



the

# Photon

online

FEBRUARY 2011

## Black Holes Hold their Breath...and Dodge the Bullet

By Enrico Barausse

According to a recent hypothesis, black holes could be destroyed by shooting a carefully aimed bullet at them. But now researchers have shown that such a process does not occur: instead, black holes seem to "shrink" in order to dodge the bullet.

Over the past decades, astronomers gathered strong evidence that black holes are ubiquitous objects in our universe, governing a plethora of astrophysical phenomena on stellar and galactic scales. More recently, advances in theoretical physics have offered the remarkable possibility that black holes may also be relevant on microscopic length scales or offer extraordinary descriptions of certain aspects of heavy-ion collisions and other high-energy experiments. As a consequence, black holes can be said to be the fundamental building blocks of our universe.

One year ago, Ted Jacobson and Thomas Sotiriou showed that, in theory, black holes could be destroyed giving rise to a naked singularity by shooting a highly energetic, grazing particle at them. If this process were possible, the Cosmic Censorship Conjecture would also be violated. This conjecture was put forward by Penrose as a mechanism to save classical General Relativity from the breakdown of predictability. It asserts that every singularity is cloaked behind an event horizon, from which no information can escape. Jacobson and Sotiriou's process, if possible in practice, would destroy the black hole's horizon, leaving a singularity exposed and spelling the end of predictability in classical General Relativity.

Now, Enrico Barausse (University of Maryland), Vitor Cardoso (IST, Portugal) and Gaurav Khanna (UMass Dartmouth) have shown that black holes can save the day, by dodging the highly energetic particle. Indeed, black holes seem to "hold their breath" and shrink very

slightly, so that the bullet grazes by but does not hit them. This result is a consequence of a mechanism, known as self-force, which takes into account the small perturbation produced by the flying particle on the black hole's gravitational field. In other words, black holes can sense the possible danger!



Illustration by A.S

### INSIDE

News	2
UMD Physicists Chosen as APS and AAAS Fellows	2
February Colloquia Schedule	3
A Letter from PALS	3
In Memoriam	4

# NEWS

**Dan Lathrop** was mentioned in a *Physics Today* article, titled “Exploring the Extremes of Turbulence,” highlighting the recent Paoletti and Lathrop *PRL*. The *Physics Today* article is at, <http://blogs.physicstoday.org/update/2010/12/exploring-the-extremes-of-turb.html> and the *PRL* is located at, <http://prl.aps.org/abstract/PRL/v106/i2/e024502>

**Jim Gates** participated in an interview for *EurekaAlert's* science news for kids portal. A video and article are at <http://www.eurekaalert.org/kidsnews/interviews.php?i=6>

**UMD's Physics Education Research Group (PERG)** was cited in the article “Changing the Culture of Science Education at Research Universities”, by professors at the Howard Hughes Medical Institute. PERG is one of few groups integrating basic education research with efforts to improve undergraduate science education. The full article is at, <http://www.sciencemag.org/content/331/6014/152.full>

**Greg Sullivan**, who was recently appointed Spokesperson of IceCube, was mentioned in a *National Geographic* article titled “South Pole Science: Tracking Neutrinos.” The article and a short video can be viewed at, <http://blogs.nationalgeographic.com/blogs/news/breakingorbit/2011/01/south-pole-science-tracking-ne.html>

## UMD Physicists Among New AAAS Fellows

**Richard Greene** and **Hassan Jawahery** have been named Fellows of the American Association for the Advancement of Science (AAAS). Election as a Fellow is an honor bestowed upon AAAS member by their peers.

Professor Greene was honored for his distinguished contributions to the field of experimental condensed matter physics, particularly for discovery of superconductivity and other novel physics in organic and copper oxide materials.

Professor Jawahery was honored for his contributions to the understanding of the physics of the bottom quark and of the differences between matter and antimatter.

## UMD Physicists Chosen as 2010 APS Fellows

The American Physical Society (APS) has awarded the distinction of Fellow to four members of the University of Maryland physics faculty:

**Paulo Bedaque**, for pioneering contributions to several distinct areas of theoretical nuclear physics, including effective field theories in few-body physics, the phase structure of dense quark matter, and nuclear forces from lattice QCD.

**Michael Fuhrer**, for experimental studies of the electronic transport properties of carbon nanotubes and graphene.

**Eun-Suk Seo**, for leading the development and utilization of particle detectors for balloon and space-based experiments to understand cosmic ray origin, acceleration and propagation, especially as Principal Investigator of the Cosmic Ray Energetics And Mass balloon-borne experiment over Antarctica.

**Greg Sullivan**, for contributions to the field of experimental elementary particle physics including contributions to the discovery of the top-quark at the Fermilab Tevatron and new properties of neutrinos using Super Kamiokande-I, and for the development of experimental techniques in neutrino detection with the Super Kamiokande-I and IceCube detectors.

In addition, **Ichiro Takeuchi**, an engineering professor who is also an affiliate of the Center for Nanophysics & Advanced Materials, was elected for pioneering contributions to the creation of novel classes of materials using combinatorial synthesis and probing their properties using novel probes.



Greene



Jawahery

New fellows will be presented with an official certificate and rosette on Saturday, February 19, during the AAAS Fellow Forum in Washington, DC.

# EVENTS

## Recent Events

In January, **Jim Gates** spent a week in Chile to give various talks including Graphs, Codes and SUSY Representations at the Third South Pacific Coast Gravity Meeting. He also participated in the Symposium on Innovation and Development and met with Dr. Aguilera Radic at CONVICYT, the Chilean equivalent to the U.S. NSF.

**Carter Hall** gave the first Faculty Research Spotlight presentation, for physics staff, on December 15. His talk was titled, "The Search for Dark Matter Underneath the Black Hills of South Dakota."

## Up Next

February 1 – *PandaX: A Dark Matter Experiment in Sichuan, China*

Xiangdong Ji, University of Maryland

February 8 – *Jefferson Lab Science: Today and Tomorrow*

Robert McKeown, Jefferson Lab

February 15 – *Working with Fermi at Chicago and Los Alamos*

Richard Garwin, IBM Fellow Emeritus

February 22 – *The Dangers of Drilling Deep*

James Glanz, *The New York Times*

[www.umdphysics.umd.edu/events/physicscolloquia.html](http://www.umdphysics.umd.edu/events/physicscolloquia.html)

## 2010 Holiday Tea



To view more images from the Physics Holiday Tea, visit <http://www.umdphysics.umd.edu/holidaytea2010.html>

## A Letter from PALS

The Physics PALS thanks all who contributed and purchased items from our recent annual Bake & Yard Sale. A bit over \$1,000 was raised for the PALS Scholarship for Physics Undergraduate Students!

(Contributions are still being handed in, so we don't have a final count yet.) Special thanks go to Xiao-Ning Zhou, Paulina Alejandro, Zeng Jane Wang, Melissa Britton, Anh La, Bonnie Seal, Pauline Rirksopa and Margaret Lukomska for cooking and keeping the Chinese appetizers available, which are our biggest sales.

Undergraduate students sometimes miss out on great learning opportunities, e.g., internship overseas because airfare is too costly, or they face having to drop out of school by their last semester because the costs have far passed what they could possibly afford. We are proud to be able to turn a tough situation around for some of our Physics undergrads. We are grateful to Tom Gleason of the Dept's Undergraduate Office for managing the PALS Scholarship for Physics Undergraduate Students for us.

In addition to raising funds for the PALS Scholarship, the unsold non-perishable foods, drinks, and toiletries were given to the Physics Graduate Student representatives

of the GSG Assembly (Michelle Groce, Tomek Kott, and Paul Syers) for their Thanksgiving Drive for a Family Support Center. Other unsold items were taken to the Salvation Army for us by Stephanie Noel.

It is your generosity to our 'Big Event of the Year' that makes this all so successful, and we truly appreciate it!  
- PALS



## In Memoriam

**Ernie Grossenbacher** passed away on October 30, 2010. Ernie worked in the Physics Machine Shop for many years, retired around 20 years ago, but came back to help out as needed. Ernie is survived by his son Howie, daughter Claire and long-time partner Rita Hobauer.

**Justin DeSha-Overcash**, a Physics and Astronomy major, passed away on January 11, 2011. He was the beloved son of Randy Allen Overcash and Karen Leigh DeSha.

**Charles Pacholkiw, Jr**, a Physics major, passed away on November 6, 2010. He was the beloved son of Charles and Janet Pacholkiw; loving brother of Laura Kristen Pacholkiw. He is also survived by his grandmother of Anna Elizabeth Pacholkiw and a large loving family.

## CONTACT US:



*The Photon* is an online newsletter from the University of Maryland Department of Physics. For questions, comments or to submit information, please contact Carole Cuaresma, [ccuaresm@umd.edu](mailto:ccuaresm@umd.edu).

