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NEWS

Awards & Honors

Nick Hadley, Professor and Associate Chair of Undergraduate Studies, has been named a Fellow of the American Association for the Advancement of Science (AAAS). Election as a Fellow is an honor bestowed upon AAAS members by their peers.

This year 486 members have been awarded this honor by AAAS because of their scientifically or socially distinguished efforts to advance science or its applications. New Fellows will be presented with an official certificate and a gold and blue (representing science and engineering, respectively) rosette pin on Saturday, 14 February from 8 to 10 a.m. at the AAAS Fellows Forum during the 2009 AAAS Annual Meeting in Chicago. As part of the Section on Physics, Dr. Hadley was elected as an AAAS Fellow for his leadership role in the discovery of the top quark and his contributions to searches for phenomena beyond the standard model of particle physics.

Jordan Goodman, Professor, was selected, by the Center for Teaching Excellence, to give the 2009 CTE Faculty Excellence in Teaching Lecture. This honor was presented to Dr. Goodman for his excellent record in teaching -- including the Distinguished Scholar - Teacher Award, the Kirwan Prize, Regents Award, his participation in the Academy for Excellence in Teaching and Learning and for his role in the Marquee course project.

The Excellence in Teaching Lecture has been created to honor those who are leading the University toward exceptional teaching and to offer them the opportunity to share their reflections, ideas, findings and visions for teaching.

(More information will be provided, when available.)

In the News

Chris Monroe, Professor, has received a lot of publicity for teleportation, including an article from the NY Times. The article can be found here.

Results from a detector built and designed by Associate Professor **Eun-Suk Seo** and colleagues were featured in a *New York Times/International Herald Tribune* article on cosmic radiation.

Sankar Das Sarma and Victor Yakovenko , Professors, had an image from their paper "Anomalous Nernst effect from a chiral d-density-wave state in underdoped cupratesuperconductors" featured in the Kaleidoscope of PRB Images, American Physical Society, November 2008.

Jordan Goodman , Professor, was quoted in Discovery News, December 12, on the possible sources of two nearby regions with an unexpected excess of cosmic rays recently discovered by the Milagro Gamma Ray Observatory.

Bob Park, Research Professor, was mentioned in Times Online, January 31. The article discussed Dr. Park's new book *Superstition: Belief in the Age of Science* and his efforts to champion scientific thinking.

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RESEARCH SPOTLIGHT

A Tabletop Source of Strong Terahertz Radiation

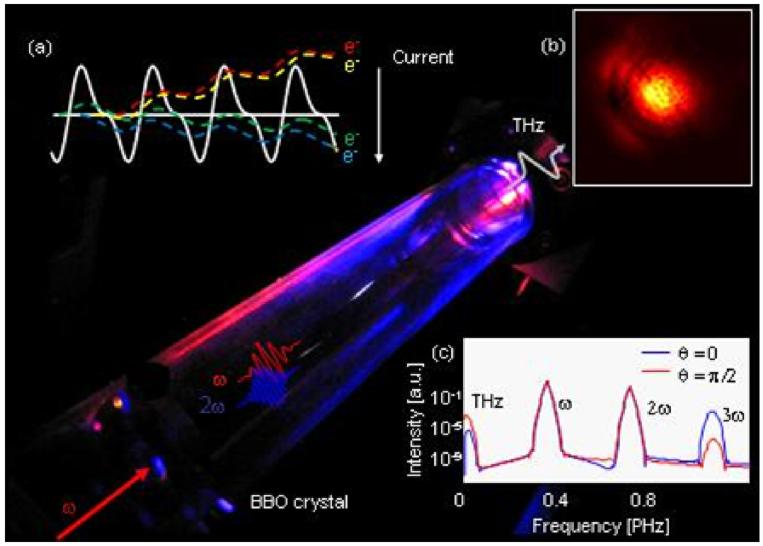
By: Ki-Yong Kim

Sandwiched between the traditional optical and microwave regimes, far infrared or terahertz (THz) frequency (1 THz = 1012 Hz) has recently drawn special attention due to its potential for molecular sensing, biomedical imaging and spectroscopy, security scanners, and plasma diagnostics. These applications provide strong motivation to advance the state of the art in THz source development. In particular, large-scale electron accelerators such as synchrotrons and free electron lasers are currently available to produce THz radiation energy in excess of several microjoule per pulse. However, due to its large cost to build those facilities and thereby limited access, there is a present and growing need to realize such strong THz generation at the tabletop scale. In this effort, we have recently demonstrated a high-energy (>5 microjoule), super broadband (>75 THz), tabletop THz source via ultrafast photoionization in gases [1].

In this scheme, an ultrafast pulsed laser's fundamental and second harmonic fields are mixed in a gas of atoms or molecules, causing them to ionize. Microscopically, the laser fields act to suppress the atom's or molecule's Coulomb potential barrier, and, via rapid tunneling ionization, bound electrons are freed. The electrons, once liberated, oscillate at the laser frequencies, and also drift away from their parent ions at velocities determined by the laser field amplitudes and the relative phase between the two laser fields. Depending on the relative phase, symmetry can be broken to produce a net directional electron current. As this current occurs on the timescale of photoionization, for sub-picosecond lasers, it can generate electromagnetic radiation at THz frequencies.

This THz generation mechanism turns out to be closely related to the mechanism used to explain high harmonic generation (HHG) in gases, as both processes originate from a common source, that is, a nonlinear electron current. The electrons re-colliding with the parent ions are responsible for HHG, whereas the electrons drifting away from the ions without experiencing re-scattering ions account for THz generation. As demonstrated experimentally [1], the generated THz and third-harmonic are strongly correlated in such a way that changing the relative phase can effectively switch the emission between THz and harmonics. This provides the basis to coherently control electromagnetic radiation in a broad spectral range, from THz to extreme ultraviolet.

Now, the next step is to scale up the laser power to produce even more powerful THz radiation. Using the Maryland's 30 terawatt (TW) laser, we anticipate producing an unprecedented millijoule level of THz radiation. Such radiation may allow us to observe extreme nonlinear THz phenomena in a university laboratory.



Intense terahertz pulse generation by mixing the fundamental (red) and second harmonic (blue) of ultrafast laser pulses in a gas. (a) Combined two-color laser field and the trajectories of electrons. (b) Focused far-field THz beam profile. (c) Computed radiation spectra of THz and third harmonic with two different relative phases q.

[1] K. Y. Kim *et al.*, Nature Photon. **2**, 605 (2008).

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ALUMNI SPOTLIGHT

NASA Astrophysicist and UMD Physics Alumnus, Peter Serlemitsos, Wins Joseph Weber Award

Instrumentation prize named for UMD physicist Weber, pioneer of gravitational wave research

GREENBELT, Md. - The American Astronomical Society recently announced prizes for distinction in astronomy and astrophysics for 2009 and an astrophysicist at NASA Goddard Space Flight Center, Greenbelt, Md. was the recipient of the Joseph Weber Award for Astronomical Instrumentation.

The Joseph Weber Award for 2009 was conferred on Dr. Peter Serlemitsos in late January in recognition of his innovative contributions to X-ray detector and telescope designs that have enabled decades of scientific advances in high energy astrophysics. The full citation for the Joseph Weber Award gives details of two landmark inventions by Serlemitsos, in detector design and thin-film X-ray optics and mentions many space missions that his advances have benefited.

"The award was given to me for my contributions to two technologies, both relating to the development of instruments for observations in the field of X-ray Astronomy," Serlemitsos said. "My involvement in these spanned almost my entire career (over 45 years) at Goddard."

The Joseph Weber Award for Astronomical Instrumentation is awarded by the American Astronomical Society to an individual for the design, invention or significant improvement of instrumentation leading to advances in astronomy. It is named after physicist Joseph Weber. The awards tend to be for a career of instrument development rather than a single specific device. The award originated in 2002, and Serlemitsos is its eighth recipient.

Serlemitsos said, "I feel very happy and honored to receive this award. The opportunity that NASA presented to me in 1962 when I joined Goddard was immense." He began his career at Goddard while still in graduate school and almost at the same time as the emergence of the new discipline.

Serlemitsos recevied his M.S. in 1964 and Ph.D. in 1965, both in Physics, from the Universriy of Maryalnd. After graduating, he has worked as an astrophysicist at the X-ray Astrophysics Laboratory at NASA Goddard, joining Elihu Boldt, the founder of the group. Peter spent most of his active career in X-ray astrophysics with emphasis in the development of space-borne instrumentation. He has pioneered two types of instruments which have since been used extensively in the field: the large area multi-wire gas proportional counter and lightweight conical foil X-ray mirrors.

In 1966, Serlemitsos began working on improving the first observational tool: the gas proportional counter. There were several balloon and rocket flights with improved detectors based on innovations that he introduced. An instrument aboard NASA's OSO-8 (Orbiting Solar Observatory) used 3 such detectors to conduct pioneering X-ray spectroscopy during its 3 year (1975-1978) lifetime. The next utilization of these detectors was in NASA's HEAO-1, whose primary aim was the cosmic X-ray background. The RXTE mission also used the largest and most sensitive such counters to study a variety of sources, both galactic and extragalactic.

The second tool that Serlemitsos worked on was an extremely lightweight X-ray mirror for medium resolution imaging and broad band spectroscopy. He began work on that in the late 1970s. Those mirrors were important because they could be used by relatively small satellites with limited budgets and other resources. The first use in space of these mirrors was onboard the U.S. Space Shuttle Columbia which flew NASA's mission Astro-1 in 1990, with two telescopes, one of which was the Broad Band X-ray Telescope (BBXRT) which contained two of our mirrors.

In 1993, NASA and Japan teamed in a space borne collaborative instrument, ASCA (Advanced Satellite for Cosmology and Astrophysics) used four mirrors. "It is safe to say that an ASCA type mission could not have been done without them," Serlemitsos said. Suzaku, a second U.S.-Japan collaborative instrument that uses them, is currently in operation orbiting Earth. In NASA's recent competition for small explorers (SMEX), his group was again successful in winning a Mission of Opportunity (MOO), which again involves Japan and is slated to conduct extraordinarily sensitive X-ray spectroscopy of cosmic sources. Its launch is slated for 2013.

His scientific interests include Fe K lines in the spectra of clusters of galaxies, spectra of Active Galactic Nucleus (AGN) and the search with ASCA for hard, AGN-like nuclear sources in nearby spiral galaxies. Serlemitsos resides in Bethesda, Md. and originally hails from Greece.

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