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ALUMNI SPOTLIGHT

Mirjam Cvetic Receives Physics Distinguished Alumni Award

Mirjam Cvetic's impressive career was showcased as Drew Baden, Professor and Chair, presented her with the 2007 Physics Distinguished Alumni Award at the 19th Annual Spring Academic Festival, held on April 20th.

"She holds the prestigious Fay R. and Eugene L. Lagenberg chair in Physics at the University of Pennsylvania," began Baden. "She has organized several major international conferences and workshops and has authored and co-authored over 235 papers. She is on the Editorial Board of the Annual Review of Nuclear and Particle Science. She is the Editor of Physics Letters B and is the first woman to serve as an Editor for Physics letters."

Cvetic's distinguished career came after years of hard work. As a child in Slovenia, she dreamt of doing research and continued her education to achieve her goals. After receiving her BS and MS, in Physics, at the University of Ljubljana she went on to obtain her Ph.D., at the University of Maryland under Jogesh Pati. Even as a student, she flourished.

"Her work as a graduate student was truly outstanding," said Pati.

During her years at UMD, she received the Geeta Udagaonkar Memorial Award for the best advanced Ph.D. student. and the Ralph D. Myers Award for the best first-year graduate student at Maryland.

"I had wanted to study unification of forces and I met Professor Pati at the International Centre for

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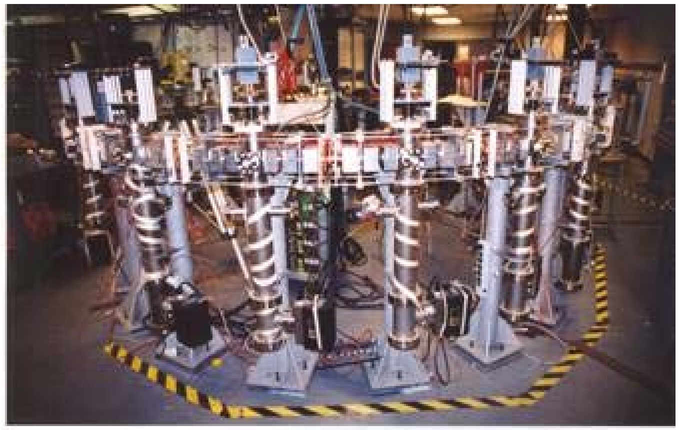
RESEARCH SPOTLIGHT

Extreme Beams
By: Patrick O'Shea

The landscape of physics over the past fifty years has been dominated by giant particle accelerators for use in high energy and nuclear physics, and more recently as light sources. The fundamental physics of beams as complex swarms of interacting charged particles has often been smothered by the engineering of the accelerators. Since the earliest days, accelerator technology has been driven by an ever escalating quest for higher energies, as exemplified by the famous Livingston plot that shows the energy of the most advanced accelerators increasing by an order-of-magnitude per decade. In recent years, however, the attention has shifted more toward quality and brightness in beams, and, therefore, to a focus on the physics of the particle dynamics in the beam. The Maryland Charged Particle Beam Group has long been a leader in the exploration of beam itself as a complex dynamical system. Our research program is characterized by a close collaboration between theory, simulation and experiment.

A Space Charge Odyssey



The University of Maryland Electron Ring

The performance of electron and ion accelerators depends critically on the quality of the beams they produce. This is true for many applications in high-energy and nuclear physics, materials science nanotechnology and biomedicine (e.g., spallation neutron sources and x-ray free-electron lasers). As we strive to produce evermore intense beams, nonlinear dynamics play an increasingly important role in the evolution of particle distributions and resultant beam quality. At very low intensity, the beam distribution is largely determined by the external accelerating and focusing forces and is independent of the details of the particle distribution. At very high intensity, however, the self-electromagnetic fields of the beam play a dominant role in beam evolution, and these self fields are very much dependent on the particle distribution. To study intense beam phenomena we have developed the University of Maryland Electron Ring (UMER). UMER is a compact model (4-m diameter) of a large recirculating accelerator. Even though it operates at only 10 kilovolts, UMER is capable of reaching beam intensities far beyond those of other accelerators. UMER is ideally suited for student projects. UMER's electron current of 100 milliamps is exceedingly large for such a low energy. When scaled to energies and parameters comparable to higher energy accelerators, the UMER beam possesses orders of magnitude more space charge than other existing machines. The beam in UMER is truly and extreme beam. UMER's beam intensity, and quality of its beam diagnostics and simulation support place our lab at the forefront of exploring space charge dynamics. In addition to the above mention applications, we are also exploring the use the of charged particle beams as a model system for the study of galactic dynamics.

Free-Electron Lasers

The exploration of technologies for free-electron light sources is an important aspect of our work Starting with the discovery controlled fire, humans have learned to use light to see, to communicate, and to initiate chemical reactions (e.g. cooking). We now use light in many forms such as x-ray, visible laser light, microwaves and radio waves. There are still some regions of the spectrum we here better and more powerful sources of light are needed, such as the x-ray, infrared and far-infrared (Terahertz). Better sources will be useful for application as diverse as improved biological imaging to naval defense, for example. Free-Electron Lasers (FELs) are a type of laser that is suited to producing high power light at wavelengths where other sources are weak. FELs use electron beams passing through a magnet array to produce light. As with other accelerator applications, the quality of the FEL light output depends critically on the quality of the electron beam used to drive the FEL. We are exploring new technologies to create, measure and control bright, high quality, electron beams. In recent years we have invented new types of electron sources, and new means to measure and control electron swarms. We perform experiments at UMER, and our Photocathode Lab as well as at Brookhaven National Lab in New York, Argonne National Lab near Chicago, and Thomas Jefferson National Accelerator Facility in Virginia.

Our labs are housed in the Institute for Research in Electronics and Applied Physics, and out research supported by the US Department of Energy, the Office of Naval Research and the Joint technology Office.

Patrick O'Shea is Professor and Chair of the Department of Electrical & Computer Engineering, with affiliate appointments in the Department of Physics, the Institute for Research in Electronics & Applied Physics, and in the Maryland Nano Center.

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US Air Force Active Duty Officer Graduates from UMD Physics

This past summer, Anthony Franz, packed his things in preparation for a big move. Unlike most graduate students, Franz had a job waiting for him after completion; teaching physics courses at the US Air Force Academy. The department teaches two core physics classes to all students. Other courses are offered for physics majors. Currently, Franz is an active duty officer in the Air Force with a rank of major. Last fall he was selected for Lieutenant Colonel and should advance to rank shortly. He will be working in the Lasers and Optics Research Center and will also provide service to the department in an administrative position yet to be determined.

“I enjoy my career,” said Franz. “It has given me the opportunity to travel and do many different things. ”

In 1992, Franz received his bachelor’s degree in Physics, with a track in space physics, from the US Air Force Academy. After graduation, he was commissioned by the US Air Force and has worked in nuclear treaty monitoring, electronic warfare modeling and simulation. Additionally, he has taught physics at the US Air Force Academy as an assistant professor. In 1997, he received his master’s degree from the Air Force Institute of Technology. His thesis efforts involved studying carrier dynamics of quantum well semiconductor lasers over the nanosecond time scales.

In 2004, Franz was selected to enter a PhD program and return to teach at the Academy under the condition that he finished in three years. In August of that year, he was admitted into the Physics program at the University of Maryland. He worked under Professor Raj Roy.

“I came to UMD because I wanted to study the nonlinear dynamics of lasers,” said Franz. “The nonlinear