"All The ν's That's Fit To Print"

ΦYAST ΦLYER

The Department of Physics & Astronomy
The University of Oklahoma

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D0 WORKSHOP REVIEW

About 230 experimental particle physicists gathered at OU from July 8-12 for the annual D0 (Dee-Zero) Workshop. The participants in the workshop are all members of the D0 collaboration at the Fermi National Accelerator
Laboratory near Chicago. The D0 experiment observes the collisions of protons and anti-protons at
the Tevatron Collider. Debris from the high-energy collisions reveal clues about the basic particles and forces in the universe. The collaboration consists of more than 400 physicists from over 20 countries. Many of the participants at the workshop had never been to Oklahoma before.

Three OU physicists who are active researchers on the D0 experiment hosted this year's workshop: Mike Strauss, Phil Gutierrez, and Brad Abbott. The workshop is a time when the
collaboration can assess the current status of the experiment and plan for the future. Such reflection was crucial this year in the wake of a major upgrade to the D0 detector and to the Tevatron collider.

Plenary sessions, parallel
sessions, and working groups were located throughout Nielsen Hall and Dale Hall as the participants developed strategies for analyzing and understanding the data being collected in their detector.

In addition to time spent working on physics, the workshop participants got a good look at many of OU's treasures, including the Sam Noble Oklahoma
Museum of Natural History, and the university's history of science collection. Many of the participants remarked that this was one of the best collaboration
Workshops in recent memory. The physics department and the university certainly showed off the excellence that OU has to offer.

Mike Strauss

NEW FACES AT NIELSEN

The Department is pleased to welcome Sonya Brindle to the
office staff. Sonya's responsibilities include helping both graduate and undergraduate students with problems as well as giving advice. She also assumes the much-fought-over role of production manager for the Phyast Flyer. We are also pleased to have Susan Walden helping out in the office on a part time basis.

Dr. Pia Mukherjee, Yun Wang's new postdoc, arrived at OU in August. She has been at Kansas State University. Pia and Yun have already started working on our joint research project in constraining fundamental physics using cosmic microwave background data. In addition, Djamal Rabli joined Mike Morrison's group as a new postdoc in early June. He comes to OU from the Pierre and Marie Curie institute in Paris. He is working on a project with Mike and Bob Nesbet (a frequent visitor to OU, from IBM Almaden
Research Center in California) to study dissociative attachment of molecules due to electron impact.

Finally, Miroslav Kopal, Phil Gutierrez' new postdoc has recently come to OU from Purdue University.

Finally, we welcome 17 new graduate students this fall: Jason Alexander (S.E. Mo. St.), Sebastien Bongard (U. Claude Bernard, Lyon, France), Dahanayaka Liyanage (U. Of Peradeniya, Srilanka), James Dickson (S.E. Ok St. U.), Laura Ernst (S.E. Mo. St.), Shawn Frierson (Old Dominion), Michael Harkness (U. S. Dakota), Sohrab Hossain (Indiana U. of Penn.), Andy Huckey (Oregon St.), Veselin Kostov (Sofia U., Bulgaria), Jonathan Mills (E. Mich. U.), Thang Nguyen (OU), Patricia Quarles (UT Dallas), Poopalasingam Sivakumar (U. Peradeniya, Srilanka), Lin Tang (Sichuan U., PRC), David Tyndall (U. Virginia), and Boon Kuan Woo (U. Malaya, Malaysia).

HIGH ENERGY WORKSHOP TO BE HOSTED BY OU IN 2003

Kim Milton and the Department will be hosting the Sixth Workshop on Quantum Field Theory Under the Influence of External Conditions (QFEXT03) in September 2003. The first
five of these meetings were held in Leipzig, Germany, famous for Bach, Mendelsohn, and the Gewandhaus Orchestra. The conference will be held in the CCE facilities. For more details see the webpage: http://www.nhn.ou.edu/qfext03/.

ALUMNI NEWS

Ralph Fearnow of Idaho Falls, ID, offers some insight into the history of the instrument shop at OU. Ralph began as a part-time student employee in 1939, working for Otto Krause, the instrument maker at the time. When Otto departed for greener pastures, Ralph reduced his class load to assume some of Otto's duties, eventually becoming a full-time assistant to Jens Nielsen with whom he designed two new infra-red spectrometers in support of the WWII effort. In 1948, the shop moved from the administration building basement into the new Physics Building (renamed to Nielsen Hall in 1970). Ralph went on to earn a BS in Engineering Physics in 1947 and became the full-time Physics Department instrument maker. In 1950, Ralph took a job with Phillips, who later transferred him to Idaho Falls, where he and his family still live. Ralph retired in 1991 and can be reached at 3310 Valencia Drive, Apt. S212, Idaho Falls, ID 83404.

RESEARCH NEWS

Recent Publications (by group)

ATOMIC/MOL:

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J.M. Paikeday and Jason Alexander, "Polarization Potential for e-Argon Scattering by Differential Scattering Minimization at Intermediate Energies," International Journal of Quantum Chemistry, Vol 90, Issue 2, 778 (2002).

Greg Parker, R.B.Walker, B.K. Kendrick, and R.T. Pack, "Accurate Quantum Calculations On Three-body Collisions in Recombination and Collision-induced Dissociation. I. Converged Probabilities for the H+Ne_2 System," J. of Chem. Phys., 117, 6083

SOLID STATE:

M. Abolfath, Leo Radzihovsky and A. H. MacDonald, "Global phase diagram for bilayer quantum Hall ferromagnets," Phys. Rev. B 65, 233306 (2002).

V. Seneviratne; J. E. Furneaux, and Roger Frech, "Far-Infrared Spectroscopy of the Poly(ethylene oxide)x-LiCF3SO3 System," Journal-Macromolecules (2002), Vol 35(#16), pp 6392-6396.

S.A. Solin, D.R. Hines, A.C.H. Rowe, J.S. Tsai, Yu. A. Pashkin, S.J. Chung, N. Goel, and M.B. Santos, "Nonmagnetic Semiconductors as Read-head Sensors for Ultra-high-density
Magnetic Recording," Applied Physics Letters, 80, 4012 (2002).

ASTROPHYSICS:

J.X. Prochaska, R.B.C. Henry, et al., "The UCSD HIRES/Keck I Damped Lyα Abundance Database: IV. Probing Galactic Enrichment Histories with Nitrogen," Pub. Astron. Soc. Pacific, 114, 933 (2002)

Andrzej A. Zdziarski,
Karen M. Leighly, Masaru Matsuoka, Massimo Cappi, & Tatehiro Mihara, "NGC 4151: An Intrinsically Average Seyfert 1,"
ApJ, 573, 505 (2002)

G. C. Dewangan, Th. Boller, K. P. Singh, K. M. Leighly, "A 10-day ASCA observation of the narrow-line Seyfert 1 galaxy IRAS 13224-3809," A&A, 390, 65 (2002).

Yun Wang, and Grant Mathews,
"A Measurement of the Primordial Power Spectrum from Maxima and Boomerang
Data," ApJ, 573, 1 (2002).

M. Orito, T. Kajino, G.J. Mathews, and Yun Wang, "Constraints on Neutrino Degeneracy from the Cosmic Microwave Background and Primordial Nucleosynthesis," Phys. Rev. D 65, 123504 (2002).

Yun Wang, Daniel E. Holz, and Dipak Munshi, "A Universal Probability Distribution Function for Weak-lensing Amplification," ApJL, 572, L15 (2002).

S. K. Leggett, P. H. Hauschildt, F. Allard, T. R. Geballe, and
E. Baron, "Atmospheric Analysis of the M/L-- and M/T--Dwarf Binary Systems LHS 102 and Gliese 229," MNRAS, (2002), 332, 78--90.

J. P. Aufdenberg, P. H. Hauschildt, E. Baron, T. E. Nordgren, I. D. Howarth, A. Burnley, K. D. Gordon, and J. A. Stansberry, "The Spectral Energy Distribution and Mass-loss Rate of the A-Type Supergiant Deneb," Ap. J., (2002), 570, 344--368.

R. Mitchell, E. Baron, D. Branch, P. H. Hauschildt, P. E. Nugent, P. Lundqvist, S. Blinnikov, and C. S. J. Pun, "Detailed Spectroscopic Analysis of SN 1987A: The Distance to the LMC Using the SEAM Method," Ap. J., (2002), 574, 293--305.

J.J. Cowan, C. Sneden, S. Burles, I.I. Ivans, T.C. Beers, J.W. Truran, J.E. Lawler, F. Primas, B. Pfeiffer and K. -L. Kratz, "The Chemical Composition and Age of the Metal-Poor Halo Star
BD +17-3248," ApJ, 572,
861 (2002).

C.R. Eck, J.J. Cowan and D. Branch, "A Search for Radio Emission from Supernovae with Ages from About One Week to More than 80 Years," ApJ, 573,
306 (2002).

B.D. Fields, J. W. Truran and J. J. Cowan, "A Simple Model for r-Process Scatter and Halo Evolution," ApJ, 575, 845 (2002)

C. Sneden, J.E. Lawler, and J.J. Cowan, "Galactic Cosmochronometry from Radioactive Elements in the Spectra of Very Old Metal-Poor Stars," Physica Scripta,
T100, 15 (2002)

Colloquia, Papers Presented

Greg Parker was an invited speaker at the "CCP6 Workshop on Interactions of Cold Atoms and Molecules" held 19-22 September, 2002, in Durham, UK. He spoke on "Theoretical treatment of Three-Body Collisions in Recombination and Collision-Induced Dissociation."

Deborah Watson gave an invited talk at the DAMOP meeting in June, entitled "Perturbation Study of the Bose-Einstein Condensate: A Dimensional

Treatment." She also presented an invited talk at an Office of Naval Research workshop in April, "A Study of Bose-Einstein Condensation using Dimensional Perturbation
Theory."

Deborah also traveled to Harvard for Dudley Herschbach's 70th birthday symposium called "Dudfest," Sept 20-22. She gave an invited talk entitled "Cold in Any Dimension - A Study of Bose-Einstein Condensates using Dimensional Perturbation
Theory" and was on a panel which discussed "Emerging
Frontiers in Chemical Physics."

John Cowan presented "Abundances and Ages of Galactic Halo Stars," and invited seminar at the Institute for Nuclear Theory, Seattle, WA (June 2002), as well as an invited seminar at the University of Texas, "Abundances and Ages of Galactic Stars," Austin, TX. (September 2002)
Karen Leighly presented a talk entitled "Narrow-line Seyfert 1 Galaxies: The Most Active of Galactic Nuclei," at the
Institut d'Astrophysique et de Géophysique, Liège, Belgium, July 18.

In June, David Branch presented an invited review talk on
"Spectroscopic Clues to the Stellar Progenitors of Core-Collapse Supernovae" at a symposium of the International Astronomical Union: A Massive-Star Odyssey, from Main Sequence to Supernova, held at Lanzarote, one of the lesser known Canary Islands.

Yun Wang was an invited speaker at the conference, "The New Cosmology Confronts Observation," August 19 - August 23, 2002, The Kavli Institute for Theoretical Physics, UC Santa Barbara. She presented a talk entitled "Probing Dark Energy with Type Ia Supernovae."

Ed Baron presented "Understanding Spectra of SNe Ia, Seminar at SUNY," Stony Brook, May. 2002.

Meetings Attended

Rusty Boyd presented a talk titled "A Low Mass, Low Profile Interconnect for the ATLAS Pixel Detector Modules" at the "Pixel 2002" workshop held in Carmel by the Sea, CA, September 9 - 12.

John Furneaux and Varuni Seneviratne attended the 8th International Symposium on Polymer Electrolytes held from May 19-24 in Santa Fe, New Mexico. They presented the poster "Phases and Phase Transitions of P(EO)6LiSbF6."

Rollin Thomas attended the workshop Type Ia Supernovae: Theory Meets Observation,
15-26 July, in Leiden, the Netherlands, where he gave a short talk about evidence for deviation from spherical symmetry in the ejecta of the unique SN Ia 2000cx.

Eric Abraham attended the Division of Atomic, Molecular, and Optical Physics (DAMOP), where he presented "The speed-dependent throughput

of a magnetic-octupole velocity filter including non-adiabatic effects," Abraham, Alnis, Anzinsh, Dashevskaya, Furneaux, Keil, McRaven, Nikitin, Shafer-Ray, Waskowsky. The conference was held in Williamsburg VA, May 28-June 1. At the same meeting, Eric and Mike Morrison presented "Prospects for an atomic clock in a light trap."

Deborah Watson's research group attended the DAMOP meeting in Williamsburg, May 29 - June 1, 2002. Brett McKinney and Deborah presented two posters.

Karen Leighly attended "Active Galactic Nuclei: From Central Engine to Host Galaxy," 23-27 July, Meudon, France, where she presented two posters: "Chandra HETG Observation of the Ultrasoft Narrow-line Seyfert 1 Galaxy 1H0707-495," K. M. Leighly, A. A. Zdziarski, T. Kawaguchi, C. Matsumoto, and "FUSE Observation of the Narrow-line Seyfert 1
Galaxy RE 1034+39," D. Casebeer, K. M. Leighly. In the photo nearby, Karen is seen schmoozing at the Meudon meeting.

Kim Milton attended the Division of Particles and Fields Meeting of the APS, Williamsburg, VA,
May 24-28, where he presented "Theoretical and Experimental Status of Magnetic Monopoles," and "Analytic Perturbation Theory and Tau Decay."

Kim also attended the Third International Sakharov Conference, Moscow, June 24-29, where the paper by Iver Brevik, K. A. Milton, and S. D. Odintsov, "Entropy Bounds in R X S^3 Geometries" was given. Finally, he attended Gravitation and General Relativity 11, Tomsk, Russia, July 1-6, and presented "Dark Energy as Evidence for Extra Dimensions."

Dick Henry attended a meeting on "CNO In The Universe," held in St-Luc, Switzerland, September 10-14, where he presented a talk entitled "On The Origin of Nitrogen in Damped Lyα Systems."

Ryan Doezema and Mike Santos attended the "Workshop on Frontiers of Spintronics & Optics
in Semiconductors,"--a Symposium in Honor of E.I. Rashba, Cambridge, Mass,
June 20-22, 2002.

Ed Baron attended IAU Symposium No. 210,
Modeling of Stellar Atmospheres, Uppsala, Sweden, June, 2002, where he gave an invited talk "Highlights of Modeling Stellar Objects with PHOENIX."

Tetsuya Mishima, Joel Keay, and Mike Santos attended the International Conference on Molecular Beam Epitaxy on September 15-20 in San Francisco, CA. Tetsuya gave a talk entitled "Anisotropic Structural and Electronic Properties of InSb/AlInSb Quantum Wells Grown on GaAs (001) Substrates" by T.D. Mishima, J.C. Keay, N. Goel, M.A. Ball, S.J. Chung, M.B. Johnson, and M.B. Santos.

Niti Goel and Thushari Jayasekera attended the NTT Basic Research Laboratories Summer Camp in Hakone, Japan from August 29 to September 5. The theme of the lectures was "From Nanotechnology to Quantum Information Technology." Both students presented posters on their ongoing research.

Visitors at Nielsen

Greg Parker hosted Michael R. Salazar, June 16 -- June 21, 2002, to discuss future joint proposals.

P.K. Kabir, from the University of Virginia, visited Kim Milton and was the first colloquium
speaker of the Fall, 2002, semester. He talked on T violation; He and Kim also discussed aspects of monopole physics.

Yun Wang was an invited participant of the workshop,
"The New Cosmology Confronts Observation: The Cosmic Microwave Background, Dark Matter, Dar Energy, and Brane Worlds," August 19-September 20, 2002, at the Kavli Institute for Theoretical Physics, UC Santa Barbara. The workshop featured daily discussion among the participants to examine the critical issues in cosmology today. Yun has started at least two new collaborations as a result of this workshop.

Grants Awarded 

National Science Foundation, Gregory A. Parker and Russell T. Pack, $180,014.

Mike Santos, Ryan Doezema, and Sheena Murphy, "Spin and Other Electronic Properties of InSb

Quantum Wells," 3 years, NSF, $435,000.
David Branch received $57K from NSF for "Direct Analysis of Supernova Spectra," and $15K from the Space Telescope Science Institute for "The Origin of Gamma Ray Bursts."

E. Baron and D. Branch, "Radiative Transfer in 3-D moving flows: Understanding
Stars, Supernovae, and Cosmology," NASA, ATP,
May, 2002 -- Apr, 2003,
$145,632.

E. Baron, "Detailed Modeling of Radiation Transport in Supernovae," NSF Stellar Astronomy and Astrophysics, Sept, 2002 -- Aug, 2005, $293,821.

Research Travel

The collaboration between the solid-state group and NTT Basic Research Laboratories continued with Jeremy Graham (an EPHYS undergraduate) and Niti Goel (a graduate student in Physics) visiting Japan to perform experiments on nanostructures made from InSb quantum-well samples. Jeremy stayed for
10 weeks, from June to August, and Niti stayed for 4 weeks in September.

During June and July, Mike Morrison spent a month at the Australian National University (his second research home) in Canberra, Australia. Mike went there to discuss future research directions with members of the Atomic and Molecular Physics labs at the Institute for Advanced Studies. Many of these colleagues have visited OU several times: Bob Crompton, Steve Buckman, Malcolm Elford, Bob McEachran. For Mike, the visit was "wonderful and way too short."

From Brad Abbott: "I am continuing to travel to the D0 experiment whenever I can, which
means typically every other week. It is a very busy time, since we are
trying to bring up a new detector for this run, publish results on data taken during the last run and build a new detector for the next run. I am in charge of overseeing the B physics group at D0 and with 17 graduate students working on B related topics, I am kept very
busy when I am at Fermilab."

Kim Milton spent a week at Washington University, St. Louis, in June, collaborating with Carl Bender on PT symmetric quantum field theory.

Greg Parker went to Los Alamos National Laboratory, Los Alamos, NM, May 6 - May 21, 2002, to collaborate with Russell Pack.

In June 2002, Ed Baron spent two weeks at ENS/UCBL, Lyon, France, working with long time collaborators Peter Hauschildt and France Allard, as well as discussing with new collaborators about the Supernova Factory.

Larry Maddox went to the VLA, near Socorro, NM, June 11-26 to reduce data. He also attended the 8th Synthesis Imaging Summer School, June 18-25, held in Socorro.

John Cowan is on sabbatical this fall at UT Austin to work on several research projects.

Progress Reports

The D0 experiment is continuing to publish a large number of results on the data taking during the last run. So far in 2002 they have published six papers, have one accepted, and have submitted four more for publication.

Kim Milton has several projects on the Casimir effect in the works: (1) With Iver Brevik and J.S. Hoye of the Norwegian University of Science and Technology, Kim is trying to settle the controversy concerning the temperature dependence of the Casimir effect. Is the "Schwinger" (really Schwinger-DeRaad-Milton) prescription corrects, thereby implying zero entropy at zero temperature, or is it not, in which case Nerst's theorem is violated? (2) Bob Jaffe and coworkers have suggested that the usual methods for removing divergences in Casimir calculations are not correct. However, his examples so far are not convincing: he rederives the usual result for parallel plates, which has been confirmed by experiment, and shows that the Casimir effect in two dimensions for a circular boundary is divergent, a fact first established 20 years ago by Sen, and proved definitively by Bender and Kim several years ago. Kim is currently attempting to rederive the 3-d result for a spherical boundary using Jaffe's method.
(3) Kim still hopes to complete the calculation of the Casimir energy of a dilute dielectric cylinder. He expects the answer to be zero, since it is easy to show the (renormalized) van der Waals energy is zero in that case. The calculation is technically somewhat challenging.

Ed Baron improved the convergence properties of his code PHOENIX significantly over the summer, enabling him to understand much more about the nature of supernovae.

From Rusty Boyd: 'The high energy physics group received an NSF MRI grant this year, in partnership with the University of New Mexico and Langston University. The OUHEP share of the funds was about $225K and was used to purchase equipment to facilitate production of the ATLAS Pixel Detector Flex Hybrids, for which we are the lead institute. Production of up to 3500 flex hybrids is planned to begin in early 2003. Equipment purchased with the MRI funds includes a Westbond 2400B wire bonder with wedge, ball and tab bonding capability. This unit uses optical pattern recognition to provide completely automated wire bonding. Over 2 million wire

bonds will be required to be made at OU for flex hybrid testing and operation. We have also acquired (with a matching contribution from the machine shop) a Mitutoyo optical comparator with digital readout and both surface and profile illumination. The comparator is used to visually inspect the flex circuits for defects and make important dimensional measurements. Other equipment purchased includes a Tenney hot/cold environmental chamber
for stress testing and temperature cycling of Pixel flex hybrids and modules, a March Plasma Systems plasma cleaner for bond pad preparation and an Agilent
Logic Analyzer system for development of future HEP VLSI ASICS. Of course, we needed more room to make use of this equipment, so we have doubled the size of our clean room to almost 300 sq. ft. We also included an entry room and utility closet with the new construction. Many thanks to Charles Kelley for his help and advice."

TEACHING NEWS

Eric Abraham attended the Project Kaleidoscope conference on physics education, June 2-5,
Williamsburg VA.

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