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

CROSS SECTIONS

Spring/Summer 2009

Quark Matter 2009 brought hundreds of scientists to Knoxville to trade ideas about the building block of matter. UT Physics helped organize the event. (Photo credit Curtis Bowles/ Oak Ridge National Laboratory.)

Quarks in the Park

UT's physicists played a key role in organizing this spring's premier conference devoted to the tiniest component of all matter, the quark.

Quark Matter 2009 (QM09): the 21st International Conference on Ultrarelativistic Nucleus-Nucleus Collisions, was held March 30th through April 4 at the Knoxville Convention Center, next to World's Fair Park. Oak Ridge National Laboratory hosted the meeting, with faculty, students, and alumni of the UT Physics Department pitching in to help. Department Head Soren Sorensen was part of the local organizing committee and estimated the conference impact on the local economy at $1.5 million. More than 600 scientists attended QM09.

Quark matter was part of the Big Bang and can still be found in neutron stars. By colliding heavy ions at nearly the speed of light (ultrarelativistic), scientists can free quarks and the subatomic particles that hold them together, called gluons. Studying their properties provides a glimpse into the first few seconds of the universe and can reveal information about atoms and their constituents. The many scientists interested in this work have gathered nearly every year since 1979 to compare notes and consider new theories and experiments.

"At the moment, (quarks) are, to the best of our knowledge, the most fundamental particles that we can deal with," Sorensen said. "Ninety-nine point five percent of normal mass—99.5% of everything we see on Earth—is made out of quarks, deep down. In the U.S., I would say roughly a third of all nuclear physicists are in this field. This is *the* major conference if you work in (quark matter)."

Along with UT, Vanderbilt, Duke, Florida State, North Carolina State, and Georgia State universities were also part of the organizational team. The local organizing committee was chaired by Glenn Young, Director of the ORNL Physics Division and a UT physics graduate. Vicki Greene of Vanderbilt, a 1984 math and physics graduate, was in charge of conference events. Physics faculty members Yuri Efremenko and Ken Read were also involved with conference planning. QM09 enjoyed a wide range of sponsors, including the UT College of Arts and Sciences, which made possible the performance of the play *Copenhagen* for conference participants. Support also came from the American Physical Society/*Physical Review*, Elsevier, the International Union of Pure and Applied Physics, the ExtreMe Matter Institute at GSI, CERN, Brookhaven National Laboratory, and Los Alamos National Laboratory.

More info at http://www.phy.ornl.gov/QM09

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Opportunities

Department Head Soren P. Sorensen

In the last issue of *Cross Sections* I focused on the tough times within our department and at the University of Tennessee due to the problematic financial situation in our state. In this issue I would like to strike a more optimistic tone and describe some of the exciting opportunities that might have an impact on our department over the next several years. A common denominator for most of these projects is that we don't know if they will materialize. They represent some of the many initiatives our faculty and staff are working on in order to enhance our research and teaching. Of course I hope they will all be funded and implemented, but years of experience have taught me that far from all the great proposals and initiatives within our department will succeed. Nevertheless, I hope you will be just as impressed with our faculty and staff initiatives as I am. Even if we might receive less and less direct state funding, I am sure we will find many other ways to keep our department strong.

NIMBioS

One of the new initiatives has actually already provided a new faculty position in biophysics. Last year a group of biology and mathematics faculty under the leadership of Professor Lou Gross from Ecology and Evolutionary Biology received a large National Science Foundation grant (~$16M over five years) for creating a National Institute for Mathematical and Biological Syntheses (NIMBioS, http://www.nimbios.org/). As part of the matching contributions for this center UT offered five new faculty positions within the general academic areas covered by NIMBioS. Our department saw this as a unique opportunity to re-start a biophysics program after Solon Georghiou and C.C. Shih retired two years ago. It turned out that one of the best (if not the best) of the many applicants for the NIMBioS positions was a physicist, Dr. Jaewook Joo, with a strong research program in mathematical biophysics. He was attracted to UT due to both the NIMBioS center and the strong theory group in our department. Dr. Joo will start as an Assistant Professor in the fall semester and will be our first, but not last, faculty member in our re-born biophysics group.

Computational Astrophysics

The most exciting opportunity for us at the moment is without doubt the large NSF Science and Technology Center proposal titled "Center for Extreme-Scale Computational Astrophysics," submitted with Joint Faculty Professor Tony Mezzacappa as the Principal Investigator and Professor Mike Guidry and Assistant Professor Christian Cardall as two of the many participants. The proposal's budget is gigantic: nearly $25M over five years with the opportunity for an additional $25M over a subsequent five-year period. Getting a National Science Foundation STC proposal approved is very, very difficult, but this proposal has already cleared the first hurdle as it was selected among 200-250 original proposals to be among the 20 that will get a much closer look. If this computational astrophysics center is among the six-to-eight centers that will eventually be funded, it will have a transformational effect on our department. UT has promised a Governor's Chair as well as three-to-four junior faculty positions in computational astrophysics as part of the center. These people—together with Tony, Mike, Christian, and many research professors, post-docs, students, and visitors—will truly make our department world-leading in computational astrophysics. The proposal is a wonderful example of how we can leverage our strength in people, equipment, and management here in East Tennessee. Through Tony Mezzacappa we already have a world-class, though small, group in computational astrophysics and with the two extreme-scale computers at Oak Ridge National Laboratory we are well situated to house such a center. The proposal has also received strong support from the UT Vice Chancellor for Research, Brad Fenwick, who has been instrumental in providing advice and financial support for teams of advisors and reviewers improving the proposal prior to submission.

JIAM

Condensed matter physics has been one of the strongest areas in our department for a long time. Now a lot of the work in this area is focused within the Joint Institute for Advanced Materials (JIAM). After Professor Ward Plummer left for LSU, Professor George Pharr from engineering has become the new director and our own Professor Hanno Weitering has become the co-director. JIAM is now transitioning from being a "virtual" institute to having its own building on the new Cherokee Campus on the south side of the Tennessee River. This was originally a very controversial location somewhat removed from the rest of the activities on the campus; but under George's and Hanno's leadership it now looks like a very exciting place that will provide a focal point for all work on advanced materials at UT when it is ready two years from now. There are still some partially unresolved issues, like funding for the necessary scientific equipment, but hopefully this will be resolved very soon.

The JIAM building is also likely to be the home of a new project Governor Phil Bredesen has announced: a large state-funded solar energy research institute. The aim is to bring Tennessee to the forefront in this important energy area, making the state more attractive for many of the solar energy companies the Governor hopes to bring here. The details on this initiative are still somewhat sketchy, but if it is funded (and currently the Governor is using all his political muscles to make sure it is) it will have a large impact on the level of research activities at UT, and we will of course make sure that physics will be an important part of it!

Governor's Chairs

Another opportunity we are pursuing is new Governor's Chairs, which is just a new name for a program very similar to the Distinguished Scientist program that has been so important to us for nearly 25 years. Currently we have two active GC searches. The first is in experimental condensed matter physics. It is too early to judge how this search will go, but we are currently talking with a particular candidate who has strong support both at UT and at ORNL and who will be able to bring our materials synthesis capabilities to a new level. Similar to the proposed Center for Extreme-Scale Computational Astrophysics, the other GC search is trying to leverage our strength in theoretical nuclear physics and leadership-scale computing to attract a world-class researcher in Lattice Quantum Chromo Dynamics. In LQCD researchers are trying to solve the many aspects of strong interaction physics where analytical methods do not work.

An additional reason for attracting top-notch researchers to Governor's Chair positions is that many of these positions will have two additional junior level positions attached to them. So this is becoming an increasingly important avenue to generating new positions in the current difficult funding climate. In other words, the UT administration wants the departments to actively compete for the resources in the form of positions and funding, and our department is in a very strong position to do that. If we will have a level playing field, I am convinced our department will gain substantially in such a competitive environment.

High School Science Education

It is not just in new research proposals and new positions we are finding opportunities. For a long time we have been trying to find ways to improve the production of physics teachers in Tennessee and to improve high school physics education. The Fentress County project described in the last issue of *Cross Sections* is just such an example. Now we might have another possibility. Our College of Arts and Sciences has generated a very strong proposal for our university to be one of two state-funded VolsTeach centers in Tennessee. VolsTeach is based on an exciting project, UTeach, from "the other UT," (the University of Texas) that over the last decade has demonstrated how to improve the quality and quantity of high school teachers in science. Our activities on this proposal are lead by Professor Stu Elston, who has many years of experience working with high school physics. If the VolsTeach center is funded, we will have great opportunities for increasing the number of physics majors aiming at a career as high school physics teachers.

Let me finally mention another type of opportunity. This spring some of the worst case scenarios outlined in my "Tough Times" articles were avoided by federal economical stimulus funding, for which we are very grateful. The university has now informed us that there will be additional stimulus funds available for renovation projects, and we have of course applied for several projects. We hope we might be able to finally renovate several of the faculty offices in Nielsen by breaking down some walls and creating windows, and perhaps move our educational astronomy laboratory to the high-bay room on the first floor (Nielsen 108), that used to house several large infrared spectrometers. This large room would also be a wonderful place for the planetarium we hope to acquire one way or the other for our astronomy classes and outreach efforts.

It is my hope that this brief overview of some of the proposals and opportunities we are working on currently has left you with the impression that even if we are having financially tough times in our state, the faculty and staff in the UT Department of Physics and Astronomy are not just sitting and wringing their hands in despair, but are actively and creatively working on making our department better.

"Even if we might receive less and less direct state funding, I am sure we will find many other ways to **keep our department strong**."

Honors Day Celebration 2009

The physics department celebrated student achievement in research, academics, and leadership on April 20 at the annual Honors Day Celebration.

Dr. Peggy Bertrand of Oak Ridge High School was the Honors Day speaker. Her talk, titled "On Teaching High School Physics," offered the students in attendance an informed perspective on the requirements, challenges, and rewards of teaching physics at the high school level. Bertrand said only about 33 percent of students enrolled in American high school physics classes have a chance of getting a teacher certified to teach physics.

With the country's demand for qualified science teachers as part of national STEM (science, technology, engineering and mathematics) initiatives, Bertrand said there are several professional opportunities for science students who opt to teach at the secondary school level.

At the conclusion of Bertrand's talk, the department recognized students for their exceptional work during the 2008-2009 academic year, while the students returned the favor by awarding the annual Society of Physics Students Teacher of the Year Award. Honors went to:

Outstanding First Year Physics Students
Steven Crawford
Cole Lillard
Zach Lindsey
Bart Weitering

Robert Talley Award for Outstanding Undergraduate Research
Adrian Sanchez

Robert Talley Award for Outstanding Undergraduate Leadership
Alex McCaskey

Douglas V. Roseberry Award
Kenneth Trofatter

Sigma Pi Sigma Inductees
Usama Al-Binni
Daniel Carney
Hangwen Guo
Saban Hus
Jennifer Niedziela
Adrian Sanchez
Christopher Tate
Meagan White
Nan Zheng

Robert W. Lide Citations
Elton Freeman
Erica Johnson
Nick Roberts

Outstanding GTA Award
John Carruth
Nirmal Ghimire
Erik Olsen
Rebecca Scott

Outstanding Tutoring Award
Jeff Tithof

Wayne Kincaid Award
Chris Smith

Colloquium Award
Irakli Martashvili

Paul Stelson Fellowship for Professional Promise
Xiaotian Zhang

Paul Stelson Fellowship for Beginning Research
Kyle Schmitt

Fowler-Marion Outstanding Graduate Student Award
Shaun Ard

Society of Physics Students Teacher of the Year
Thomas Papenbrock

Society of Physics Students President Alex McCaskey (right) presents Dr. Thomas Papenbrock with the SPS Teacher of the Year Award.

Dr. Michael Guidry (right) presents Chris Smith with the Wayne Kincaid Award for his contributions to the astronomy program.

Dr. Peggy Bertrand of Oak Ridge High School delivered the Honors Day address.

Undergraduates Oleg Ovchinnikov, Andy Welton, Geoff Laughon, Adrian Sanchez, Jeff Tithof, and Alex McCaskey represented the physics department at EURēCA 2009.

Geoff Laughon worked with fellow student Andy Welton on the study of Cherenkov Light Absorption and Re-Emission in Liquid Scintillator.

Adrian Sanchez was among the winners in the Arts & Sciences category.

Youth Will Be Served

Undergraduates Show off Their Research at EURēCa 2009

They're working on national energy challenges and creating miniature black holes. They understand Cherenkov light, black holes, neutrinos, and energy transformations at the nanoscale, and they have the posters to prove it.

Six physics majors represented the department this spring at EURēCA: the Exhibition of Undergraduate Research and Creative Achievement. This annual event, sponsored by the university's Office of Research, showcases the ingenuity and creative thinking of undergraduate students collaborating with UT faculty members. The exhibition was held the first two days of April and featured student work, most in the form of posters, in 12 divisions, from Agricultural Sciences through Theatre. Physics students taking part were Geoff Laughon, Alex McCaskey, Oleg Ovchinnikov, Adrian Sanchez, Jeff Tithof, and Andy Welton.

Ovchinnikov's work on Deciphering energy transformations on the nanoscale was driven by challenges in energy research and information technology. He worked with scientists from Oak Ridge National Laboratory to develop scanning probe microscopy methods for mapping energy transformation and dissipation on the nanoscale, a project that earned him several honors this spring (see page 10).

Tithof's work with Professor George Siopsis focused on Black Holes at the LHC (Large Hadron Collider) and addressed the intriguing question of creating mini black holes at particle colliders to dig deeper into ideas like quantum gravity, extra dimensions, and the creation of new particles. McCaskey focused on the Calibration of NOνA Neutrino Detector Through Monte Carlo Simulations of Incident Cosmic Ray Muons, where he developed a number of computer codes that generate random muon events, model detector geometry, and track muons through individual detector cells. Welton and Laughon reported on the Study of Cherenkov Light Absorption and Re-Emission in Liquid Scintillator; their data will be used for calculating the corrections for reconstructed neutrino energy in the NOνA experiment.

Sanchez's research on Neutrino Signatures from Supercomputer Simulations of Core-Collapse Supernovae claimed one of the prizes given in the Arts and Sciences Division. His research advisor was Bronson Messer, a physics department alumnus with the Theoretical and Computational Astrophysics group at ORNL.

"We're now using some of the tools Adrian helped develop to look at neutrino signatures from multidimensional supernova simulations we're running on tens of thousands of processors on Jaguar and Kraken at ORNL," Messer said. "He jumped right in from the start and came up to speed amazingly fast. He's one of only five people on the planet to run the detailed neutrino transport 'in anger' (i.e., to do an actual simulation), and was able to get it up and running in a matter of days. I can't imagine a better student."

The department's strong showing continues a trend: last year Tithof placed first in the natural sciences category and was also honored with a Phi Kappa Phi award for his work.

For Sam Hurst, Persistence Pays Off

You may never meet Sam Hurst. But if you've ever typed your PIN into an ATM or flipped through your e-mail on an iPhone, you know his work. His scientific curiosity has translated into counting neutrons, singling out atoms, and developing the touch screens that redefined how we shop, bank, and communicate. As a boy in rural Kentucky, Hurst's first ambition was to become a university professor. In the years since, his remarkable list of accomplishments proves that he met that goal and then some.

Counting Neutrons and Atoms

Hurst grew up in Ponza, a small community five miles from Pineville, Kentucky, and was fascinated by science from an early age.

"As I kid I was really intrigued by Thomas Edison," he said. "I read all the books I could get on Edison. My first real ambition was to become a university professor. Amazingly enough, I was able to become a physics professor."

At age 15 he set out for Berea College, where in 1947 he earned a degree in physics with a minor in mathematics, and also won over his wife, Betty. From there he went to the University of Kentucky, completing a master's degree in 1948. It was while registering for classes at UK that he met Rufus Ritchie (Ph.D., 1959), who became a lifelong friend and collaborator. Both went to work for Oak Ridge National Laboratory following graduation. Hurst started out as a physicist in the Health Physics Division, earning $325 a month.

"I spent a week on night shifts with Roy Clark, surveying one of the reactors," he said. "The big problem was that they didn't have a neutron survey meter. Roy had a survey meter for beta rays and gamma rays, but not neutrons, which is important near a reactor. So I set to work on neutron dosimetry. That was my first field at the lab. I worked on several versions, and some of them are still being used and manufactured commercially. That was a fun way to start; besides Ritchie was my great collaborator."

Sam Hurst (Ph.D., 1959) has enjoyed a storied career as a professor, researcher, and entrepreneur.

Hurst used a proportional counter technique to measure neutron fluxes, as well as the radiation dose absorbed in human tissue. The "Hurst Fast Neutron Counter" became a standard instrument in early nuclear programs around the world.

Within a year or so of his arrival at ORNL, Hurst began pursuing a Ph.D. in physics at UT Knoxville, a feat he completed in 1959, though not without a few interruptions.

"I was taking classical mechanics," he said. "I started the course, and then they called from Nevada (for me) to test weapons for about a month. That wrecked the course and I had to start it again. That went on about three times."

At the national laboratory, Hurst and his colleagues worked in huts until the 4500 complex was completed.

"By that time," he said, "I worked entirely on instrumentation but was beginning to do some physics research behind instrumentation; the physics needed to understand the instruments better."

That research would lead to his next big contribution. He started working on the ionization of matter; how much ionization you got from a certain amount of energy.

"I got the idea 'Why don't we measure ionization instead of radiation emission,'" he said. "So that was the beginning of resonance ionization spectroscopy (RIS)."

In RIS, a laser is tuned to selectively excite and then ionize an atom. Working with Marvin Payne and other colleagues at ORNL, Hurst showed that individual atoms could actually be detected and counted using this approach. The RIS technique can be used to find impurities in electronic chips, detect neutrinos from the sun, or detect pollutants in the environment. But the most satisfying element of the work for Hurst is how it completed a loop in scientific history.

Nobel prize-winning physicist Niels Bohr had speculated on the metastable states produced in the ionization of helium, with the idea that the total ionization could be increased by the collision of metastable states with impurities.

"RIS is the technique we used to study the helium atom, which Bohr had studied," Hurst said. "We solved a problem that puzzled Bohr—he didn't have the tools to get the final answer then—and it was the most satisfying physics because it completed a long story and resolved the problem of how the metastable states could be produced in the first place."

Touch Screens

The most widespread of Hurst's imaginative solutions, however, actually came about as a time-saving device. The elograph was born at the University of Kentucky, where Hurst spent four years as a professor.

"Jim Parks, Dan Bartell, Thurmond Stewart and Lee Weidner were working on a Van de Graff accelerator to study atomic physics," Hurst said. "The machine was for nuclear physics. We were one of the first groups in the country to use it for studying atomic physics, but we had to take the night shift.

"A spectrograph cranked out huge reams of strip charts," he continued. "In those days, automatic data processing with computers was just beginning, but we recorded everything first on these big, long strip charts. And for every data point, you had to get an X and Y coordinate off the chart. So the students were sitting there with a ruler in the X direction and in the Y direction to measure each of those points. Thus, we started thinking about an electrical method."

"There's a kind of paper that will conduct electricity," he explained. "We took one of these sheets, spread it in the X direction, put electrodes to conduct the electrons, and put another set of electrodes to go in the Y direction. We had an insulating paper in between. We would stick the bundle with a needle at each data point and we had two voltmeters . . . so you could read each coordinate off a digital voltmeter instead of a yardstick. Jim Parks worked that out the very first night I mentioned it to him."

This method of analyzing data cut a week's worth of work to two hours.

"I realized there might be other uses for the technique, so we took out a patent," Hurst said.

The elograph became the science behind Elographics, a company Hurst and fellow stockholders founded in 1971. They started out making instruments in basements.

"We found that we had two problems with our equipment," Hurst said. "Number one, the equipment wasn't any good; and number two, there wasn't a market for it. But it led us to a transparent screen that you could put on a computer terminal. Thus we made a transition from the scientific market to the consumer market."

The technology debuted at the 1982 World's Fair in Knoxville. Under the leadership of John Dabbs, Bill Gibson and John Talmage, Elographics grew to about 200 employees in Oak Ridge before it became a subsidiary of Raychem Corporation in 1986. Now Elo TouchSystems, the company is recognized as the world's largest touch products company. Markets include kiosks, banking, ticket machines, in-vehicle touch systems, and medical equipment.

"The cash registers you see today use these touch screens; they're selling 10 billion dollars' worth of those (systems) a year," Hurst said.

Hurst has founded or co-founded five businesses, including Elographics, Atom Sciences, Pellissippi International, and Consultec Scientific. His latest venture is TopoTec, a consulting firm to develop next-generation touch screen technology.

"We're developing not a touch screen, but a multi-touch screen," Hurst said. "The original touch screen could only be touched at one point at a time. This one can be touched with all fingers and scanned and get a pattern."

The first project was to work out something for the blind, capitalizing on the growing popularity of gestures.

"A lot of stuff on the Internet will speak to the blind, but they have to know how to get to it," Hurst said. "What this screen will do is enable them to put their fingers down in a hand gesture and get to the thing they want."

Hurst is quick to give credit for such scientific successes, particularly in industry, to his colleagues.

> "The beauty of science is that it produces things that become very useful to everybody."

"When I saw applications, my nature is to look around and find people who can do it better than I can," he said. "I don't have to look too far."

His wife, Betty, said good-naturedly that the story has always been "if they saw Sam coming down the hall, they ran in the opposite direction."

Kidding aside, however, he sees science as an important originator of technology.

"When the technology begins in science, it evolves," he said. "When the technology begins in technology or any industry, it goes more directly to the problem or a particular application.

"When we were doing the physics experiments, we had no idea that these would be used on computer terminals—we didn't know it would be something that so many people could use," he said.

Continued on page 8

Alumnus Profile, from page 7

"The beauty of science is that it produces things that become very useful to everybody. So many people, particularly nowadays, forget the science and go straight to the technology. In my opinion, this is short-sighted."

He also believes in the advice he got from Tom Bortner, an early mentor he knew at ORNL.

"He taught me that they way you learn something to get what you want is just persistence," Hurst said. "Hard-headed persistence."

Research, Industry, and Academe

With all his accomplishments in industry and research, Hurst did not abandon his childhood ambition to become a university professor. In addition to his four years on the physics faculty at UK, he was a visiting professor at Florida State University, and, in the early 1960s, helped start the Ford Foundation Professorship program between UT Knoxville and ORNL.

"Actually it was started by Alvin Nielsen and myself," he said. "We made a proposal to the Ford Foundation and got some money together, which encouraged the university and the laboratory people to work together. At one point, I was writing a letter for Nielsen to send to the lab; then I'd go to the lab and write the reply from lab director Alvin Weinberg. Ritchie said I was playing myself a game of tennis. But we kept on exchanging letters until we got something started."

He also started the Institute of Resonance Ionization Spectroscopy at UT to serve as an academic home for RIS, serving as director from 1985 until 1988. He has since retired in an official sense, but hasn't stopped pursuing ideas. Among his interests is the forum on science and religion that he and Ritchie established a few years back.

"I'm working on something now in physics that has, in my mind, a definite religious connection," he said. "This has to do with information. Technical information as defined by Shannon is conserved. It had to be here before matter was created in the universe. I spoke on this at one of the forum meetings. It was a fantastic response. Every hand went up at the same time at the end of the talk. Conservation of information assures that something will always be here and represents a type of eternity, and that is what catches the imagination."

Never one to let technology outrun him, he's setting up a blog devoted to the topic.

By his own estimate, Hurst has published a couple hundred papers and has "30 some patents." He has three IR-100 Awards, and is a Union Carbide Corporate Fellow as well as a fellow of the American Physical Society. He is a member of the University of Kentucky Alumni Association Hall of Distinguished Alumni and holds an Honorary D.Sc. Degree from Berea College. In 2005 he won the Distinguished Alumni Award from the UT Physics Department. He and Betty have also established the G. Samuel and Betty P. Hurst Scholarship Fund to support physics majors as they pursue their degrees at UT.

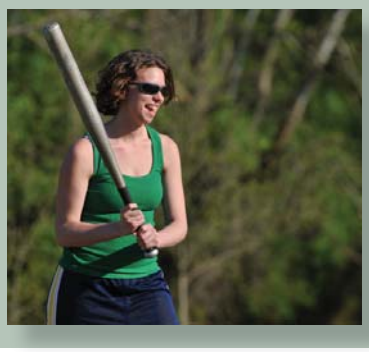
Hurst's distinguished career authorizes him to make predictions about the future of technology, and he said he suspects that teleportation and quantum computing will be among the ideas that rise to prominence in the next decade or so. Science, as he sees it, is the bedrock of survival.

"Science is all we've got going for us as a civilization," he said. "It's the driver of civilization. It's the only field in which ideas come up as hypotheses and you try to prove them wrong by learning new things. And so the hypotheses change quite rapidly, and that's a sign of progress.

"But to Betty," he said, laughing, "it's a sign that we don't know what we're doing, and I suspect her judgment is correct."

A Day at the Park

The Society of Physics Students hosted the department's annual spring picnic on April 24 at Holston River Park.



Charlotte Seals takes an at-bat in the traditional softball game.

Graduate Student Allison Reagan has her hands full with some future physicists.

Kate Jones Wins Outstanding Junior Investigator Award

Second OJI Honor for UT Physics in Three Years

Assistant Physics Professor Kate Jones is one of three nuclear physicists to receive a prestigious Outstanding Junior Investigator (OJI) Award from the U.S. Department of Energy this year.

The Office of Nuclear Physics OJI program recognizes exceptional scientists early in their careers by supporting development of their individual research programs. The honor brings with it a total of $300,000 over the next three years for Jones' research proposal: "Spectroscopic Studies Close to ^{100}Sn and ^{132}Sn Using Direct Reactions and Gamma Ray Measurements." She was also named the university's "Scholar of the Week" on July 6 for her research accomplishments.

Kate Jones is one of only three nuclear physicists to win an Outstanding Junior Investigator award from DOE this year. She is the second UT nuclear physicist in three years to win the honor.

This is the second Outstanding Junior Investigator award for UT's nuclear physics program in just three years: in 2007 Assistant Professor Thomas Papenbrock also won an OJI award for his proposal, "Structure of Rare Isotopes."

Jones is part of UT's experimental nuclear astrophysics group, which investigates the workings of the subatomic nucleus and the role it plays in how elements are created. The natural elements found in our world—hydrogen, helium, carbon and oxygen, for example—can trace their origins to either the Big Bang or nuclear reactions in stars and supernovae. Nuclear astrophysics experiments reveal clues about the required conditions for this nucleosynthesis. The UT group's efforts are more keenly focused on nuclei close to the nuclear shell closures, where their structure has the greatest impact on element production. "Magic nuclei" have either protons or neutrons in certain "magic" quantities (2, 8, 20, 28, 250, 82, and 126); Jones' research program will focus on nuclei close to the doubly-magic isotopes tin-132 and tin-100. She will conduct experiments at the Holifield Radioactive Ion Beam Facility at Oak Ridge National Laboratory and the National Superconducting Cyclotron Laboratory at Michigan State University. As part of her OJI award, she will take on a graduate student to study rare isotopes of tin to explore how the nuclear structure changes as fewer and fewer neutrons are present.

Jones earned her Ph.D. in experimental nuclear physics at the University of Surrey, England, in 2000. In 2003 she won a Lindemann Trust Fellowship, an honor awarded to graduates of exceptional promise who have shown a talent for original research. She joined the physics faculty at UT in 2006. Along with Jones, the two other nuclear physicists recognized this year with OJI honors were William Detmold of the College of William and Mary and Anna Statso of the Pennsylvania State University.

Undergraduate Daniel Carney plays a little Frisbee with his buddy Frodo.

Professor and Coach Lee Riedinger sets up the rosters for softball.

See the picnic photo gallery at http://www.phys.utk.edu/images/galleries/picnic2009/index.html

News from the Physics Family

Faculty

Professor Lee Riedinger has been asked to serve on the search committee to choose a director for the Howard Baker Center for Public Policy, which opened on campus in early 2003. The center's mission is to develop programs and promote research to further the public's knowledge of our system of governance, and also to highlight the critical importance of public service. Riedinger served as science advisor to then-Senator Baker from 1983 to 1984.

On February 6, **Professor Geoff Greene** helped officially break ground for the external experimental building that will house the neutron electric dipole moment experiment at the Spallation Neutron Source (a research profile on this work appeared in the Fall 2008/Winter 2009 issue of *Cross Sections*). This is an approximately $2M dollar construction project that will be completed in December of this year.

Physics Professor Geoff Greene (left) and David Arakawa of the Department of Energy break ground at the SNS for a building to house the neutron electric dipole moment experiment.

Professor Witold Nazarewicz has been elected to a two-year term on the American Physical Society Division of Nuclear Physics Executive Committee. He was also awarded an Honorary Doctorate from the University of the West of Scotland on July 8. Dr. Nazarewicz was recently appointed a Visiting Professor of UWS, where he held a three-month Carnegie Centenary Professorship last year.

Students

Undergraduate physics major Oleg Ovchinnikov won the 2009 Vanderbilt Prize for Undergraduate Research in Physics & Astronomy. His entry on "Deciphering Energy Transformation on the Nanoscale" featured his work with Dr. Sergei Kalinin and Dr. Stephen Jesse at the Center for Nanophase Materials Sciences at Oak Ridge National Laboratory. This year's prize came with a $2,000 award for Oleg, although this wasn't the first honor for his studies. In March this presentation was also named the outstanding student poster at the 2009 Tennessee Section of the American Association of Physics Teachers (TAAPT) meeting, held at Oak Ridge High School. **Associate Department Head and TAAPT President James E. Parks** worked with ORHS Physics Teachers to organize that meeting, which included several presentations from UT physics students.

The following physics students were recognized with 2009 Chancellor's Honors this spring: **James Alsup, Joe Overman, Ozgur Polat, Jeff Tithof, Andrew Yue, and Jun Zhao** were all honored for Extraordinary Professional Promise, while **Joe Overman** was recognized for Extraordinary Academic Achievement.

Congratulations to our new alumni! These students finished their degrees in the Spring 2009 semester:

Bachelor's Degrees
Jason Earl Bane, B.S. in physics
Alan Thomas Barnard, B.S. in physics
Caleb James Porter, B.S. in physics
Bianca Brigitte Worsham, B.S. in physics
Brandon Raye Burns, B.S. in engineering physics
Dustin Eldon Smith, B.S. in engineering physics

Graduate Degrees
Kevin Charles Baker, Ph.D.
Te-Yu Chien, Ph.D.
Kenji Fuchigami, Ph.D.
Dwayne Omar John, M.S.
Erica Parmly Johnson, M.S.
Ryan William Kapler, M.S.
Adam Robert Krause, Ph.D.
Robert Stephen Mahurin, Ph.D.
Michelle Lynn Neeley, M.S.
Jessica Lynn White, M.S.
Nan Zheng, M.S.

Alumni

Laszlo Adler (Ph.D., 1969) is the Taine McDougal Professor Emeritus at Ohio State University.

Jesse Henderson (B.S., 2005) is a graduate student in natural resource policy at North Carolina State University.

Jeong-Kwan Na (M.S., 1986; Ph.D., 1991) is a senior research physicist at the University of Dayton Research Institute.

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The physics department has several award and scholarship funds to support our vision of excellence in science education at both the undergraduate and graduate levels:

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

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The Robert Talley Undergraduate Awards

Graduate Awards & Fellowships

Paul Stelson Fellowship Fund
Fowler-Marion Physics Fund

Other Departmental Funds

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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 at (865) 974-2365 (phone) or on the Web at www.artsci.utk.edu/development/index.asp

Outreach Snapshot

Paul Lewis, director of space science outreach, explains the finer points of astronomy to the university's Haslam Scholars in June.

Astronomy outreach has enjoyed a full slate this year, with the Rockets! program Lewis offers through Kids U and the Aerospace Education Workshop he helps organize for the Civil Air Patrol. He also hosted 300 visitors in February with the "100 Hours of Astronomy" events he developed to help celebrate the International year of Astronomy. To keep up with astronomy public viewings and special events, please visit the Web site http://www.phys.utk.edu/trdc/.

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