



WESTERN MICHIGAN UNIVERSITY
College of Arts and Sciences
Department of Physics

Newsletter

A Newsletter for Friends of the Western Michigan University Department of Physics



The Department of Physics provides annual operating funds for the accelerator laboratory. Out of these funds, routine maintenance of the accelerator is carried out. Major upgrade of the accelerator is carried out by submitting grant proposals.

Grants and award keep Van de Graaff accelerator running strong

The major research facility in the department of physics at Western Michigan University is the High Voltage Engineering Corporation 6-MV model EN tandem Van de Graaff accelerator, which has been in continuous use for nearly 40 years.

During this long history, the accelerator laboratory has established itself as an important research training facility and as an educational tool through a broad spectrum of uses and applications. Furthermore, the laboratory played a key role in the establishment of the Ph.D. program about two decades ago.

Faculty research has resulted in numerous publications in leading physics journals and formed the basis for several Ph.D. dissertation projects (since 1995), numerous M.A. thesis projects (since 1970), and a number of Honors College and undergraduate research projects. The accelerator facility has been, and continues to be, an important component in faculty research that receives external support.

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As an example, a Pelletron charging system to replace the belt-driven system was obtained with funds from an NSF-MRI grant in 2004.

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Dr. Asghar N. Kayani

In September 2009, another NSF-MRI proposal was awarded to WMU. This proposal was submitted by Dr. Asghar N. Kayani, the principal investigator (PI), and co-PI's Drs. Michael Famiano, Emanuel Kamber, John Tanis, and Alan Wuosmaa. The \$294,044 award, along with university sharing costs of \$126,019, was used to purchase two new ion sources (an RF charge exchange ion source and a Source of Negative Ions by Cesium Sputtering [SNICS]), for our accelerator, to replace the existing ones that had become mostly obsolete.

It was planned to purchase both sources as complete units including power supplies, extraction and focusing elements, and

other associated instrumentation. The ion sources were commercial units available from National Electrostatics Corporation (NEC) in Middleton, WI, a highly-regarded manufacturer of state-of-the-art particle accelerators and associated equipment for use in academic, governmental, industrial, and medical applications.

Upon the funding of this proposal, both the RF exchange source and the SNICS source were ordered immediately from NEC and were delivered to us in August, 2010.

Installation of the new ion sources was carried out under the supervision of Kayani. The department instrument shop and electronics shop provided the much-needed support for this project. Actual installation of the ion sources and power supplies was carried out by Kayani; Allan Kern, the department's accelerator engineer; Rick Welch, the machine shop supervisor; Benjamin Gaudio, the electronic shop supervisor; and graduate and undergraduate students. Student help during the installation was mostly voluntary; however, the Department of Physics and the Office of the Vice President for Research provided funds to hire an undergraduate student to develop vacuum interlocks for this project. Dr. Steve Ferguson, a retired accelerator physicist, also volunteered to help install the new ion sources. Layout of the ion sources was cleverly designed to keep the old duoplasmatron source in place.

Installation of the new ion sources is complete and is producing beams for the accelerator. The project has moved to implementation of the research and educational phases, and several other department personnel have become involved. Regarding research usage, department faculty playing key roles, in addition to Kayani (condensed matter physics), include: Dr. Michael Famiano (Nuclear Astrophysics); Dr. Emanuel Kamber (Atomic Physics); Dr. John Tanis (Atomic Physics); and Dr. Alan Wuosmaa (Nuclear Physics). Each of these physicists have broad experience and expertise in promoting innovative uses and partnerships of the upgraded facility.

Berrah publishes article on first-ever Free Electron Laser

The response of matter to ultrashort, intense x-ray pulses had been virtually unknown until the team of Professor Nora Berrah published the first article using the world's first x-ray Free Electron Laser, the Linac Coherent Light Source (LCLS), which opened its doors to research in many fields in October of 2009. The work entitled "Ultraintense X-ray Induced Ionization, Dissociation, and Frustrated Absorption in Molecular Nitrogen" was published in *Physical Review Letters* on June 23, 2010, and was also selected as an article for *Physics Synopsis*, entitled "Molecular Snapshots with Femtosecond x-rays," and for the journal cover picture (at right).

These results are pivotal for a new field of ultrafast probing of the structure and dynamics of molecules using femtosecond x-ray light sources. Understanding the interaction of molecules with intense ultra-short x-ray radiation is crucial to studies of structure and dynamics in chemistry, physics and biology. Knowledge of this interaction impacts biomolecular structure-function relationships, plasma production and inertial confinement fusion as well as possible means of producing warm dense matter at known atomic densities.



Michitoshi Soga

Emeritus receives Japanese citation

Michitoshi Soga was awarded a Foreign Minister's Commendation from the Ministry of Foreign Affairs of Japan in an August ceremony at the Japan Consulate in Detroit. The honor recognizes outstanding achievements in international fields that promote friendly relations between Japan and other countries.

Soga joined the WMU physics faculty in 1968 and retired in 1996. He began officially working with the international affairs office in 1986, building relationships and linkages between the University and his native Japan. His legacy of bridge-building was recognized in 2006 with the founding of the Soga Japan Center at WMU. He remains "on call" for the University to serve as a diplomat for Japanese institutions, alumni and students.

Staff News

Meet our newest staff member, Chris Hoffmann



Chris Hoffmann has joined the staff as manager of the physics laboratories. He graduated from Valparaiso University with a bachelor's degree in physics and mathematics in May of 2001. He then moved onto Northern Illinois University to complete the high-school-teacher certification and pursue graduate work in solid-state physics.

After completing the teacher certification, Hoffmann taught science classes at Wauconda High School for three years. He then returned to graduate school to complete his master's in solid state physics in May of 2010.

His research interests have moved from solid state physics to physics education research. In managing the labs, Hoffmann uses research-based methodology whenever possible. In the past, he has also been involved in science outreach by assisting with science summer camps, giving demo shows to community groups, and assisting with science competitions. When not in the lab, Chris can be found playing board games from his continually expanding board game collection, or reading.

New Post-docs

Post-doc Javier Garcia

Javier Garcia is a new postdoctoral research associate working in Manuel Bautista's astrophysics research group. Javier received his bachelor's degree in physics in 2003, and a master's degree in 2005 from the Venezuelan Institute for Scientific Research (IVIC). Javier concluded his doctoral studies in astrophysics in 2010 at The Catholic University of America, in Washington, D.C. His thesis was carried out at NASA Goddard Space Flight Center on modeling X-ray spectra of accretion disks around black holes. Javier's research at WMU will be in studying X-ray spectra of iron-peak elements and in modeling X-ray spectral features of resonant Raman scattering from interstellar molecules.



Post-doc Pavle Juranic

Pavle Juranic is a new postdoctoral research associate working in Nora Berrah's research group. Pavle earned his doctoral degree in physics at the University of Madison in May of 2007, working at the Synchrotron Radiation Center in Stoughton, WI to complete his thesis titled "Multiple Photoionization Studies of Atoms and Molecules Using Ion Time-of-Flight Spectrometry." After finishing his degree, he worked as a postdoc at the Free Electron Laser in Hamburg (FLASH), working in the photon diagnostic group to invent and design new ways to non-destructively measure the properties of a Free Electron Laser (FEL) beam, as well as conducting research with FEL light. He joined the group of Dr. Berrah to carry out research at the Advanced Light Source at Lawrence Berkeley National Laboratory.

Post-doc Timur Osipov

Timur Osipov has also joined the Berrah research group. Timur received his bachelor's degree in both physics and computer science at the University of Nevada, Reno in 1998, and his doctoral degree in atomic and molecular physics at Kansas State University in 2003. Upon completion of his doctoral work, Timur took a position as a postdoctoral fellow with the Atomic, Molecular, and Optical Physics Group of the Chemical Sciences Division of Lawrence Berkeley National Laboratory from 2004-2007 and then became a research scientist there from 2007-2009. He is an accomplished research scientist with over 10 years experience in experimental atomic and molecular research and in state-of-the-art system design for dynamic experiments in molecular physics. He joined the team of Dr. Berrah to build the advanced research facility at the Free Electron Laser at the SLAC National Accelerator Laboratory.



Alumni News

Modhi Alsheri (M.S. '99) has been teaching physics and mathematics since leaving WMU, first at the University of Toledo, then at Kalamazoo Central High School. Since 2004, Modhi has been an instructor at the Kalamazoo Area Mathematics and Science Center (KAMSC), a regional enrichment center serving both public and private school districts in Kalamazoo and St. Joseph counties. Students in KAMSC's on-site secondary mathematics and science program receive a four-year, accelerated curriculum including opportunities for mentorships, research, academic competitions and numerous electives.

When asked about teaching at KAMSC, Modhi's response was "I absolutely love it. It is a great environment. The students are highly motivated, disciplined and well behaved. I teach calculus-based physics, multivariate calculus, and calculus BC." And as a local Kalamazooan, Modhi often attends our weekly department colloquium series.

Fatih Hasoglu (Ph.D. '08) has accepted a position of assistant professor in the Department of Computer Engineering at Gazikent University. Gazikent University is in Gaziantep, one of the largest cities in Turkey, located in the southern part of the country. His duties will be to teach physics and computer classes for engineering students and to continue his research in theoretical atomic physics. Fatih will finish up his postdoctoral work at Georgia State University this academic year and begin his new position at Gazikent University in July of 2011.

Jennifer Thompson (B.S. '10) is currently employed at Fermi National Laboratory in Batavia, Illinois. As an undergraduate student at WMU, Jennifer had spent two summers working as a Department of Energy intern on the support systems for the Collider Detector at Fermilab (CDF). Upon graduation from WMU, she was hired as an Engineering Physicist specifically assigned to NOvA (NuMI

Off-Axis ν_e Appearance), which is a neutrino experiment consisting of two detectors (one at Fermi and one in Minnesota 500 miles away, both underground) that will search for the $\nu_\mu \rightarrow \nu_e$ transition. According to Jennifer, "In a nutshell my job is to perform tests and analyses to ensure the proper function and response of various parts of the detector. This includes the liquid scintillator, the PVC used to construct the detector, and the detector filling system.

Most of my work is actually chemical, despite the 'physicist' title, making me one of only two chemists here. My favorite part of the job is hands-on testing and being able to use both my chemistry and physics backgrounds. I've always been a 'get your hands dirty' kind of person, so doing the testing on the detector components has been a perfect fit for me. I get to do the messy work and run chemical and physical tests, and then I get to explain the results from both a chemical and physical view."

Ileana Dumitriu (Ph.D. '10) is presently a visiting assistant professor of physics at Gustavus Adolphus College in St. Peter, Minn. In Ileana's words, "The physics department at Gustavus offers a comprehensive major designed to prepare students for graduate study in physics, engineering or related fields. According to data from the National Science Foundation, in the 10 years from 1999-2008, 25 Gustavus alumni received their Ph.D.s in Physics. Among the liberal-arts colleges, Gustavus was third highest in the nation as the baccalaureate origin of physics Ph.D.s for this time period.

This fall semester I am teaching General Physics I, an introductory physics class, an upper level mechanics course, and a General Physics I lab section. Teaching at Gustavus is extremely rewarding. The students are very hardworking and strongly motivated. Colleagues in the department are very helpful. I think Gustavus Adolphus College is a wonderful place to start my career, and I know that my graduate studies at Western Michigan University opened up this opportunity for me."

Farhat is Alumni Achievement Award recipient

This year's Alumni Achievement Award from the Department of Physics and the College of Arts and Sciences was presented to Dr. Ahmad Farhat (Ph.D. '98). Farhat is a warranty business supervisor in global manufacturing quality for the Ford Motor Company.

As a graduate student at WMU, Farhat was a research assistant in Professor Nora Berrah's experimental atomic physics research group. His thesis project "Angle-Resolved Studies of Inner Shell Excitations for Argon, Krypton and Xenon Using Third Generation Synchrotron Sources" involved the use of the Advanced Light Source at Lawrence Berkeley National Laboratory and resulted in eight professional publications.

After finishing his degree, Farhat went to work for Ford Motor Company almost immediately, and quickly rose in the ranks from a technical expert in reliability and data analysis, to a process assurance auditor, to a reliability implementation engineer, to his present position. He also has taught physics at the University of Michigan, Dearborn, as an adjunct instructor.

During his visit to campus on Oct. 1, 2010, Farhat gave a special colloquium on "Reliability and Hazard Analysis Using Field Data." In this talk, he discussed Ford Motor Company's Analytical Warranty System and how he uses probabilistic models and statistical procedures to analyze a vast amount of warranty repair data in order to improve Ford's products and processes. He was presented with the 2010 Alumni Achievement Award for Physics later in the day by WMU President John M. Dunn.



From left: Dr. Nora Berrah, Dr. Ahmad Farhat, and WMU President John M. Dunn.

Two Named Gwen Frostic Doctoral Fellows

Frostic Doctoral Fellowships are given annually by WMU's Graduate College. They are made possible by an endowment from the estate of the late poet, artist and naturalist Gwen Frostic, a 1929 WMU alumna. The competitive fellowships range in amount from \$1,400 to \$4,000 and will assist doctoral students in all fields with dissertation expenses, including tuition and fees, materials and travel.

In 2010, two physics graduate students received the award. Ravin Kodikara, from Sri Lanka, received a \$4,000 fellowship. He is conducting research in the area of nuclear astrophysics. His dissertation is titled "Proton Capture Reactions and Network Calculations on ^{46}Ti , ^{64}Zn , ^{114}Sn and ^{116}Sn Relevant to the rp-Process." His research has allowed him to perform experiments both in the Van de Graaff accelerator facility at WMU and the National Superconducting Cyclotron Laboratory at Michigan State University. His dissertation chair is Dr. Michael Famiano. Kodikara earned his bachelor's degree from the University of Colombo in Sri Lanka in 2004 and his master's from WMU in 2009. He received two Department of Physics awards: the Haym Kruglak Graduate Outstanding Teaching Award for 2006-07 and the Jacob DeWitt Outstanding Teaching Award for 2008-09.

Buddhika Senarath-Dassanayake, also from Sri Lanka, received a \$4,000 fellowship. His dissertation "Electron Transmission Through Glass Capillaries" investigates the transmission of atomic particles through electrically insulating capillaries. This research, which is at the intersection of atomic physics and materials science, offers potential applications in science, medicine, and technology. His dissertation chair is Dr. John Tanis. He earned his bachelor's degree in 2004 from the University of Peradeniya in Sri Lanka, and he was the recipient of the Haym Kruglak Award for Outstanding Teaching in 2006-07 and 2007-08, the Jacob DeWitt Award for Outstanding Teaching in 2008-09, and the Leo R. Parpart Scholarship for Outstanding Research in 2009-10.



Buddhika Senarath-Dassanayake

Graduate Student Research Presentations

- Shahin Abdel Naby and Tamer El Kafrawy presented at the 41st Annual Meeting of the American Physical Society's Division of Atomic, Molecular, and Optical Physics, held in Houston, Texas, in May.
- Salem AlFaify presented at the 5th International Conference on Spectroscopic Ellipsometry, held in Albany, N.Y., in May.
- Salem AlFaify, Asma Ayyad, and Buddhika Dassanayake presented at the 21st International Conference on the Application of Accelerators in Research and Industry, held in Fort Worth, Texas, in August.
- Shahin Abdel Naby presented at the 2010 NASA Laboratory Astrophysics Workshop, held in Gatlinburg, Tenn., in October.
- Salem AlFaify and Manjula Nandasiri presented at the Annual Symposium of the Pacific Northwest Chapter of the American Vacuum Society, held in Richland, Wash., in September.
- Buddhika Dassanayake presented at the 18th International Workshop on Inelastic Ion-Surface Collisions, held in Gatlinburg, Tenn., in September.
- Janina Grineviciute presented at the American Physical Society April Meeting, held in Washington, D.C., in February.
- Manjula Nandasiri presented at the International Conference on Advanced Ceramic and Composites 2010 Meeting, held in Daytona Beach, Fla., in January.

This edition of the newsletter was compiled and edited by Tom Gorczyca. Please feel free to e-mail me with your comments or questions: thomas.gorczyca@wmich.edu

The Department of Physics Roster

Faculty

Manuel Bautista
Nora Berrah
Clement Burns
Sung Chung
Michael Famiano
Thomas Gorczyca
Dean Halderson
Charles Henderson
Emanuel Kamber
Asghar Kayani (Accelerator Director)
Kirk Korista
Arthur McGurn
Paul Pancella (Chair)
Lisa Paulius (Assistant Chair)
Alvin Rosenthal
David Schuster
Dinesh Shetty
John Tanis
Alan Wuosmaa

Graduate Students

Abdel Naby, Shahin (Egypt)
Adams, Betty (Michigan)
Al-Amar, Mohammad (Jordan)
Al-Faify, Salem (Saudi Arabia)
Alshrari, Amal (Saudi Arabia)
Ayyad, Asma (Israel)
Bandara, Amila, (Sri Lanka)
Barthelemy, Ramon, (Michigan)
Bedoor, Shadi (Jordan)
Bokari, Eiman (Saudi Arabia)
Chakraborti, Priyanka (India)
De Silva, Samantha (Sri Lanka)
Dissanayake, Amila (Sri Lanka)
Dumitriu, Ileana (Romania)
Dumitriu, Laurentiu (Romania)
Elhoussieny, Ehab (Egypt)
Elkafrawy, Tamer (Egypt)
Ganapathy, Subramanian (India)
Gao, Xuan (China)

Garratt, Elias (Michigan)
Grineviciute, Janina (Lithuania)
Hamam, Khalil (Jordan)
Keerthisinghe, Darshika (Sri Lanka)
Kodikara, Ravin (Sri Lanka)
Li, Chengyang (China)
Lighthall, Jonathan (Michigan)
Mamudi, William (Indonesia)
Marley, Scott (Michigan)
McCowen, Robert (Michigan)
Moore, Bryan (Michigan)
Nandasiri, Manjula (Sri Lanka)
Rai, Buddhi (Nepal)
Senarath Dassanayake, Buddhika (Sri Lanka)
Stefanick, Trevor (Michigan)
Taibu, Rex (Malawi)
Tecos, George (Michigan)
Towers, Sarah (Michigan)
Yang, Jianqing (China)

Emeriti

Eugene Bernstein
Gerald Hardie
Dean Kaul
Robert Poel
Robert Shamu
Michitoshi Soga

Staff

Kerry Cochran
Benjamin Gaudio
Chris Hoffmann
Allan Kern
Lori Krum
Rick Welch

Post-doctoral Research Associates

René Bilodeau
Li Fang
Vanessa Fivet
Javier Garcia
Pavle Juranic
Brendan Murphy
Timur Osipov

Robert Scherzer retires



Robert “Bob” Scherzer has been the Laboratory Coordinator for the Department of Physics since 1987. Bob came to Western with a background in electrical engineering and for twenty-three years he kept the equipment running, coordinated purchasing, managed the workforce of graduate teaching assistants, and contributed in many other ways to the educational mission of our department. He designed

an improved diffraction grating spectroscope and had an article about this work published in the *Physics Teacher* in 1995. Bob helped with the organization and design of the Physics Phest events held at the Kalamazoo Museum during the 1990s and he frequently volunteered to give physics demonstrations to middle and high school students. Teachers often warmly thanked him for these learning experiences. Bob was instrumental in the re-design of our calculus-based physics laboratories for the PhysTEC project in the early- and mid-2000s. He also taught several courses for the Department and received superior student evaluations.

Bob’s co-workers enjoyed his low-key but decisive style. He was nominated for Supervisor of the Year by his graduate student employees. We all wish him many years of happiness with his wife Judy, his children and grandchildren.



Alumni Information Update

Please use this form to update our mailing list, and/or to let us know what you have been doing, and what you would like to see in future newsletters. Fill out any portion of the form below and return to: Editor, Physics Department, 1903 W. Michigan Avenue, Kalamazoo, MI 49008-5252 or e-mail to: physics-department@wmich.edu.

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If alumni, degree and year: _____

Tell us more about yourself, and/or what you would like to see in future newsletters:

**Western Michigan University
Department of Physics
1903 West Michigan Ave.
Kalamazoo, MI 49008-5252
Office phone: (269) 387-4940
Office fax: (269) 387-4939**

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Department of Physics
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Kalamazoo, MI 49008-5252
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