"All the ν's That's fit to Print"

ΦYAST ΦLYER

The Department of Physics & Astronomy
The University of Oklahoma
Volume 1, Number 3 Spring 1993
Dick Henry, Editor

ANNUAL STUDENT AWARDS

Numerous students in the Department were recognized at the Annual Student Awards program on April 29. The Nielsen Award for an outstanding thesis was presented to Moustafa Bahran, who received his PhD in December. The Fowler Prize, given to an outstanding senior in the Department, was presented to Adam Fisher. Two Karcher Prizes were presented to two other outstanding seniors in Physics and Astronomy, Olen Boydstun and Steve Gouveia. Likewise, Jason Lonon received the Karcher Award for the outstanding senior in Engineering Physics. Ishibashi Kazunori was recognized as the outstanding junior in Physics and Astronomy and Nicole Belcher, Michael Fast, and Eric Smith were named outstanding juniors in Engineering Physics. Adria Morris was named the outstanding sophomore in Physics and Astronomy. Each of these individuals is to be congratulated on their hard work and significant achievements leading to their recognition by the Department.

NEW GRADUATE STUDENTS

The Physics and Astronomy Department will be gaining at least 10 new graduate students in the fall. This year the Admissions Committee, chaired by John Furneaux, received 40 domestic and 150 foreign applications. Those students who will be part of the entering class (with perhaps more to come) are: Neal Miller (Clemson; astro), John Carzoli (Beloit; astro), Olen Boydstun (OU; phys), Kimberly Bigham (SEOKST; phys), Lisa Xiang (Louisville; phys), Adam Fisher (OU; astro), Xumei Zhang (Memphis St.; phys), Melani Menendez-Barreto (Puerto Rico; astro), Mohamed Toutounji (OU; phys), and Heidi Morris (UTAustin; astro).

NEW FACES

Sergey Kravchenko has recently joined the Solid State group as a postdoc for John Furneaux. Sergey is from the Academy of Sciences High Pressure Institute in Moscow, and has most recently been working at the University of Nottingham. Sergey's wife, Anna, is a mathematician and is currently doing ``volunteer'' work with Bruce Mason. Sergey and Anna have two daughters, Kate and Zusha.

ALUMNI NEWS

Vicki Farmer (BS, 1982) is currently working at the Jet Propulsion Lab, where she has been doing optics reliability engineering for the Wide Field/Planetary Camera (WF/PC-2) project related to Space Telescope instrumentation. This is the camera which is going to be sent up to correct

a lot of the imaging problems on the HST. Vicki's job is to make certain that the previous mistakes are not repeated. The camera is scheduled to be shipped to Goddard Space Flight Center in June for the launch late this year. Vicki is also beginning to work on similar testing for the Multi-angle Imaging Spectroradiometer instrument to go on the Earth Observing Satellite platform.

Jeff Friedman (PhD 1992) is on the faculty of the University of Puerto Rico, Mayaguz. Jeff recently received tenure there (only two months after receiving his PhD from OU...how did he pull THAT off?). Jeff continues to work on pulsars, the subject of his dissertation, and plans to attend a summer workshop in Poland. Last summer he spent some time at Phillips Laboratory, near Boston, working with Tom Miller. Jeff and his graduate student hope to return to Phillips during the coming summer. Also they will be presenting a paper on their recent work at a May conference in Reno and later at another meeting in Boston in October. Jeff notes that he rides his bike to work twice a week, 25 miles each way, plus he still plays soccer for the city of Aguadilla.

MIRROR MINOR: Late-night astronomical dreams

The Astronomy group, through the efforts of Bill Romanishin, has been awarded $13,850 from the Instructional Improvement Awards Competition, to purchase a modern computer-controlled telescope which will be both more powerful and easier to use than the one now at the OU observatory. The new telescope will be used in astronomy courses and hopefully will proved the impetus for an expanded public school outreach program.

WHAT'S UP (DOWN? CHARM? STRANGE?) IN HIGH ENERGY PHYSICS?

The high energy physics group has had an extremely busy and exciting year! The experimental group is involved in one experiment that is currently taking data, and two that are in the final stages of data analysis. In addition, work on the major OU generic SSC silicon microstrip project is reaching a very successful conclusion. Three HEP group members - Pat Skubic, Dave Kaplan and Phillip Gutierrez, have been accepted for membership in the only currently approved SSC experiment - SDC, in which they expect to make a major contribution to the Silicon tracking detector by drawing on the well recognized expertise gained at OU. This effort will be helped by the award to PI Skubic and co-PI's Gutierrez and Kaplan, of a new grant from the Texas National Research Laboratory Commission and new funds from DOE for work on SDC. In order to facilitate the continuation of our Silicon work, Kalbfleisch, Skubic, Gutierrez and Kaplan were recently selected as one of only five University HEP groups to be awarded a special grant from the DOE University Research Instrumentation Program. Additional recent funding has been awarded through SAHEP (Skubic, Kaplan and Gutierrez) and Prairie View Consortium (Kalbfleisch). HEP theorists Kim Milton and Ron Kantowski are working on a number of aspects of quantum field theory, including non-perturbative techniques to be applied to Abelian and non- Abelian gauge theories. In addition, new insights in graph-counting combinatorics have been discovered by Kim and collaborators and second-order corrections to orthopositronium decay are being computed. Ron Kantowski has led an extended Clifford algebra project that is being brought to conclusion and is currently beginning work on Neural networks. The theorists and their two postdocs are supported by DOE and SAHEP.

George Kalbfleisch and Pat Skubic are leading the OU effort on the CLEO experiment at the Cornell Electron Storage Ring (CESR) which also involves postdocs Fred Butler, Bill Ross and Joel Snow and OU graduate students P L Wang, X Fu, M Lambrecht and M Wood. The goal of this experiment is to perform a complete study of mesons containing b-quarks. These are produced by colliding beams of electrons and positrons. A particularly interesting recent result is the observation of B decaying to K*g which occurs about once in 105 decays. It is believed that this occurs

through higher order Feynman diagrams called "penguins". The OU group has also contributed to extracting the largest sample of fully reconstructed B events in the world.

Two Fermilab experiments (E653 and E706) that have finished taking data are currently being analyzed. E653 involves George Kalbfleisch and Pat Skubic along with Joel Snow. The experiment has produced many interesting results on the decays of mesons containing charm quarks. The most interesting recent result from E653 is that neutral B mesons and charged B mesons have been observed in this fixed target experiment and might have different lifetimes. If the lifetime difference is confirmed, a result would be very surprising and may have important implications.

Phillip Gutierrez along with graduate student John Keuhler have been analyzing data from E706, which has as its goal the measurement of the internal structure of the proton; the quark and gluon distribution functions. The collaboration has just had a paper accepted by Phys Rev D.

The group is continuing a major R&D effort on silicon detectors for use at the SSC; work begun by George Kalbfleisch as indicated above. Recent talks by Dave Kaplan (IEEE and DPF) have reported results of analysis carried out by him and OU student Eric Smith. Noteworthy results include the first establishment of sub-3 micron resolution on Ohmic sides of double-sided silicon microstrip detectors. Additional papers are being prepared for publication on this. In another aspect of the Silicon program, Dave Kaplan traveled to Japan in March to carry out OU's contribution (calibration of VLSI readout system) to beam tests of new prototype SDC silicon microstrip systems. Preliminary results indicate that these test were highly successful - initial talks have been given and data analysis is continuing both in Japan and at OU. Further trips are expected in May (to report OU Silicon results) and in the Fall (for further beam tests).

Phillip Gutierrez, Pat Skubic and graduate student H Wang are collaborating with physicists at Lawrence Berkeley Lab on the design of a novel silicon detector that provides excellent spatial resolution in two orthogonal coordinates from a single measurement. This is to be compared to double sided silicon strip detectors that require correlating signals from the two sides of the detector. In association with this work we have been running simulations of SSC events to justify the inclusion of these detectors in the SDC experiment.

Moustafa Bahran, who received his PhD in December, and George Kalbfleisch have completed an experiment designed to confirm or deny the existence of a neutrino of 17 KeV mass as claimed by Simpson (1985). Their work, recently published, has been much cited and should finally put to rest claims for a 17 KeV neutrino mass. George has also been very active in a special program to involve minority physicists in SSC work (Prairie View program) and has been training students and faculty at Langston University recently for this purpose.

Kim Milton, postdoc Stephen Siegmund-Broka and graduate student Dean Miller are using a technique developed by Kim (finite element lattice) for solving Quantum Electrodynamics (QED) non-perturbatively, to calculate the value of the electron anomalous magnetic moment (g-2). Additionally, Kim is working with graduate student Marios Lymberopoulos in calculating the decay rate of orthopositronium. Currently, a 6 to 10 standard deviation discrepancy exists between the calculated decay rate and experiments. Is it possible that QED, long considered the best theory we have, is wrong or at least not complete. We'll have to wait for the results on this exciting topic. In addition, Kim is collaborating with people outside of OU. Using the d-expansion method he along with S. Boettcher are calculating g-2 for the electron. A collaboration with C. Bender has just produced a paper on the simplifying effects of transforming from power series coefficients to continued fraction coefficients for Feynman diagram combinatorics.

Ron Kantowski has been using the Vilkovisky-DeWitt effective action to remove gauge dependent problems occurring in 2-dimensional quantum field theories of gravity interacting with a scalar field as well as beginning work with postdoc Caren Marzban on neural networks, as mentioned above. This interesting project promises to be of valuable for SSC experimental work as a trigger for fast particle identification and so foster collaboration between the theory and experimental groups - which is rare in high energy physics nowadays. Phil Gutierrez

THE PAPER CHASE: RECENT PUBLICATIONS

``Experimental limits on heavy neutrinos in tritium beta decay'', G.R. Kalbfleisch, and M.Y. Bahran 1993, Phys Lett. B, 303, 355.

"Quantum Effects in the Inelastic Scattering of HF and DF by Argon", by L. J. Rawluk, M. Keil, M. H. Alexander, H.R. Mayne, and J. J. C. Barrett, Chemica Physics Letters Vol202 p291, 1993.

"Type Ia Supernovae as Standard Candles", David Branch and Douglas L. Miller, 1993, ApJ 405, L5.

``Refractory Element Depletion and the Determination of Abundances in H II Regions'', R.B.C. Henry, 1993, Monthly Not. Royal Astr. Soc., 261, 306.

PROPOSALS FUNDED

"Supernova Intensive Study", D. Branch, Harvard University, $37,000, one year.

"Quantitative Ultraviolet Spectroscopy of Supernovae", D. Branch and E. Baron, NASA, $65,000, one year.

"Energy Transfer and Incipient Reactions of HF", Mark Keil, American Chemical Society Petroleum Research Fund, $50,000, two years.

"Principal Investigator Research Investment Program", Mark Keil, to assist in constructing an atomic fluorine source for crossed-beam scattering studies, OU Research Administration, $9,925.

DOE Theory Task Grant, Kim Milton, $115,000, one year.

Instructional Improvement Awards Competition, Bill Romanishin, $13,850, for purchase of a telescope.

John Cowan received $2,000 from the OU Research Council for the purchase of a hard disk, plus some additional funding for travel to China in the fall to present lectures.

SEMINARS, INVITED TALKS, ETC.

"Type Ia Supernovae, the Hubble Constant, and Prospects for the Deceleration Parameter", David Branch, presented at the Fourth Texas-Mexico

Conference on Astrophysics in Austin, in March.

"Near-Threshold Electron-Molecule Scattering: The Agony and the Ecstasy", Mike Morrison, Department of Physics and Astronomy, University of Kentucky, April.

"Type Ib Supernovae", Ed Baron, Department of Physics and Astronomy, University of Kansas.

"Type Ib Supernovae", Ed Baron, Department of Physics and Astronomy, Arizona State University.

"Exploding Stars as Probes of the Universe", David Branch, University of Central Oklahoma, March.

MEETINGS ATTENDED

Mid-America Regional Astrophysics Conference, Kansas City, was attended by Dick Henry and graduate students Jim Buell, Joe Howard, Dawson Lasseter, Tad Thurston, Chris Eck, Christina Reeves-Shull, and undergraduate Lorette McKibben, in April. Five members of this group presented papers on a wide range of astronomical topics.

The Fourth Texas-Mexico Conference on Astrophysics, Austin, attended by David Branch and Dick Henry.

APS Meeting, Seattle, attended by Bruce Mason, John Furneaux, Ryan Doezema, Tim Kwiatkowski, Chuck Hembree, and Shuhua Zhang, March.

THE WELCOME MAT: VISITORS FROM AFAR

Mark Keil hosted Howard Mayne in November and Kopin Liu in March. Kim Milton hosted Carl Bender (Washington Unversity) in February, Stefan Boettcher (Washington University), Pankaj Jain (University of Kansas), Scott Yost (University of Tennessee), and Larry Yaffe (University of Washington) during March and April. Jim Truran (University of Chicago) and Friedl Thielemann (Harvard University) were both guests of John Cowan in April. Wayne Trail (JILA) and Brian Elza (LLNL) visited with Mike Morrison in April.

MIRROR MAJOR: Late-night Dreams of the Astronomy Group

The Astronomy group would like to build a 1 meter class research telescope in Oklahoma. Although such a telescope would not be large as research telescopes go these days, we believe we could make a large "scientific splash" with such an instrument because we would concentrate on one scientific project- observation of extragalactic supernovae. Systematic study of such objects over a period of years could, we believe, help answer one of the most fundamental questions in all of astronomy- How distant are other galaxies?

Such a telescope, equipped with the latest observing technology and computing equipment, would be a premier teaching tool for our undergraduate and graduate students. Students would participate in all aspects of the project, from obtaining the data, to analyzing it with modern computers, to writing up the results for publication.

This telescope would cost on the order of 1 million dollars. In today's world, there is virtually no chance of obtaining funding for such a project from state or federal sources. So if you want an observatory named after you, send in your check now! Another need is for a potential site for such a telescope. Ideally, we would like a place south of Oklahoma City, well away from any city lights, within a 3 hour drive of Norman, with existing road and electricity access nearby. Anyone who has or knows of such a site is asked to contact Bill Romanishin.

GRADUATE STUDENT NEWS: Focus on Atomic-Molecular

The Atomic & Molecular group at the OU Department of Physics and Astronomy holds the potential for significant growth over the next few years. There are currently just three students and five faculty in the group, but several incoming and first year students have expressed interest in joining the team.

Tommy Erickson is a recent addition to the A&M group and is helping Dr. Mark Kiel (himself new to the Department) set up their lab. Tommy describes his current work as "plumbing", but will soon be performing reactive scattering experiments with Dr. Kiel. Second year students Jim Snyder and Kyle Copeland will spend their summer in this lab.

Kushlani Dharmasena works with Dr. Maureen O'Halloran measuring the angular distribution of fragments from the photodissociation of molecules. Kushlani recently passed her specialist exam, gaining full Ph.D. candidacy.

Bill Isaacs, a student of Michael Morrison, is studying alignment effects in collisions between Rydberg atoms and rare gas atoms. The calculations model an experiment underway at the Joint Institute for Laboratory Astrophysics in Boulder, CO, where he spent last year. Bill will take his show on the road this month and present his work via poster at the Division of Atomic, Molecular and Optical Physics meeting in Reno, NV. Bill hopes to graduate soon.

Former students in the news: Terry Goforth, who earned her Ph.D. under Deborah Watson just three years ago, was recently granted tenure at Southwestern Oklahoma State University. Xifan Liu holds a teaching position at the Oklahoma High School for Science and Mathematics in Oklahoma City. Wayne Trail and Brian Elza, both former students of Dr. Morrison, are finishing successful postdocs at JILA and Lawrence Livermore National Labs, respectively. Both are actively pursuing the prospect of permanent positions. (Any offers?) Bill Isaacs

MIDDLE SCHOOLERS MESMERIZED: A 6th-8th Grade Astronomy Night

Bill Romanishin helped organize and put on the first ever Astronomy Night for Norman 6th to 8th graders at the Sarkeys Energy Center on Marh 27th. This event, sponsored by the NASA Space Grant Consortium, featured telescopes on the Energy Center roof (but of course it was cloudy!), a slide show tour of the solar system, videos from NASA planetary probes, a model (to scale!) of our solar system, and a "human solar system" in which students were able to understand the phases of the Moon and planets by walking around a light bulb "Sun". Almost 100 Norman students and parents attended this event. Bill hopes to do this type of event twice a year in the future.

DEPARTMENT MEMBERS RECEIVE AWARDS

Four individuals associated with our Department received recognition at the annual Faculty Awards luncheon held in early April. Mike Morrison was named a David Ross Boyd Professor, the first faculty member in the history of the Department to receive this honor. In addition, Dick Henry received a Regents' Award for Superior Teaching. One current and one former graduate student were honored with awards as well. Joe Howard, a student in astrophysics received a Graduate Teaching Assistant Award for his excellent teaching in the introductory astronomy discussion classes. Joe has been a graduate student at OU since fall, 1990. Doug Roberts (PhD, Astrophysics 1992) received a campus-wide award for his dissertation ``A Study of the Neutral and Ionized Gas in the Interstellar Medium and Galactic H II Regions''. Doug was also honored by the Department last year with the Nielsen Award. He is currently a postdoc at the University of Illinois.

FISCHBECK AND WHITMORE RETIRE!

Get the details in the summer newsletter, scheduled to go to press during the last week of July, along with lots of other news. Alumni: let's hear from a few more of you. What are you doing? Where are you doing it? Please tell me by Friday, July 23.