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2007 physics

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Message from the Chair

Greetings from Miami University Physics! I hope each of you is doing well and that 2008 has gotten off to a terrific start for you. I am pleased to write to you today to give you an update on the comings and goings of the Physics Department since I last wrote. This is my seventh year as Chair of the Department and it has been an immense pleasure working with the faculty, staff, and especially the students and alumni of the department. We are a dynamic collection of people who are equally committed to making the physics department one of the best in the country.

In 2006-07 a major focus for our department was our Program Review. This process occurs every six years and provides opportunity to assess the strengths and areas of growth for our department. The department prepared a detailed self-study of all aspects of our program. This was submitted to the university's Academic Program Review Committee, which in turn supplied it to two external reviewers from Duke and the Colorado School of Mines and three internal reviewers from Computer Science, Chemistry and History who conducted a site visit. The final review applauded our increase in scholarly productivity and contributions to the educational mission of the university. Recommended areas of improvement included increasing external funding, enhancements to our graduate program, and development of a long-range strategic plan.

We are pleased to have Dr. **Khalid Eid** join us in fall 2007 as the inaugural James C. and Carole E. Garland Assistant Professor of Physics. Dr. Eid's expertise is in the area of nanoscale magnetism. He earned his Ph.D. from Jack Bass' group at Michigan State and held positions of post doc and staff scientist at the Penn State National Nanofabrication Facility prior to joining our faculty.

Let me highlight a few developments in the department. This spring we celebrated with Dr. **Jan Yarrison-Rice** her promotion to the rank of Professor (more details inside). The Ray Lee Edwards Conference Room, after more than 20 years of faithful service to the department, was spruced up with new chairs, carpeting, and lounge furniture. In addition, a gift from one of our alumni allowed us to install a fixed AV system in the room. We are grateful for the endowment provided by the Frische's to establish the room and provide for ongoing maintenance.

Our annual fall faculty retreat was devoted to Strategic Planning and preparation for our Program Review site visit. The spring faculty/student retreat addressed among other issues, the possibility of a graduate student journal club. **Burcin Bayram** agreed to do a trial run in the 07-08 academic year as part of her duties as Seminar Chairperson.

This year's Benson Lecturer was E. Dan Dahlberg, Distinguished Professor of the Institute of Technology and Professor of Physics and Director of the Magnetic Microscopy Center at the University of Minnesota. He gave an entertaining popular lecture entitled, "Magnetism at the Nanoscale: A Voyeurs Tale." Not only is Dr. Dahlberg an expert in magnetic materials, but is a noted educator and founding member of the entertaining purveyors of demonstrations—The Physics Force.

We were honored to have as our 7th annual George and Carolyn Arfken Physics Scholar-in-Residence, Dr. Wei Zhong, Research Fellow, Harvard Medical School. She gave two lectures, one popular, entitled, "Light and Molecules: Directions in Biomedical Imaging," and one technical, entitled, "The Quest to Beat the

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Thanks!

The Department is grateful to Jim and Carole Garland for endowing the James C. and Carole E. Garland Professorship in Physics. Khalid Eid holds the first chair of that professorship. We are also grateful to our former colleague, Don Kelly and his wife Jane, for endowing new scholarships in the name of George Arfken and Ray Lee Edwards.

We are most grateful to all our alumni who contribute to our scholarship funds, which include the *Culler Awards*, *Benjamin Lee*, *George and Carolyn Arfken*, *Raymond M. Hughes*, *Ray Lee Edwards*, *Andrew Wolf Bylenga*, *John E. Cocanougher*, *Drake Family*, *William E. Shoupp*, *Carl Frische*, *Philip and Cora Macklin*, *John and Genny Snider* and *Votaw Scholarships*.

We also wish to thank all of our alumni who so generously support our general account. These gifts are critical in providing discretionary funds essential to maintaining the vitality of our physics program. If you would like additional information as to how you may further assist the program or students, please contact The Office of Development at (513) 529-5150 and ask to speak to the development officers for the College of Arts and Science.

Message from the Chair *continued*

Resolution Limit of Light." She also gave short courses on "Biomedical Microscopy" and "Photodynamic Therapy and Photodiagnosis." Dr. Zhong was hosted by **Paul Urayama** and interacted closely with him and his research students during her visit. This year we hosted three Arfken Scholars (shorter visits): Harold Carmichael (U of Auckland) and Barry Sanders (U of Calgary), both hosted by **Perry Rice** and **James Clemens**; and Wayne Saslow (Texas A&M), hosted by **Mick Pechan**.

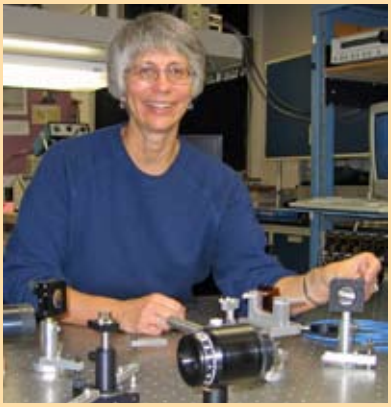
Eighteen undergraduate majors and eight graduate students graduated this past academic year. Among our current students are one Harrison Scholar, one Goldwater Scholar, one Goldwater nominee, and one Astronaut Scholar.

The graduate program is bursting at the seams with well-qualified students. We were given two overbooks and have two students supported on research grants for a total of 19 full-time students. These students are eager to do research and are highly sought after as scholarly collaborators by our faculty.

Thank you for continuing to support Miami and the Physics Department. Your interaction with students and financial support is an added value that allows us to maintain excellence for those following your path.

To all our valued physics alumni,
Best wishes for a blessed year,
Mick Pechan

Department News



Jan Yarrison-Rice

Caroline Scacca, Jesse Manders, Colin Boyle, Siwei Cao

We are excited to highlight the work of **Jan Yarrison-Rice** (PhD 1990, Univ of Arkansas), our newly promoted Professor of Physics at Miami University. Since 2000, Jan has developed a strong research program in the fabrication and optical characterization of nanoscale materials and devices. She has also incorporated Miami students into research collaborations with Chemistry at Miami and in Electrical Engineering and Physics at University of Cincinnati. Her work is published in journals such as Nano Letters (2 publications), Applied Physics Letters (7), Optics Express (1), and the IEEE Journal of Nanotechnology (1). Many of these papers were featured in the Virtual Journal of Nanotechnology. Jan is proud of the students who have been active participants in her laboratory. At present, Siwei Cao is working on her MS degree in Physics, and three undergraduates, Caroline Scacca, Jesse Manders, and Colin Boyle, are working on two different projects in the JYR Nano Lab.

Yarrison-Rice is involved in a number of major research projects at this time, including plasmon-enhanced nanowire biosensors (with $330K funding from NSF through collaboration at UC), photonic band gap optoelectronic devices (two separate projects), and pedagogical methods for enhancing critical thinking at all levels in Physics courses with Profs **Beverley Taylor** and **Jennifer Blue**, and single molecule electronics (with $100K NSF funding in the Nanoscale Exploratory Research with Chemistry at Miami).

Other areas of Jan Yarrison-Rice's life at Miami Physics are seen in her service both to nanotechnology and women in science. Jan founded and has served as faculty advisor since 1991, to the WISDEM Program (women in science disciplines, engineering and mathematics) which is a theme living learning community based in the residence halls for women to live with and study with others with similar interests. Another group that Jan interacted with was the Kutztown, PA Middle School Future City Team (20 young scientists) who are developing a "nano-enhanced" city in the year 2050, which incorporates nanotechnology in all levels of its daily life. These young people are very excited about their prospects in the upcoming competition.

All in all, the Nanoworld is alive and thriving at Miami. For more information on various research projects, courses being taught, and service including links to specific papers, see Jan Yarrison-Rice's Homepage at www.cas.muohio.edu/~yarrisjm.

Paul Scholten announced his intention to retire at the end of the 2007/8 academic year after 30 years of service. A reception is planned for the end of the semester. Well-wishers are encouraged to send greetings to Dr. Scholten in care of the department.

Michael Pechan enjoyed teaching University Physics to primarily first year engineering students and Electronic Instrumentation lab to sophomore physics majors. He directed UG research of Ryan Bennett and Kyle Bechtel and MS thesis of Willis Agutu. Dr. Pechan published four papers in The Journal of Applied Physics. He was awarded a grant from US Department of Energy for nanoscale magnetism research ($60,800), and was recently elected as an officer in the American Physical Society Topical Group on Magnetism and Its Applications (GMAG).

Perry Rice is still doing work in quantum optics and quantum information theory, with some semiconductor laser work again. His work is supported by NSF, and he was on the program committee for the last two Quantum Electronics and Laser Sciences meetings. He and **James Clemens** are collaborating with Luis Orozco's experimental group at the University of Maryland/Joint Quantum Institute, dealing with entanglement and how to measure it.

Samir Bali is busy in his lab with grad student Nate Souther and undergrad students Matt Briel, Richard Wagner, and Peter Harnish. They are setting up an optical lattice where the atoms in a cold, ultradilute gas at a temperature of few MicroKelvin are arranged by laser beams into a crystal-like, periodic spatial structure. He also built a laser-based sensor that is the only device capable of measuring small, rapid changes in the refractive index of highly turbid media, up to

100 times more turbid, or opaque, than milk. He is actively looking for agencies that would sponsor this research on a sustained basis.

The Miami Quantum Optics Group was formed by a collaboration of **Perry Rice**, **Samir Bali**, and **James Clemens**. They can offer students both theoretical and experimental opportunities and are seeking prospective students. Weekly meetings provide support for students and are attended by **Dr. Phil Macklin**. Funds are available for graduate and undergraduate summer stipends.

Burcin Bayram received Research Corporation, Cottrell College Science Award in the amount of $37,539 to do *"Photoionization Spectroscopy of highly excited cesium atoms"*. She had three refereed publications in 2007 on which four graduate and two undergraduate students are co-authors. Dr. Bayram recently initiated international collaborations with Technische Universitat Berlin, Germany and Istanbul University, Turkey, on the studies of Raman spectroscopy and high-resolution laser spectroscopy. Dr. Bayram has ongoing experimental research studies in the area of collisional based spectroscopy using pulse lasers as tools to understand the dynamical properties of the excited state alkali atoms in collisions with buffer gases. Through her recent grant, Bayram group started constructing photoionization spectroscopy experiments. The goal of this research program is to take snapshots of dynamics of atomic/molecular reactions using electron/ion imaging technique in order to measure the velocity distribution of the reaction product and to gain information about what direction and how fast a product left the reaction center. This information, in return, yields how the angular momentum is distributed in the products or in the Rydberg states. A snapshot using ion/electron imaging has a very striking feature: it allows us to "see" the secrets of nature appeared on a camera screen with full picture in living colors.

The undergraduate majors continued their tradition of presenting an Outstanding Teaching Award to a faculty member. The recipient for 2006/7 was Dr. **Paul Urayama**.

This past year, our faculty taught 26 undergraduate majors courses and 18 graduate courses. We also taught 46 service courses to approximately 2100 students. Our graduate students taught 62 sections of introductory lab courses to approximately 1200 students. The faculty published 32 papers in peer reviewed journals; made 59 presentations at regional, national and international meetings; submitted 13 proposals requesting more than $4.6M and were awarded 9 grants totaling in excess of $2.4M. This research involved 22 graduate and 35 undergraduate students (past and present).

News of our students

Where appropriate the name of the faculty mentor appears in parenthesis

SPS Outstanding Senior Award
David Rench

Outstanding Undergraduate Researcher
Michael Salerno (Paul Urayama)

College of Arts and Science Dean's Scholar, Goldwater Scholar, Astronaut Scholar, and Provost's Student Academic Achievement Award
Eric Frey

Undergraduate Summer Scholars
Scott Keller (Paul Urayama)
Eric Frey (Paul Urayama)

Sigma Pi Sigma Inductees
Benjamin Agyare
Eric Frey
Thomas Haver
Ramesh Marhatta
David Rench
Iris Zhang

Outstanding Graduate Student Researcher
Ramesh Marhatta (Burcin Bayram)

AAPT Outstanding Graduate Student Teacher Award
Benjamin Agyare
Thomas Haver

Department Scholarship Recipients
Eric Frey
Daniel Schwind
Andrew Aseltine
Andrew Hesselbrock
Eric Todd
Sally Watkins
Matthew Briel
Cody Moorefield
Michael Maffett
Ryan Perhala
Michael Rooney
Nathan St. John
Luke Keltner
Jesse Manders
Richard Wagner
Daniel Wentzel
Joshua Jasensky
George Schnell
Scott Keller

Degree Awards 2006/07
Physics MS:
Willis Agutu (Pechan)
Benjamin Agyare (Bali)
Samuel Bish (Bali)
Ryan Coons (Bayram)
Thomas Haver (Urayama)
Ramesh Marhatta (Bayram)
Simon Wayne (Church)
Yuhong Iris Zhang (Bali)

Physics BS:
Stephen Holtkamp
Jeff Hyde
Andrew Jacobs
Bryan Kerns
Elyse Lyle
David Rench

Physics BA:
Kyle Bechtel
Peter Burch
Matt Dopkiss
Ashley Mueller
Taylor Phillips
Brian Slepian
Matthew Williams

Engineering Physics BS:
Ryan Bennett
Katherine Binzel
Jonathan Dudley
Joshua Federer
Gregory Newstadt
Ryan Nowak
Michael Salerno

Alumni News

We love to hear how you are doing. Send us your updates and we would be glad to publish them. Send your emails to Judy Eaton at eatonja@muohio.edu. Please put Alumni Newsletter in the subject line.

Russell Starkey, Jr. (BS 1964) was inspired to write after receiving last year's newsletter. He writes, "My degree and NROTC education and training set me up for entry into the Navy Officer Nuclear Power Program. I've now spent a 43-year career in the nuclear power arena and have been responsible for management of two nuclear generating stations and a uranium enrichment plant. Next year, my wife and I plan to retire to Oxford, where our oldest daughter, also a Miami grad, currently lives."

Vince Billock (BS 1981, MS 1983) wrote that, after leaving Miami, I got a PhD in Biophysics at Ohio State. I married my college sweetheart, Bambi, and we have three kids, ranging from age 5-17. I've spent most of my career doing basic research at military labs; I took two years off to study complexity theory, which reshaped all of my subsequent work. I'm at Wright-Patt now, where I'm a Lead Scientist with General Dynamics. My research focuses on modeling human vision and on inducing catastrophic failures of human vision, like biased hallucinations, forbidden colors and perceived causality violations. Our most recent paper appeared in PNAS this year and I'm writing a book called *Chaos Reigns When Vision Fails*, which will be out in November 2009—just in time for the Christmas shopping season.

Jane (Scipione) O'Laughlin (MS 1985) returned to campus to deliver a Wednesday seminar, "Metallic Mesh Coatings." She joined Battelle Science & Technology International in Columbus, OH after graduation, and is now manager of Battelle's Microfabrication Group. They specialize in applying metallic micromesh coatings on visible and infrared windows and domes in aerospace applications for electromagnetic shielding, defog/deice heating, and radar cross-section control. Keith Ramsey (BS 1984) is a member of her group.

Elijah Ayieta (MS 2004) is in the physics department of IUPUI. He recently passed his qualifying exams, and is working on PhD research. He is in the condensed matter group (nanophysics/material science). This year, he was also the recipient of the AAPT Outstanding Teaching Assistant Award. He writes, "I am currently working on metallicity and electronic states of semiconducting polymers (PVDF-an ideal material to make inexpensive organic LED and organic thin film transistors). Recently, I finished one project on Electronic state of Fe nanostructure on Pt (997) vicinal surface (an ideal method for making quantum nanowires), which I presented at the America Vacuum Science conference in Seattle in October 2007. I am hoping to finish by May 2009 if all goes well."

Sean McBride (MS 2005) is in a PhD program at Kansas State University. He writes, "The parameter I study called the slip length, plays an important role in microfluidic technologies. The slip length parameter at the liquid-surface interface of these devices describes how easily a fluid flows over the surface. As microfluidic devices decrease in size, slip becomes very important. I have found in the literature, numerous discrepancies exist in the magnitude of slip between different experimental methods used to measure it. I am trying to look at slip from a method that produces reliable and consistent results. As for other news, both **Dyan** (**Jones McBride**, MS 2005, also in the Kansas State PhD program) and I passed all five examinations on the first attempt—only a few passed all five exams on the first try. Dyan is taking her last physics class right now (Grad Thermodynamics) and has completed her Physics Education Research classes and oral examinations. With completion of her research, she'll be done in May 2009. I have a handful of courses to go myself, and hopefully I can get done by 2010."

Andrew Jacobs (BS 2007) is a Mac Specialist at the Apple Store in the Kenwood Towne Center, Cincinnati, Ohio.

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