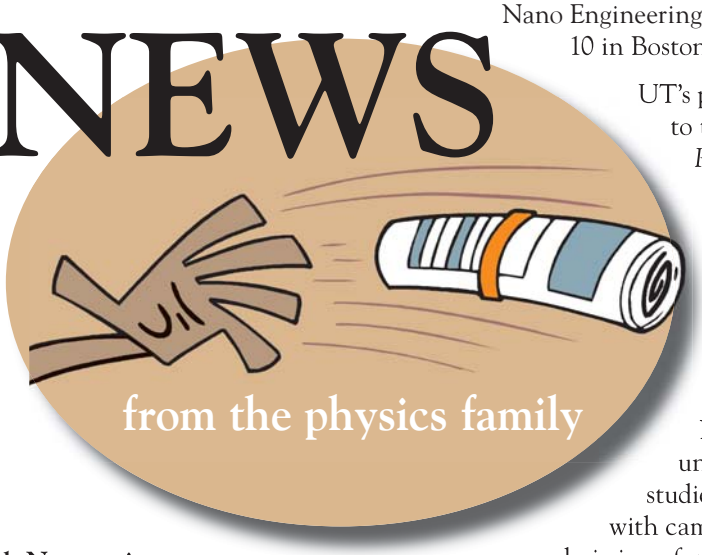
Scientists have long known that superconductivity results from the pairing of electrons, which allows electric current to pass through a material with no resistance. Yet a satisfactory explanation of exactly what binds those electron pairs at high temperatures (high-Tc) has yet to be discovered.

Wilson uses neutron scattering to get a more precise picture of how high-Tc materials are structured and what properties give rise to their superconductivity. Neutrons are an excellent probe because they are highly penetrating and pass easily through the bulk of materials, and they are sensitive to both structure and static/dynamic magnetism in the system.

Wilson studied the cuprate $Pr_{.88}LaCe_{.12}CuO_{4-\delta}$. Cuprates are ceramic compounds containing elements of metal sandwiched between layers of copper and oxygen atoms. They become superconducting when they are "doped" with a carrier; either electrons or holes (vacant electron positions). He used neutrons to probe the behavior of the material's spin—an intrinsic property, the same as charge or mass—and found that magnetic resonance seems to be a unifying fundamental feature among the cuprates, regardless of the doping carrier type.

Wilson earned a B.S. in physics at UT in 2002. He is a member of Professor Pengcheng Dai's research group and was the lead author on "Resonance in the electron-doped high-transition-temperature superconductor $Pr_{0.88}LaCe_{0.12}CuO_{4-\delta}$," which appeared in the July 6 issue of *Nature*.

NEWS from the physics family



Faculty

Distinguished Professor **Elbio Dagotto** has been appointed to the National Research Council's Solid State Sciences Committee (SSSC), a body that helps set the national agenda for materials research. The SSSC is one of 11 committees comprising the Board on Physics and Astronomy, the National Academies' principal forum for physics and astronomy issues.

Professor Pengcheng Dai's research group has moved closer to understanding high-temperature superconductivity. The results were published in the article "Resonance in the electron-doped high-transition-temperature superconductor $Pr_{0.88}LaCe_{0.12}CuO_{4-\delta}$," which appeared in the July 6 issue of *Nature* (see story on Stephen Wilson, page 9).

On November 1, **Professor Witek Nazarewicz** began a three-year appointment as associate editor of *Reviews of Modern Physics*. Nazarewicz has also been invited to serve a two-year term on the editorial board of Newfound Press, a digital imprint of the UT libraries.

Professor Lee Riedinger became the university's interim vice chancellor for research on September 1. He is responsible for overseeing the research operations on the Knoxville campus. Riedinger was associate vice chancellor for research from 1991 until 1995 and head of the physics department from 1996 until 2000.

Professor Jim Thompson is part of a scientific team honored with a Nano 50 Award for their work on high-temperature superconducting wires. *Nanotech Briefs*, a digital magazine for design engineers, chose "HTS Wires Enabled via 3D Self-Assembly of Insulating Nanodots" for recognition as one of the top 50 advances in nanotechnology in the past year. Thompson and his colleagues from the ORNL Materials and Science Technology Division designed and characterized wires that can carry current, unimpeded, at high temperatures. Other project scientists with UT ties are **Sukill Kang** (Ph.D. 2001) and **Anota Ijaduola** (Ph.D. 2005). The Nano 50 awards dinner was part of the NASA Tech Briefs National Nano Engineering Conference held November 9 and 10 in Boston.

UT's physicists contributed two articles to the September 2006 issue of *Nature Physics*. **Professor Pengcheng Dai's group** looked at the role of magnetism in superconductors; **Adjunct Professor David Mandrus** and his colleagues wrote up their work on crystals and how their structure can influence their properties.

Dr. Linda Painter became the university's interim dean of graduate studies on August 1. She will work with campus units on the recruitment and admission of graduate students and with the Graduate Council on policies concerning graduate students' rights and responsiblities.

Alumni

Duncan Earl (B.S. in engineering physics 1993; M.S. in physics 1997), is a member of the research team honored with a 2006 R&D 100 Award from *R&D* Magazine for the development of a hybrid solar lighting system.

David O. Patterson (B.S. in engineering physics 1962; Ph.D. in physics 1966) is retired from the Defense Advanced Research Projects Agency and resides in Virginia Beach, Va.

Gary M. Woody (B.S. in physics, 1971) is an educator at Laurel High School in Knoxville.

In Memoriam

The department was saddened by the passing of two physics alumni this past August: Phil Burt and Art Mason.

Philip Barnes Burt came to UT as a freshman and majored in physics and math, finishing his bachelor's degree in 1956. As an undergraduate he was editor of *The Orange and White*, the forerunner to *The Daily Beacon* student newspaper. Burt was Physics Professor Ed Harris' first master's degree candidate, going on to earn his Ph.D. under Harris' direction in 1961. His career included stops at the California Institute of Technology, where he was a senior scientist at the Jet Propulsion Laboratory, and a year at the Stanford Linear Accelerator Center. A theoretical physicist, he joined the physics faculty at Clemson University in 1965 and also did consulting work with Oak Ridge National Laboratory. He was an inaugural member of the physics department's board of visitors. Phil Burt passed away on August 6 in Clemson, South Carolina. He is survived by his wife, Harriet, four children and two grandchildren.

Arthur A. Mason was a student of Alvin Nielsen and earned his Ph.D. in physics in 1963. He married Helen Burnette, the physics department's secretary/office manager, in 1964, and later that year became one of the first faculty members selected to open the UT Space Institute in Tullahoma. During his long and distinguished tenure at UTSI, he held posts including director of academic programs, assistant dean, and associate dean. He also established a chapter of the Society of Physics Students and served as advisor to Sigma Pi Sigma, the physics honor society. He retired from UTSI on May 31, 1995. Art Mason passed away on August 22 and is survived by his wife, Helen.

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