

"All the v's

That's fit to Print"

ΦYAST ΦLYER

The Department of Physics & Astronomy

The University of Oklahoma

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Dick Henry, Editor

Danette Miller, Production

NEW FACES

The Department welcomes five new postdocs and 11 new graduate students this fall.

The postdocs (and sponsors) are: Kyungsun Moon (Mullen) from U. Cal.-Davis; Leonard Gamberg (Milton) from U. Tuebingen, Germany; Stefane Mazevet (Morrison) from Australia National University, Canberra; Aleksei Sergeev (Watson) from SMU; and Igor Solovtsov (Milton) from JINR in Dubna, Russia. Says Kieran Mullen, "Postdocs are a vital part of any research group. They bring in new ideas and approaches, and provide graduate students with a fresh perspective. They help students learn the material that is beyond the level of their classes, so they can connect with current research."

The new graduate students are: Yichao Chen (Shanghai); Brent Eskridge (Southern Nazarene U., OK); Nicky Goff (Henderson State); Jingming Huang (Mic. Tech.); Shahriar Khosravani (Pittsburg State University, KS); Shane Lindstrom (OU); Wei Luo (Sichuan U., China); Rick Miller (Central Mich. U.); Robert Mitchell (RPI); Guangwei Mu (U. Sci. & Tech., China); and Hongli Zhang (Peking U., China).

1996 Summer REU Program

Nielsen Hall was alive with the pitter-patter of little feet this Summer -- from a score of undergraduates participating in our first annual Research Experiences for Undergraduates (REU) program. This summer program is funded by a three-year NSF grant (Robert Petry and Maureen O'Halloran Co-PI's; Sheena Murphy and Kieran Mullen co-writers) with additional monies from the Department of Physics and Astronomy, the Graduate College, the Office of the Provost, and the College of Arts and Sciences. The REU program supported students in a ten week summer research program. Nine students were chosen from a nation-wide pool of applicants and three students from among OU applicants. REU participants were Jennifer Frese (Bowdoin College, ME), Billy Gaston (Langston Univ. OK), Jim Hicks (OKC Univ., OK), Sharon Kennedy (Univ. Central Oklahoma), Preston Larson (OU) Kristen Luken (Rockhurst College, MO) Janet Martinez (OU), Alex Ogston (Kenyon College, OH), Dean Richardson (OU), Kirill Shokirev (Univ. Arizona), Thomas Rollin (Purdue, IN), and Kirk VanOpdorp (Augustana College, IL). The REU grant provided travel and housing expenses as well as a generous stipend. In addition, seven other OU undergraduates receiving support from

other departmental research grants participated in the program. These students included Darrin Casebeer, Jennifer Deaton, Emily Gresham, Jennifer Jeffries, Derrick Kiker, Stephen McDonald and Tina Patrick.

The program got off to a late start due to funding delays during the federal budget crisis. With the help of Grettie Bondy, the four supervising faculty members pursued an aggressive advertising campaign via mail, email, and the Web. This work resulted in over 100 applications, each of which had to be carefully evaluated. The top applicants were then matched to different research groups, based upon their background and individual preference. During the 10 week program each student participated in a group seminar as well as an individual research project with a mentor within the department. The twice-weekly seminars provided a basic grounding in quantum mechanics and an overview of theoretical and experimental work in different disciplines (condensed matter, atomic and molecular physics, astrophysics and high energy physics). During the first four weeks of the program, students also took part in a weekly discussion of science and ethics, directed by Prof. Kenneth Taylor from the History of Science Department. For their individual research, students took part in projects ranging from calculating interatomic potentials in 6 dimensions (in hyperspherical coordinates no less!) to designing, building and calibrating thermometers to work in high magnetic fields at temperatures close to absolute zero. Many thanks are due to the numerous faculty mentors, graduate students and post-docs who worked with the REU students.

The REU program was designed to be fun as well as productive. Thanks to the efforts of the supervising TA's, Adria Morris and Tom Ericson, there were a number of successful social events. These included volleyball games, a weekly "Bad Movie Night," midnight poetry sessions, cookouts, and trips to various Oklahoma City sites. Weekends saw students venturing further afield, including activities such as a rock climbing expedition to the Wichita Mountains (in Southwest Oklahoma), canoeing on the Illinois River (in Northeast Oklahoma), and a trip to Dallas (in Baja Oklahoma). Students were enthusiastic about their experience, and some have already expressed interest in returning to OU for graduate study.

The program will be repeated next year. Talented sophomores and juniors in Physics and Astronomy are encouraged to apply this spring, either by writing the Department directly, by emailing reuphy@nhn.ou.edu, or by accessing the REU Homepage: "<http://www.nhn.ou.edu/reuhome/>".

Maureen O'Halloran

Kieran Mullen

Lights, Camera, Action CUT!

Hollywood is just plain fickle! As you may recall, the Physics Department had a little taste of Hollywood last year when our building was chosen as a set for the filming of the movie Twister. The movie premiered in May in Oklahoma City in grand Hollywood tradition -- gala affairs both before and after the showing with movie stars in attendance. Tickets sold for \$50-\$250 but, hey, what's a little money when you're building's gonna be in pictures? A small group of us got all gussied up and attended the red carpeted premier in high anticipation. The movie was filled with dark skies and lots of tornadoes -- one or two came down the road every few minutes, each one bigger than the one before! Moviegoers were on the edge of their seats, some screaming and others laughing. It was definitely an exciting movie! We, of course, were busy looking for scenes of Nielsen Hall and OU. Oh cruel fate, all the Nielsen Hall scenes were CUT and the only reference to OU was on the head of one lone storm chaser (baseball cap with OU logo). Like I said earlier: Hollywood is just plain fickle!

Grettie Bondy

ALUMNI NEWS

Jim Walker (PhD 1970) recently checked in via email. Jim did his masters work with Dr. Nielsen and his doctoral dissertation under Bob St. John. He worked for the CIA in development until retiring in 1994. You can reach Jim at walkerjd@pop.erols.com.

Janet Fender (BS 1974) is president-elect of the Optical Society of America. She will ascend to the presidency in 1997. Janet is currently at the Phillips Lab at Kirtland AFB, NM. Read about her on pg. 57 of the 12/94 issue of Physics Today.

Margaret Burnham Branchflower (MA 1942) responded to recent references to the Department Picnic and Song in this space. Apparently, the Physics Department Picnic was the official homecoming for the Department. Margaret writes, "Everyone was expected to attend: alumni, faculty, graduate students, secretaries, wives/husbands. Each year The Song was brought up to date. Since Dean Dodge's middle name was "Levi", the tune Solomon Levi was a natural. The outstanding events of the year were celebrated in song. The boys made glass slides of the words, managed a screen, set up a generator for electricity. A campfire was lighted after dark. I remember other songs sung as well. A baseball game was the afternoon feature." Thanks for being a bridge to the past, Margaret.

Glenn McIninch of Rochester, NY, an alumnus of the Department, dropped in during the summer to say hello. Glenn was visiting family in Purcell. Glenn is responsible for sending in the picture taken at the Department Picnic back in the 30's. Glenn worked for Kodak and is now retired.

C.C. Lin, currently the John and Abigail Van Vleck Professor of Physics at the University of Wisconsin-Madison and former OU Professor of Physics and Astronomy, will be given the Will Allis Prize for "advancing the understanding of the microscopic behavior of ionized gases through his innovative and pioneering studies of excitation in electron and ion collisions with atomic and molecular targets."

MORRISON VISITS AUSTRALIA

Mike Morrison spent the summer in Australia on a Fulbright Senior Scholar Grant. He was based in the Atomic and Molecular Physics Labs of the Research School of Physical Sciences and Engineering in the Institute for Advanced Studies at the Australian National University. During this time he worked with Drs. Stephen Buckman, Erich Weigold, and Robert W. Crompton on current and future research in electron scattering physics. In addition he visited with colleagues at the above mentioned universities. Several new collaborations have resulted from this travel which his group will be pursuing during the next several years.

During his stay, Mike gave several talks, including colloquia and more specialized seminars on various aspects of electron collision physics; these included talks at Flinders University (Adelaide), the University of Western Australia (Perth), the Australian National University (Canberra), and Murdoch University (Perth). He also gave an invited lecture to the Institute of Physics on his interdisciplinary teaching in Science in Contemporary Culture, which he also presented elsewhere. This was entitled: "Dr. Frankenstein, Dr. Feynman, and Mrs. Oedipa Maas: A Science Course for People Who Hate Science."

Extensive discussions with Dr. Robert K. Nesbet (IBM) and scientists at the ANU during his visit have led to a potential breakthrough in resolving a severe discrepancy that has plagued comparison between theory and experiment on vibrational excitation in molecules for almost 40 years. Work is underway in collaboration with Dr. Nesbet to try to pin this down decisively.

PAPER CHASE

Recent Publications

W.K. Liu, Xuemei Zhang, Weiluan Ma, J. Winesett, and M.B. Santos "Molecular Beam Epitaxial Growth and Characterization of AlInSb/InSb Quantum Well Structures", J. Vac. Sci. Technol. B14, 2339 (1996)

X.M Fang, T. Chatterjee, P.J. McCann, W.K. Liu, M.B. Santos, W. Shan, and J.J. Song "Molecular Beam Epitaxial Growth of Europium-Doped Calcium Fluoride and Barium Fluoride on Silicon," J. Vac. Sci. Technol. B14, 2267 (1996)

K.A. Milton, "Quasilocal Formulation of non-Abelian Finite-Element Gauge Theory," Phys. Rev. D, 53, 5898 (1996).

D. Branch, W. Romanishin, and E. Baron, "Statistical Connections Between the Properties of Type Ia Supernovae and the B-V Colors of Their Parent Galaxies, and the Value of the Hubble Constant", ApJ, 465, 73 (1996).

E.H. Smith, G.R. Kalbfleisch, "Double-sided silicon charge correlation study: matching multiple track hits", NIM a, 371, 428 (1996).

M.Strauss, et.al., (SLD Collaboration), K.Abe, "Measurements of R(B) with Impact Parameters and Displaced Vertices," Phys.Rev.D53, 1xxx-xxxx, 1996

Tony Magistrale and Michael A. Morrison, "A Dark Night's Dreaming: Contemporary American Gothic Fiction." (Charleston, SC: University of South Carolina Press, 1996).

Grahame Danby, Brian K. Elza, Michael A. Morrison and W. K. Trail, "The Separable Representation of Exchange in electron-molecule scattering I: Elastic Scattering and Rotational Excitation", Journal of Physics B, Volume 29, 2665 (1996).

William A. Isaacs and Michael A. Morrison, "Analytic Born Completion in the Calculation of Electron--Molecule Differential Cross Sections", Physical Review A, Volume 53, 4215 (1996).

K.Abe, M.Strauss, et.al., (SLD Collaboration), "First Study of Rapidity Gaps in e+e- Annihilation," Phys.Rev.Lett.76, 4xxx-xxxx, 1996

M.Strauss, et.al., (SLD Collaboration), K.Abe, "Factorial and Cumulant Moments in e+e- Annihilation to Hadrons at the Z0 Resonance," Phys.Lett.B731, 149-156, 1996

Fang X.M., Liu W.K., Shan W., Chatterjee T., McCann P.J., Santos M.B. and J.J. Song, "Molecular Beam Epitaxial Growth of Eu-doped CaF₂ and BaF₂ on Si", J. Vac. Sci. Technol., B14(3) (1996) 2267

Liu W.K. and Santos M.B. "Characterization of Oxide Desorption from InSb(001) Substrates", J. Vac. Sci. Technol., B14(2) (1996) 649

Fang X. M., McCann P. J. and Liu W.K. "Growth Studies of CaF₂ and BaF₂/CaF₂ on (100) Silicon Using RHEED and SEM", Thin Solid Films 272(1) (1996) 87

G.M. MacAlpine, S.S. Lawrence, R.L. Sears, M.S. Sosin, and R.B.C. Henry, "Nitrogen-Rich And Sulfur-Rich Gas In The Crab Nebula", ApJ, 463, 650 (1996).

GRANTS RECEIVED

National Science Foundation PI: M.B. Santos, Co-PI's: J.E. Furneaux, R.E. Doezema, "Electronic Properties and Growth of Novel InSb-Based Quantum Wells," \$300,000 for 3 years.

National Science Foundation, K.A. Milton, PI, "Nonperturbative Expansion in Quantum Chromodynamics: A Cooperative Research Proposal," a three-year grant to fund cooperative research visits with Igor Solovtsov of Dubna, Russia, \$19,937, more than 99% of the amount requested.

NSF, D. Branch, Supernova Studies, \$50,000

NASA, D. Branch, Supernova Intensive Study, \$7500

DOE, G. Kalbfleisch, \$445,000. This is George's 17th consecutive year of DOE funding.

MEETINGS ATTENDED/PAPERS PRESENTED

Kim Milton: Lattice '96, Washington University, St. Louis, June 4-8, 1996 Presented paper entitled "Finite-element quantum field theory."

George Kalbfleisch: 28th International Conference on HEP, Warsaw, Poland, July, 1996. "A New Search for Low Mass Magnetic Monopoles", with Milton, Strauss, Hladik, and Smith.

David Branch: Debate on the Extragalactic Distance Scale, April 1996, Smithsonian Institution, Washington, DC.; Conference on the Extragalactic Distance Scale, May 1996, Space Telescope Science Institute, Baltimore, MD.; Critical Dialogues in Cosmology, June 1996, Princeton, NJ.

Ted Mansell: Attended the spring meeting of the Acoustical Society of America (ASA) in Indianapolis, IN. (May 13-17) He presented the paper, "Sound Intensity Patterns from Two Bass Handbells."

Members of Mike Morrison's group attended the Division of Atomic, Molecular, and Optical Physics meeting in Ann Arbor, MI, and presented papers: "Collisions of Aligned Rydberg Calcium with Xenon: Impulse Approximation Calculations (William A. Isaacs & Michael A. Morrison) and "Scaling Relations for Rotational Excitation Cross Sections in Low-Energy Electron-Molecule Scattering" (Wayne K. Trail & Michael A. Morrison).

Mike Morrison attended Theoretical Workshop on Electron Scattering Processes, at the Australian National University and presented a paper entitled "Accurate Adiabatic Calculations of Low-Energy Electron-Molecule Collision Cross Sections: A Journey Off The Energy Shell." Mike also attended a Festschrift for Robert W. Crompton at the Australian Academy of Sciences (Canberra) and presented a paper entitled: "The OU/ANU Electron-Molecule Project: The First Twenty (!) Years."

Ed Baron: Nordic Symposium on Galaxy Evolution, NORDITA, Copenhagen June, 1996. "Using Supernovae as Abundance Probes".

Dick Henry: "Toward Understanding Nucleosynthesis Patterns In Intermediate-Mass Stars", R.B.C. Henry, K.W. Kwitter, J. Buell, IUE Symposium on Planetary Nebulae, Groningen, The Netherlands, August, 1996.

Xiao-Ming Fang, Amy Liu, Pat McCann and Mike Santos attended the 9th Intl. MBE Conf. in Malibu, CA, August 1996 and presented two papers:

Liu W.K., Fang X.M., Winsett J., Ma Weiluan, Zhang Xuemei, Santos M.B. and McCann P.J. "Large-mismatch Heteroepitaxy of InSb on Si Substrates using Fluoride Buffer Layers".

McCann P.J., Fang X.M., Liu W.K., Strecker B.N. and Santos M.B. "MBE Growth of PbSe/CaF₂/Si(111) Heterostructures".

Kory Goldammer and Mike Santos attended the 38th Electronic Materials Conference in Santa Barbara CA, June 1996 and Kory presented the paper:

Santos M.B., Liu W.K., Ma Weiluan, Zhang Xuemei, Goldammer K.J., Hauenstein R.J. and O'Steen M.L. "Growth of InSb/Al_xIn_{1-x}Sb Strained Layer Structures by Molecular Beam Epitaxy".

RESEARCH TRAVEL

Kim Milton:

Cambridge, Oxford, and London, UK, June 18-30. Met with Richard Lim of World Scientific to discuss book projects, visited Claudia Eberlein at Cambridge to discuss sonoluminescence, visited Donald Degenhardt of Oxford University Press to discuss book projects, visited Dennis Sciamia in Oxford to discuss sonoluminescence and the Casimir effect. Kim spent the bulk of the time at Imperial College, London, where he worked with Carl Bender on a new version of the nonperturbative delta expansion appropriate to symmetry breaking. Then on to Los Angeles, June 30-July 7, where Kim worked at UCLA on sonoluminescence and on the delta expansion, and met with his book co-authors, Lester DeRaad and Wu-yang

Tsai, and with Julian Schwinger's widow, where they signed a contract to publish the electrodynamics book with Addison-Wesley.

Ed Baron:

Spent a month in Stockholm visiting Claes Fransson's group. Began a new collaboration to work on the late time observations of SN 1987A, also discussed Type II supernovae with Peter Lundqvist and Robert Cummings.

Mike Strauss:

Spent 6 weeks at Fermilab doing research on D0 from May 15 until June 30. Also spent one week in Boston with Phil Gutierrez at the D0 summer workshop.

Dick Henry:

Spent a week at Williams College in July with collaborator Karen Kwitter working on the planetary nebula abundance project. Karen, Dick, and graduate student Jackie Milingo, enjoyed four beautiful nights of data-taking at Kitt Peak National Observatory during May, where they took numerous spectra of planetary nebulae, using the 2.1m telescope.

RESEARCH BREAKTHROUGHS

Kim Milton: I believe I have definitively proved that the Casimir effect is not responsible for the puzzling phenomena of sonoluminescence. A paper discussing this in detail has been submitted to Physical Review D. I also submitted a critical comment to Phys. Rev. Letters, attacking the claims to the contrary by Eberlein. I am currently studying the dimensional dependence of the vector Casimir effect, an investigation complementary to our earlier study of the scalar Casimir effect.

George Kalbfleisch: The monopole experiment at Fermilab has been approved (7/22/96). With that comes DOE and OU funding plus (the real plum) space in the basement of Nielsen Hall.

TEACHING NEWS

Kim Milton:

My effort continues to focus around the graduate electrodynamics book. My student evaluations last spring indicate that it was very well received. Version 2 was completed in May, and I'm currently incorporating new material (including old notes from Schwinger's course at UCLA that Mike Strauss took in 1983). The final version should be in the hands of the publisher (Addison-Wesley) next summer. I might note that we had something of a bidding war last spring, with World Scientific, Oxford UP and Addison-Wesley all wanting to publish it. The editor of OUP showed the manuscript to Chris Llewellyn-Smith, Director-General of CERN, and he liked it!

Mike Morrison:

Last Spring I further developed the Mathematica component of my upper-level undergraduate course in quantum physics. This year I will be working with Bruce Mason preparing extensive course material for this class, including both text material and Mathematica notebooks. I will also be completing the manuscript of the second (and last) part of my tome UNDERSTANDING QUANTUM PHYSICS, which is scheduled for publication by Prentice-Hall before the millenium.

VISITORS

Mike Morrison:

Last spring I hosted visits by Drs. Ilya Fabrikant, a theorist from the University of Nebraska who is interested in perhaps collaborating with us on Rydberg Atom research, and Barry Dunning from Rice University, an experimentalists specializing in very low energy electron collisions. Barry, too, is interested in a possible collaboration.

Ed Baron:

Peter Hauschildt July 1996, fixed a numerical diffusion problem in their radiation transport algorithm, began working on 3-D radiation transport.

Dick Henry:

French collaborators Chantal Balkowski and Veronique Cayatte from l'Observatoire de Paris, Meudon, visited for a few days in April to discuss observing projects involving cluster galaxies.

TALKING SHOP ON THE WWW

Want to know what the shop guys are up to? There is now a link on the local phyast home page, as well as a link posted on the university research home page, (under "other links").

Joel Young, shop supervisor, explains, "The shop page gives a fairly good idea of what we're capable of. In addition there is a shop policy, and I believe it is referenced under priority rating. It's sort of a mission statement/ten commandments all rolled into one. The page was constructed by myself and Gamini Dharmasena."

FALL COLLOQUIUM SPEAKERS

9/26/96

Robert Keolian, Naval Post Graduate Schools, Monterey, CA, "Thermoacoustic Refrigeration... Sounds Cool, Huh?"

10/10/96

Seth Putterman, UCLA, "Sonoluminescence"

10/17/96

Thomas Gallagher, Univ. of Virginia, "Resonant Collisional Energy Transfer Between Rydberg Atoms"

10/24/96

Jerry Bonnell, NASA-Goddard, "Gamma Ray Bursts"

11/4/96

Stephen Buckman, Australian National University, "Atomic & Molecular Exp."

11/14/96

Igor Solovtsov, Bogoliubov Laboratory, "High Energy Physics"

11/21/96

Allan MacDonald, Indiana University, "Condensed Matter"

12/5/96

Bob McEachran, York University, "Atomic & Molecular Theory"

FRIDAY NIGHT AT THE OBSERVATORY

For the fourth year, the Department will host three fall public lectures on astronomical topics, coupled with observatory open houses. All lectures begin at 7:30pm in 128 Dale Hall. The observatory opens after the lecture around 8:45pm. The speakers and topics for this fall are: September 20, Mike Zeilik (U. New Mexico), "The Skies of the Southwestern Pueblos"; October 18, Barbara Anthony-Twarog (U. Kansas), "Origin Stories of the Milky Way"; and November 15, Debra Burris (OU), "The Universal Dating Game, Or How Old Is the Universe". Telescopic targets always include the moon, plus any planets lurking in the night sky. Please join us if you can.