"All The ν's That's Fit To Print"

ΦYAST ΦLYER

The Department of Physics and Astronomy
The University of Oklahoma

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REFLECTIONS ON 2004

For the occupants of Nielsen Hall, the year was colored by the construction of the Phase II addition. We endured cold in January while new heat and air units were being installed to service both old Nielsen Hall and the new addition, in the expectation that by summer's end we would be happily moved into in the new office wing. It was not to be: even by year's end, due to construction delays, we had only occupied the basement "junior laboratory" and the third floor of the new wing. (The faculty in those new third-floor offices were dubbed "the Elect" by one of the unlucky prospective second floor occupants.) But finally, a week after spring break, the rest of the new offices were ready for moving in. We are all very happy!

The new office wing is connected to the south side of old Nielsen Hall along the South Oval. It has three floors and a basement. All four levels are connected to the old building by hallways running north/south just to the east of the elevator shaft in the old building. The basement space is for our "junior laboratory" and the other three floors contain 30 faculty offices and three small conference rooms (one per floor). The addition is separated from the old building by an atrium, in which contains a Foucault pendulum and space for our daily tea.

The addition frees up space in old Nielsen Hall for new research, for graduate students and post-docs, who have been woefully packed into the current space. It could not be timelier! Our entering class of grad students numbered 22 surely the largest in many decades, if not a record number, leading to a total of 70 graduate students. The increase in the number of graduate students is very welcome as our research enterprise just grows and grows. Our external funding topped $4 million in 2004 setting a new record. At the same time we taught more than 17,000 credit hours.

What new opportunities lie just over the horizon? Stay tuned, dear alumni, we are making you proud now but there are several major initiatives in our research groups that, if successful, would attract additional national notice to Physics and Astronomy at OU. Meanwhile, please drop by and check out our new surroundings!

--Ryan Doezema

DEPARTMENT FACULTY GARNER NUMEROUS AWARDS

Again this year members of the department were recognized for their dedicated research, teaching and service at the annual faculty awards ceremony on April 19. Stu Ryan received the Regents' Award For Superior Teaching, Bruce Mason was honored with the General Education Teaching Award, Eric Abraham was awarded the L.J. Semrod Presidential Professorship and Greg Parker was made a George Lynn Cross Professor.

Last fall, John Cowan was honored with the College of Arts and Sciences Kinney-Sugg Outstanding Professor Award for his achievements in research and teaching. Paul Bell, dean of arts and sciences who along with a cadre of co-conspirators, broke into one of John's General Astronomy lectures, surprising John and his cheering students, announced the award. Read more about John and the award by googling "sugg oklahoma arts & sciences."

David Branch received the 2004 Distinguished Alumnus Award for the Department of Astronomy, University of Maryland, where he earned his Ph.D. in 1969. In April 2005 in exchange for presenting a colloquium (Type IA Supernovae: Explosion Models versus Observational Constraints), he was given a handsome plaque.

PHYSICS 2005

Relativity is a century old and it's time to celebrate. The Physics and Astronomy Department is planning a series of four lectures plus an at-the-mall day of physics demonstrations this coming September and October. Speakers, subjects and dates (if known) are: Dr. Eugenie Scott, an anthropologist at the National Center for Science Education, who will speak on Friday, September 23, on biological evolution vs. intelligent design; Dr. David Rowes, a historian of science at the University of Mainz, who will talk about the effects of Einstein's relativity on U.S. politics, on Friday, September 30; Dr. Wesley Elsberry of the National Center for Science Education, speaking on Thursday, October 6, about the Big Bang, cosmology, and science education; and Dr. Tim Gay of the University of Nebraska, talking on Friday, November 4, about physics and football. If you are within driving distance of Norman, please plan to join us for these interesting talks. More information will be posted at the department web site as it becomes available. Dr. Scott's lecture is being co-sponsored by the Department of Zoology, while Dr. Elsberry's lecture will be part of a SLEP seminar to be taught on the Norman campus. The speakers and topics were chosen for their potential for raising questions and debate about science, scientists and science education before the public. If you within driving distance of Norman, please plan to join us for these discussions.

OU BOHR LECTURE NOW ONLINE

Physicist Niels Bohr visited OU twice during his life, once in the 1930s and again in 1957. During his second visit, Professor Bohr, then Director of the Institute of Theoretical Physics at the University of Copenhagen, presented a lecture. Thanks to Tom Miller, a transcript of the lecture is available. To access is, go to www.nhn.ou.edu and click on 'events.'

ALUMNI NEWS

Last spring, news that former department member, Dr. Colin Plint, had passed away was published in the Phyast Phlyer, and the following remembrances were sent in response.

•**Art Altshiller** BS Physics 1963: Dr. Plint was my professor for Optics, Mechanics, Thermodynamics and Electricity and Magnetism during 1962 and 1963. I fondly remember him as a very personal and caring teacher. He was encouraging to me throughout my studies at OU and he kept track of my progress from course to course. He also introduced me to my first "big idea" in the world of physics, the "heat death of the universe." He would frequently integrate such topics into his lectures. When I visited OU about 10 years ago and looked at the old lecture halls, I immediately thought of him. He was a fine teacher who made a strong impact on me. I was fortunate to be his student.

Art also informed us his retirement from his position in advance placement and honors physics teaching at Van Nuys Science Magnet High School. "I have taught with L.A. Unified for 33 years and finished my last 18 years at Van Nuys HS. I graduated from OU in 1963 with a BS in Physics. I anticipate continuing to teach the AP

course as a part-time assignment and remain affiliated with L.A. Valley College as an evening mathematics instructor. However, the big day is arriving and I will be formally retired May 11. I hope to visit the campus in the near future. Until then, I anticipate watching our football team play UCLA in the Rose Bowl this coming September.

•**James Litton** BS Physics 1956: I have no specific anecdotes to relate about Colin However, he was a personal friend for a short but highly meaningful time and a real inspiration to me. He and his wife and baby daughter visited my wife and me in married student housing for dinner when we were sophomores or juniors (circa 1955). Colin came to see us in New York when he was there for an APS conference and we visited them in Norman while he was the department head. I gave a graduate seminar to his OU students in some plasma work we were doing in 1962 or 1963. I have never met a more intellectually honest and effective teacher nor one more dedicated to his calling. He was the first Englishman I had known and his amusing Oxford stories were fascinating, like stuff out of books I had read about student days and scholars in Oxbridge. He was a kind, gentle, scholarly but well organized man whom fate and Oklahoma Legislature academic funding behavior did not treat very kindly. I was in the process of trying to hook up with him again after the event honoring Professor Lin and we had just e-mailed each other and had started to have a dialogue again when he told me he had to go to England on family business and I never heard from him until I got Florence's note. Although it was about 40 years since we had last met, I felt that I had sustained a personal loss and we wish him and Florence the peace they greatly deserve.

Other news from alumni and friends:

•**Jerry Elliott** (BS Physics 1966): "Well, the story is a true story. . .Toward the end of my studies there at OU in physics, I had to take Orbital Mechanics. As an undergraduate, I was thrown into a class with upper-level degree candidates (MS and Ph.D.) which wasn't all that bad, and certainly very competitive! Dr. C.C. Lin taught the course, which also made it difficult, and I was always glad he could put into math what his broken English failed to convey!

My father passed away from a sudden, unannounced heart attack during my studies there, and I must admit it was hard at times to have full concentration since he was the bread winner of the family and I didn't know if I was going to be able to continue financially in OU or not. I remember digging ditches in the hot Oklahoma summers just to earn enough money to stay in college. Anyway, back to the story.

I finished all my course work in 1965 and was proud to achieve my BS in physics, minor in mathematics. I actually graduated in 1966, but did not receive my diploma nor was I able to attend graduation ceremonies because NASA hired me on campus and I left for Houston and a position as a flight controller at NASA's Manned Spacecraft Center (the name later changed to Johnson Space Center) and Mission Control.

The first assignment I had at NASA was a guidance engineer for the unmanned Agena spacecraft used to perfect the rendezvous' with the two-man Gemini capsule. At the termination of the Gemini Program, that led me to serve as a guidance engineer for the Apollo Lunar Module spacecraft (the vehicle that landed men on the moon). On Apollo 8, I transferred to a prime position in Mission Control Center as retrofire officer with enlarged responsibilities as flight dynamics retrofire officer in the Mission Operations Control Room during Apollo 9, 10, 11, 12, 13, 14, 15 and 16 in Earth orbit and lunar missions.

I provided prime leadership in managing the mass properties for lunar descents and the computations for nominal and abort returns to Earth from orbit and deep space. During nominal missions, I computed the return-to-earth trajectories from the moon to the Earth, and passed the information to the astronauts to return safely to splashdown.

Aside from directly participating in the Apollo 11 the first moon landing, one of the rewarding occasions in my career was when I was a distinguished recipient of the highest U.S. civilian honor, for duties as the lead retrofire officer at NASA Mission Control Center during the aborted Apollo 13 space mission with safe return of the flight crew. Using my OU physics and common sense, I successfully returned the
Apollo 13 crew to Earth on a safe return trajectory, which resulted in the Presidential Medal of Freedom by President Richard M. Nixon.

Two Hollywood movies have been made including, my role in real life at NASA, the recent being Tom Hanks, "Apollo 13". The first was an ABC Suspense Movie of

the Week in 1970 by Universal Studios and aired nationally on television, starring actor Robert Culp, who played me.

When the Apollo 13 mission was over, the Apollo 13 astronauts and the ground flight control team had a party in celebration of this worldwide event. The crew walked up to me and congratulated me for bringing them home, shook my hand and honored me with the achievement. For a split second, I remembered what Dr. Lin had taught me, and the fact that I made an average grade in the class amidst all those MS and Ph.D.'s in the class. I was never ashamed that I made a "C" in the course, as I knew the material, but wasn't able to take Dr. Lin's tests very well. I believe there was only one test the whole semester, and I made a "C" on it.

Snapping back to the party and the moment, I just smiled at the astronauts, and said to them, "I wonder what your thoughts would have been if you knew the guy on the ground bringing you home made a "C" in the course!" Their mouths drooped a bit, then everyone turned from shock to laughter! They knew that the "C" was no measure of the grade I deserved in the course. They said I made an "A", and thanked me again!

Looking back over my nearly 39 years at NASA, I will never be sorry I majored in physics, nor ever regret I attended the University of Oklahoma. As an American Indian, I may have been the first to graduate from the Department of Physics. I have had several years of using my physics in my career in various positions at NASA, knowing that OU was well represented in the development and operation of manned space flight, and I will always be grateful for OU and my helpful professors and their encouragement.

As Paul Harvey says, "And that is the rest of the story!"
Thanks.

•**Tom Miller** "One of Rud Nielsen's Ph.D. students, A. T. Stair of Visidyne, Inc., told me that he went to dinner twice with Nielsen and Bohr. He said that Bohr was so soft-spoken and had such a thick accent that he didn't understand a word that Bohr said, at dinner or in his lecture. He said that Bohr would start a sentence normally, but that the volume would tail off as the sentence progressed."

OU ALUM BECOMES APS FELLOW

Gregory Benford (BS Physics, 1963) honored with an APS Fellowship. Benford, also a well-known science fiction author, professor of physics at the University of California, Irvine.
The citation read: "For theoretical and experimental research in a wide range of fields, introducing new ideas in plasma physics and astrophysical jets."

Dr. Benford conducts research in plasma turbulence theory and experiment, and in astrophysics, having published more than 100 scientific papers. He is a Woodrow Wilson Fellow and a visiting fellow at Cambridge University. Throughout the last decade, he has worked as an adviser to the Department of Energy, NASA and the White House Council on Space Policy.

In 1989, Benford was host and scriptwriter for the television series "A Galactic Odyssey," which describes modern physics and astronomy from the perspective of the evolution of the galaxy. The eight-part series was produced by Japan National Broadcasting for an international audience.

Benford's articles on science have appeared in *Smithsonian, Natural History, New Scientist, Omni, The Magazine of Fantasy, and Science Fiction*. He is the author of more than a dozen novels, among them "Timescape" (a Nebula award winner) and the recent, "Beyond The Fall of Night", written with Arthur C. Clarke. He has won the Nebula Award twice, the John W. Campbell award and the Australian Ditmar award for international novel. In 1989, he won the United Nations Medal in Literature.

DEPARTMENT RESEARCH

Below are summaries submitted by several members of the department that describe their ongoing research programs.

Lloyd Bumm: Bumm's group has developed a novel atomically flat substrate for their scanning tunneling microscopy and photonic studies. They are made by supporting flat gold nanoparticles on indium tin oxide coated glass. This substrate has the advantage over thin-film substrates in that the plasmon modes of the substrate are not damped, thus serving as photonic antennae. The group will use these substrates for their single-molecule STM experiments.

David Branch: With students, Branch is working on a "comprehensive comparative study of the spectra of Type Ia supernovae (SNe Ia)". They are calculating synthetic spectra with the parameterized resonance-scattering code, SYNOW, and varying the input parameters to obtain best fits to all SNe Ia spectra that they can obtain from observers. The results will provide an internally self-consistent quantification of the spectroscopic diversity among SNe Ia. From this they hope to learn how the various observational manifestations of SNe Ia diversity are related to the their physical causes. The results will be of interest because many people are making plans to spend big money discovering numerous high-redshift SNe Ia, in the hope of probing the nature of dark energy. To have confidence in using SNe Ia to probe dark energy, we must advance our physical understanding of SNe Ia.

Kim Milton: Milton and his student Ines Cavero-Pelaez completed an "impressive" calculation (in the words of the referee) of the Casimir energy for a dilute dielectric cylinder, showing that, as long anticipated, the quantum vacuum energy vanishes in second order in the deviation of thedielectric constant from its vacuum value. They are studying how divergences that occur in such calculations, particularly of the energy density near a curved surface, can be associated with the energy of the surface itself. Milton and his collaborators at Trondheim, Norway, have continued their studies of the temperature dependence of the Casimir pressure. With Carl Bender and students Cavero-Pelaez and K.V. Shajesh he constructed a new version of quantum electrodynamics, called PTQED, which is not Hermitian, but in which, because of PT symmetry, a unitary S matrix still results.

Eddie Baron: Baron spent the past year on sabbatical at OU, Lawrence Berkeley National Lab Computational Research Division, the Hamburger Sternwarte, and as Professeur Invite at the LPNHE, University of Paris VII. In Paris, he joined the French team working on the Nearby Supernova Factory using an Integral Field Spectograph to obtain more than 200 well-sampled light curves and spectra of Hubble Flow Type Ia supernovae. These data will not only shed light on the nature and differences between Type Ia supernovae, but will serve as the template objects for high redshift searches to uncover the nature of "dark energy." He also worked with OU graduate student Sebastien Bongard who is obtaining a joint Ph.D. from the University of Lyon and OU. In Berkeley, he worked with OU graduate Peter Nugent on the SEAM method of using Type II supernovae as distance indicators. In Hamburg, he worked with his long-time collaborator Peter Hauschildt to take their detailed stellar atmosphere calculations to full 3-D (which involves a 7-D phase space). At OU, he worked with Darrin Casebeer, Karen Leighly and David Branch on modeling Fe-LoBAL AGN.

Mike Morrison: Recent months have seen major developments on several projects. Djamal Rabli (a postdoc) and Morrison have finished a multi-year study of dissociative attachment in molecular hydrogen. This process is of fundamental interest because the initial particles (an electron and a molecule) are different from the final particles (a hydrogen atom and a negative hydrogen ion). One surprising and important finding of our research is that an aspect of physics that has been neglected in all previous calculations affects cross sections for this process by a factor of two. In a different project, Thushari Jayasekera (a graduate student), Kieran Mullen and Morrison have devised a way to apply evaporative cooling to electrons in quantum devices. Especially exciting is our very recent (and wholly unexpected) discovery of the physical mechanism that controls this process: this discovery led to an astonishingly trivial way to determine in advance of device construction the geometry that will maximize cooling. Other (ahem) cool stuff is going on, but I've reached my editor's word limit.

Brad Abbott: The past nine months have been very fruitful for Abbott. He has been focusing his analysis efforts on B physics and five papers related to B physics have been submitted for publication during the past six months. One of the primary analyses Abbott has been working on is measuring Bs mixing. The first results of

this analysis are out and should be presented at a number of conferences this winter. Abbott is collaborating with Indiana University in an effort to increase the data sample for B physics by a factor of five. This is particularly useful, since many of the processes we are searching for are very rare.

Ryan Doezema and Mike Santos: The Santos-Doezema group, with graduate students Robert Meyer and Taroshani Kasturiarachchi and former post-doc Xinhui Zhang, is finishing the final touches on publications resulting from several experiments. One showed an unexpected interaction between the spins of electrons confined in InSb quantum wells. A second shows a dependence of photoluminescence extinction energies on quantum well thickness at variance with observations in other quantum material systems, and a third is measuring the effect of strain on the band-gap parameters that determine the confinement energies in the wells. The is in the process of purchasing a new spectrometer that will allow it to study so-called zero-field (applied magnetic) spin resonance in InSb quantum wells.

Mike Strauss: Mike Strauss is working in two areas with the Dzero collaboration. He is convener of the tracking group, responsible for reconstructing the path that charged particles traveled through the detector. Although the tracking code is relatively mature, problems related to faster data-taking rates, upgraded detectors and incomplete understanding of the material are being addressed. Strauss, a graduate student Mandy Rominsky and Brad Abbott are working on measuring the fraction of time that the B quark decays via a three-body decay to a J/Psi, Kstar and pi meson. This branching fraction is not very well measured, so the new measurement should be the best in the world.

John Cowan: Cowan has been working on abundances in metal-poor (old, low iron-abundance) stars in the Galactic halo. Using both ground-based (Keck) and space-based (Hubble Space Telescope, HST) observations, new detections have been made of the elements germanium, platinum and zirconium. The abundance trends indicate different origins or sources for these three elements throughout the history of the galaxy. These studies have involved former REU student, now graduate student, Jason Collier. Radio and X-ray studies of extragalactic supernovae and supernova remnants, SNRS, have been ongoing. These studies are designed to understand the late stages of star formation preceding supernova explosion, as well as both radio and X-ray emission mechanisms. The observations have utilized the VLA, the VLBA and the Chandra X-ray Facility, and involved graduate student Larry Maddox, REU student Emily Wolfing and former graduate student (now professor at Marquette) Chris Stockdale.

Karen Leighly: Leighly, her students and her collaborators continue to study Narrow-line Seyfert 1 galaxies and other active galactic nuclei (AGN). Several papers were published within the last six months. Leighly and undergraduate student John Moore published two papers in ApJ "Hubble Space Telescope STIS Ultraviolet Spectral Evidence of Outflows in Extreme Narrow-line Seyfert 1 Galaxies: I. Data and Analysis" and "Hubble Space Telescope STIS Ultraviolet Spectral Evidence of Outflows in Extreme Narrow-line Seyfert 1 Galaxies: II. Modeling and Interpretation." Chiho Matsumoto, who was a postdoc in the AGN group, published a paper titled, "An XMM-Newton Observation of the Seyfert 2 Galaxy NGC 6300. I. The Nucleus" in the Astrophysical Journal. OU graduate students Larry Maddox and Aida Nava were coauthors on this paper. Ohio State University collaborator Dirk Grupe published a paper titled "Chandra Observations of the Narrow-line Seyfert 1 Galaxy RXJ2217.9-5941" in the Astronomical Journal.

Several other projects have entered their final stages. OU graduate student Darrin Casebeer, Leighly and Baron submitted a paper titled "FUSE Observations of the Narrow-line Seyfert 1 Galaxy RE 1034+39: Dependence of the Broad Emission Line Strengths on the Shape of the Photoionizing Spectrum" to the Astrophysical Journal. After spending the summer participating in the REU program at McDonald Observatory in Texas, OU undergraduate Moore has almost completed revisions of the spectral fitting of the 900 Sloan Digital Sky Survey spectra for the submitted paper, "Fe II and Mg II in Luminous, Intermediate-Red shift Narrow-line Seyfert 1 Galaxies from the Sloan Digital Sky Survey."

Currently, Leighly is working on analysis of the coordinated HST and Chandra observations of the very interesting and unusual quasar PHL 1811. She presented results from these observations and other work at "The 2004 Ringberg Castle Workshop on AGN Physics" in November. Darrin Casebeer is finishing modeling the spectrum of an unusual "Fe LoBAL" AGN using the generalized radiative transfer code PHOENIX, in collaboration with Baron, Branch and Leighly. He presented the results at the American Astronomical Society meeting in San Diego in January. OU undergraduates Randi Worhatch and Caitlin Finley have joined the SDSS spectral analysis effort and have started to compile a catalog of the FeII and MgII properties of the intermediate-redshift Narrow-line Seyfert 1 galaxies, in collaboration with Moore. Observations of several objects were made recently. The first of three coordinated HST and FUSE observations of the Narrow-line Seyfert 1 galaxy 1H 0707-495

were performed in December. Also December, an XMM-Newton observation of PHL 1811 was made. OU Jiehae Choi, whom graduated December 2004 with a BS, is currently analyzing the data. OU undergraduate Ryan Biesemeyer accompanied Leighly to the MDM observatory on Kitt Peak and obtained optical photometry of several luminous quasars on the Hiltner 1.3 meter telescope. Chandra observations of two of the 12 objects from Moore's SDSS extreme FeII/MgII sample have been made, and Moore is starting to work on those data. In his spare time, Moore is setting up and calibrating the recently purchased spectrograph for the OU observatory. An XMM-Newton observation of another quasar, RX J0439-45, was performed at the end of January. An XMM-Newton observation of IRAS 17020-4544 was performed at the end of the summer, and those data are being analyzed by Chiho Matsumoto. All together, the Guest Investigator program grants from these recent observations brought in $281,128.

Jim Shaffer: The Shaffer group is working on cold Rydberg gasses. We have presented our results on long-range interactions and inelastic collisions in the gas at an invited talk at the annual Optical Society of America/Laser Science (APS) OSA/LS meeting. The work is the first to observe long range, 9-10 micron, dipole-dipole interactions that lead to atomic frequency shifts. The effect that we observed has been proposed as one of the main ingredients of an atomic quantum computer. Our results from some of this work has been submitted to Physical Review Letters. We currently have four graduate students; Richard Overstreet, Jonathan Tallant, Jeff Crawford and Arne Schwettmann working in the group. One undergraduate, Patrick Zabawa, is finishing his CAPSTONE project on 2D tomographic inversions. Now that our ion imaging spectrometer is online and we have a far off resonance optical dipole trap, we plan to continue our studies of ultracold collisions by using energy and angle-resolved product state distributions.

Dick Henry: Along with graduate student Aida Nava, Henry has continued studying the origin and chemical evolution of the element nitrogen in the galactic systems. Focusing on a large group of blue compact galaxies, Nava has carefully reanalyzed the observational data and determined the abundances of oxygen, nitrogen and their attendant uncertainties. With this new information statistical tests have been performed to show that the observed scatter is real. Detailed chemical evolution models which they subsequently ran seem to imply that these objects have not been forming stars for more than 7 billion years, and at a very slow rate at that. Henry also continues to work with Jason Prochaska at Lick Observatory on understanding nitrogen abundances in a group of damped Lyman alpha systems. Since these systems appear only at high red shift they provide an opportunity to peer back in time to within three billion years of the big bang to gauge the abundances of nitrogen at that time. Finally, Henry and undergraduate student Julie Skinner have been busy analyzing data from a large chemical abundance database of Galactic planetary nebulae with the goal of extracting additional information from the data through the shrewd use of statistics. Julie will continue working on this project during the summer as an REU student.

HIGH ENERGY AWARDED EPSCOR GRANT

The high-energy physics group at OU has received a DOE EPSCoR grant to establish the Oklahoma Center for High Energy Physics (OCHEP). This center is includes high-energy physicists from OU, Oklahoma State University (OSU), and Langston University. The goals of OCHEP is to establish a regional center dedicated to research and education in high-energy physics. The initial grant provides $1.2 million from the DOE for three years, plus funds from the state of Oklahoma and the universities, bringing the total to $3.1 million over three years. OU will receive $500.000 from DOE, and a total of $1.6 million over three years.

Under this grant, two programs will be initiated. The first is developing an experimental high-energy physics program at OSU, and the second is developing a Grid computational facility at OU. The latter will be done in cooperation with the OU Supercomputing Center for Education and Research (OSCER). The amount and scope of the data collected in modern high-energy physics experiments requires tremendous computational resources. These challenges are being met by grid computing, which uses a worldwide network of computers to process data and computer simulations of the experiments. The grid enables global sharing of resources which provides distributed computing resources for large-scale data analysis, management of data, information and knowledge, collaborative tools for geographically distributed human researchers and real-time remote instrumentation sharing and monitoring.

Finally, the OCHEP will promote education, outreach and human resource development. The grant will provide funds to enable high school teachers and undergraduates to do summer research at OU and OSU, and to run summer workshops in high-energy physics for high school teachers.

PARTS OF JOEL YOUNG TO BE LAUNCHED INTO SPACE

Ceramic parts, machined to extremely high accuracy by Director of Instrumentation, Joel H. Young, at the Department of Physics and Astronomy of the University of Oklahoma, are scheduled to be launched into space in 2005 on the U.S. Air Force's TacSat-2 satellite as one element of the Atmospheric Density Specification Experiment. The aim of the program is to provide information on the density of the tenuous atmosphere at satellite altitudes so that satellite drag perturbations in orbit positions can be calculated. The TacSat-2 satellite will be launched into a sun-synchronous, nearly circular orbit at high inclination to sample large regions of near-earth space.

The ceramic pieces are critical components of the Atmospheric Density Mass Spectrometer instrument aboard the satellite. They support the four metal rods that comprise the quadrupole mass filter in the mass spectrometer and must be accurate within a tolerance of three micrometers to ensure good instrument performance. Alumina was chosen because it can withstand the rigors of launch and thermal cycling. But its hardness also means that it is difficult to machine to high tolerance, and even more challenging to produce two identical pieces with the same tolerance. Air Force Research Laboratory personnel who designed the instrument found Young to be expert in the working of "green" and fired alumina, and the resulting ceramic pieces are among the best they've received in 30 years of building space-rated mass spectrometers. "Others have said they could deliver alumina parts to our specifications, but in the end we were disappointed," said John Ballenthin, project leader at AFRL's Space Vehicles Directorate, whose group has had mass spectrometers on three Space Shuttle flights, as well as on satellites, high-altitude balloons, sounding rockets, and NASA aircraft.

DEPARTMENT RECOGNIZED FOR WOMEN FACULTY MEMBERSHIP

The February issue of the AIP Report on "Women in Physics and Astronomy, 2005" lists OU among 21 Ph.D. granting physics departments in the United States in the United States having at lease four female faculty members. The data came from a survey that received a ninety-four percent response rate. Many of the other schools on the list, such as Michigan, Washington, Wisconsin and MIT have larger departments than OU and thus, percentage-wise we are doing well in recruiting women to our faculty.

TEACHING NEWS

Lloyd Bumm: "Spring, 2005, Bumm taught Nano Lab, as a hands-on introduction to nanoscience for scientists and engineers. This is the new course that Matt Johnson and Bumm have been funded to develop (NSF Nanotechnology Undergraduate Education). The course activities covered a diverse set of topics important in nanotechnology. These topics included crystallography, x-ray diffraction, nanoparticles, Mie scattering (extinction spectra and light scattering), electron microscopy (SEM and TEM), scanning probe microscopy (STM and AFM) and microfluidics. Bumm also took the students on a field trip to Zyvex and to TI's DLP demonstration facility (Richardson and Plano, Texas).

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