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NEWS

Awards & Honors

Edward "Joe" Redish, Professor, has been nominated for the National Society of Collegiate Scholars (NSCS) UMD Chapter's Distinguished Membership in the Society. The honorary membership is a formal way to recognize and appreciate Dr. Redish's outstanding contributions to the classroom, campus and community.

Professor **Ted Jacobson's** proposal, "Growth of the Vacuum in Cosmology," was awarded funding from the Foundational Questions Institute (FQXi).

Bill Dorland, Associate Professor, was appointed Director of University Honors, beginning January 1, 2009. The University Honors Program is a living-learning program for students with exceptional academic talents.

Nick Hadley, Professor and Associate Chair of Physics, was elected as the new chair of the LHC Collaboration Board. This makes Dr. Hadley the highest elected physicists in USCMS. New regarding his recent appointment appeared in Fermilab Today. To view the article, visit:
http://www.fnal.gov/pub/today/

Professor **Sankar Das Sarma's** article, entitled "Dielectric function, screening, and plasmons in two-dimensional graphene," was identified by *Essential Science Indicators* as the highest cited paper in its field.

Robotics@Maryland, the University of Maryland's Student Team, won the International Underwater Robotics Competition held in San Diego, CA. The team is made up of 75 students across campus including three physics majors.

In the News

James Drake, Professor, was quoted in the July 24th issue of *Nature*. The article on NASA satellites can be viewed at: www.nature.com

Douglas Hamilton, Professor, published an article in the July 03 issue of *Nature*. His paper reported that the intensities of low-energy ions, measured by Voyager 2, produce non-thermal partial ion pressures in the heliosheath that are comparable to (or exceed) both the thermal plasma pressures and the scalar magnetic field pressures. The article can be viewed at: www.nature.com

Daniel Lathrop, Professor and Director, was interviewed by *Black and White: Interviews Essays and Reports* on his research regarding the Earth's magnetic field. He was also featured in the Diamondback on the same subject. The *Interviews Essays and Reports* article can be viewed at:
blackandwhiteprogram.com/interview/dr-dan-lathrop-the-study-of-the-earths-magnetic-field
The Diamondback feature can be viewed at:
media.www.diamondbackonline.com/media/storage/paper873/news/2008/07/03/News/Spinning

Robert Park, Professor Emeritus, was quoted in CNN-Money on July 2nd. In the article, Dr. Park commented on BackLight Power's claim that they were able to convert water into a boundless source of cheap energy. The article can viewed at: money.cnn.com/index.html

Ellie Lockner, Graduate Student, is highlighted on the recently-launched Department of Energy's Office of High Energy Physics web site. The Research Areas section of the site features a series of profiles about scientists in the field including Lockner, who is currently working on the CMS experiment at CERN. The profile can be viewed at:
www.science.doe.gov/hep/research/proton.shtml

Steve Rolston, Professor and Associate Chair, wrote an article that appeared in the first issue of *Physical Review's* web publication. The article entitled "Ultracold Neutral Plasmas" can be viewed at: physics.aps.org/articles/v1/2

Yanhua Shih, Alumnus, has been receiving a lot of good press regarding his initiation of ghost-imaging research. Dr. Shih is a former PhD student of Professor Carroll Alley. One article by the Air Force Office of Scientific Research Public Affairs can be viewed at:
www.af.mil/news/story.asp?id=123100828

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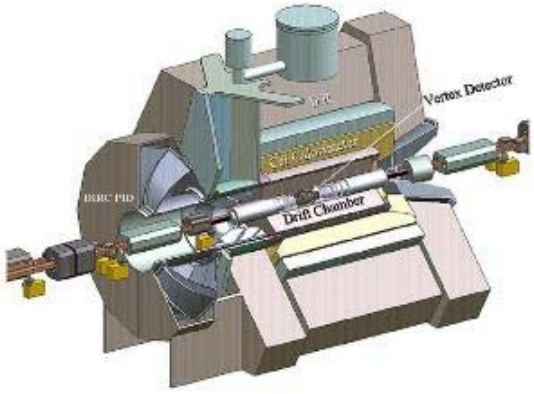
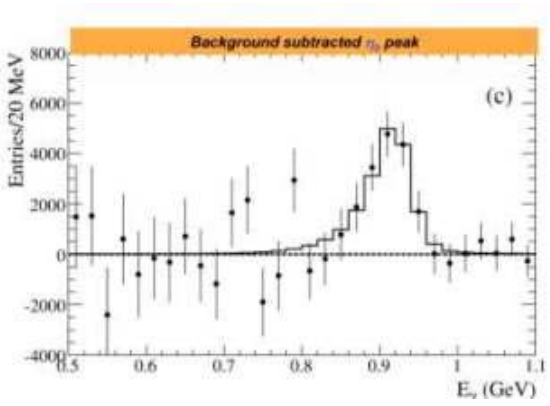
RESEARCH SPOTLIGHT

First Measurement of ηb (ground state of b/anti-b quark pair)

Collaborators on the BaBar experiment, at the U.S. Department of Energy (DOE)supported Stanford Linear Accelerator Center (SLAC)have detected and measured the lowest energy bound state of the "bottomonium" family: ηb. This is the first observation of the ground state of a b and anti-b quark pair.

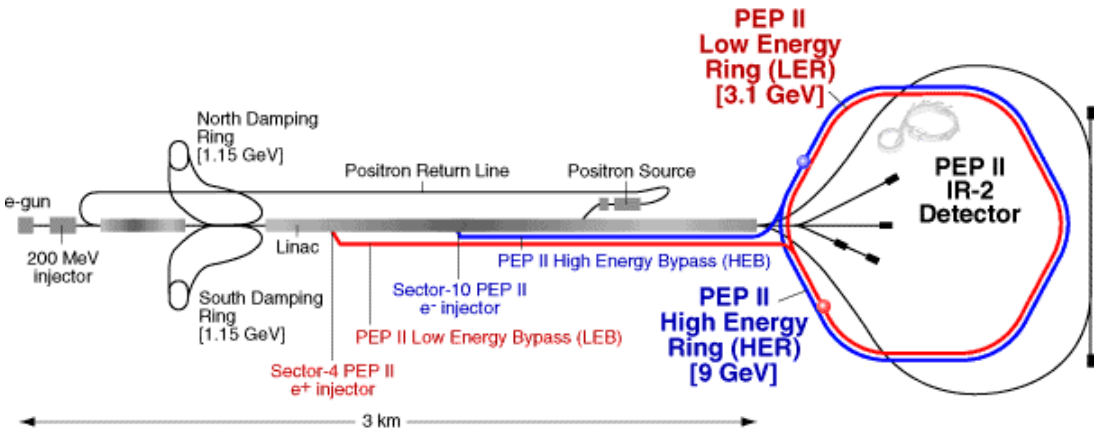


The significance of this observation has to do with the fact that in the absence of spin-spin interactions the ηb would be degenerate with the lowest s-wave state with the quark spins aligned: the b/anti-b bound state called the "upsilon 1S", denoted Υ(1S). The spin-spin interaction generates a very small hyperfine splitting between the Υ(1S) and the ηb. For this data, the PEP-II center-of-mass energy was tuned to the 3rd radially excited state Υ(3S) resonance, and the analysis consisted of looking for the photon transistions from the Υ(3S) to the ηb, a magnetic dipole transition, and thus just as in atomic physics, highly suppressed. (In fact, our very own Joe Sucher wrote a wonderful article on M1 transitions in atomic and particle physics in 1978 right after the charmonium J/ψ was discovered, Rep. Prog. Phys. **41** 1781-1838, 1978, available here).



Given the suppressed transition, this state has been anticipated but has gone unobserved for quite a long time. Failure to observe it has led many particle physicists to speculate that it may be interfering with a light CP-odd Higgs state, which masks its signature. The ηb observation at BaBar provides a key element of our understanding of the physics of the b/anti-b system, and allows probing the role of spin in the strong interactions. Lattice QCD predictions for these hyperfine splittings will now be able to be tested and calibrated. This is only the first step – to be able to dig so deep in the role of spin in quark anti-quark interactions. The BaBar group expects to be able to map out a number of states and transitions that are all sensitive to hyperfine splitting effects. This will open up an entirely new area in the field of precision physics of the strong interaction, since the higher mass of the b quarks (relative to the up, down, charm, and strange quarks) allows strong interaction calculations that are more reliable than in the lighter quark sectors, and testing the lattice QCD calculations in these systems.

"This is a tremendous achievement for both the PEP-II accelerator and the BaBar Collaboration", said SLAC Director Persis Drell. SLAC is the home of the PEP-II accelerator complex, which consists of two independent storage rings bringing a 9-GeV electron beam in collision with a 3.1-GeV positron beam at the center of the BaBar detector. The asymmetric energies result in a collision center-of-mass that is moving in the laboratory frame of BaBar, and this motion is crucial for study of CP violation in bottom meson decays.



The BaBar collaboration consists of 459 physicists and 74 institutions in 10 countries, is supported by the Department of Energy as well as by international funding, and is led by UMD Professor Hassan Jawahery, their current "Spokesperson" since 2006. Professor Jawahery has been involved with BaBar since it's inception in 1993, and served as physics coordinator in 2001-2002 during initial running that began in 2000 and subsequent measurements of CP violation in the bottom-quark sector. "This very significant observation was made possible by the tremendous luminosity of the PEP-II accelerator and the great precision of the BaBar detector, which was extremely well calibrated over the BaBar experiment's 8-plus years of operation", said Professor Jawahery. "These results were highly sought after for over 30 years and will have an important impact on our understanding of the strong interactions. It's amazing, we are doing atomic physics at 10 GeV, and that's the beauty of this."

In the News

BaBar's discovery of eta-b-meson has been largely covered in the past two months. Most recently, by Physics Today at: ptonline.aip.org/getpdf/servlet/GetPDFServlet?filetype=pdf&id=PHTOAD000061000009000014000001&idtype=cvips and the CERN Courier at: cerncourier.com/cws/article/cern/35433

Hassan Jawahery is the Gus T. Zorn Professor and current BaBar Spokesperson. For questions or comments, he can be reached at jawahery@umd.edu

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ALUMNI SPOTLIGHT

Q&A with Alumnus David McGady

David McGady graduated from UMD this past spring. Since May, he has worked with Professor Tom Cohen to better understand some aspects of the Schwinger mechanism. He is an NSF Graduate Fellow. This fellowship will help support his graduate studies at Princeton University for three years. Below, David answered a few questions regarding his experience at Maryland.

What led you to the University of Maryland?

I had wanted to get an undergraduate degree in Physics from the University of Maryland since the summer between 7th and 8th grade: when I realized that I wanted to seriously study physics. I knew that Maryland generally was a very good school across a broad range of academic disciplines. Further, I was specifically aware that the Physics Department was very well regarded---having consistently ranked 13th or 14th in the nation over the decade or more.

How would you describe your experience here?

My experiences here have been extremely positive, and I am confident that in my time here I have had the opportunity and support to build strong backgrounds in both research and in undergraduate physics.

In particular, since the second day of my freshman orientation program I have been involved in undergraduate research. In my time as an undergraduate in the Physics Department, I had the privilege of working in three different research groups, where I worked on both experimental and theoretical problems in High Energy Physics (Supersymmetry), Condensed Matter (Superconductivity) and Nuclear/Particle Physics (Chiral Symmetry in QCD, and Strong-Field QED).

Where are you currently working?

I currently work with Dr. Cohen in the TQHN (Theoretical Quarks, Hadrons and Nuclei) group in the department. I am working on two theoretical papers concerning the "Schwinger Mechanism" ---which refers to particle-antiparticle pair creation in the presence of a strong electric field.

What are you required to do?

My position entails the following day-to-day activities:

1. Read recent articles in the field to understand new developments and possibly identify fruitful new lines of research;
2. Perform literature searches to find out whether or not a particular line of research has already been pursued, and if so, to what extent the associated questions have been answered;
3. Do calculations---both proof-of-principle order-of-magnitude estimates, and more precision calculations---to study specific aspects of previously unanswered, or otherwise unaddressed theoretical questions; and finally
4. Contributing to the writing and/or editing of papers which summarize the results of these new calculations/findings.

Do you enjoy it?

Doing theoretical physics has been my dream job since I was 13-years old: I enjoy it very much, and am very lucky to have had the chance to work on current problems in theoretical physics as an undergraduate at Maryland. Further, I am looking forward to my time as a Physics Graduate Student at Princeton.

I would like to stress that Maryland's Physics Department is in the vast minority: most schools in the nation do not offer many (or even any) chances for undergraduates to work on real, active, problems in theoretical physics.

What advice would you give current students?

This is a fantastic department with vast resources. If you are willing to take advantage of them, then you can learn a lot, and do rather well for yourself. Classes are very important. Pay attention, work with other students if you're stuck (physics is a collaborative effort), and knock on professor's doors to ask for help if you are lost. The professors' asked to teach the major's courses are, as a rule (which are, however, made to be broken), very good and very patient.

However, classes are half of it: they are the background knowledge needed to look into the unknown aspects of nature, of physics. This is a huge department with many opportunities for willing and hardworking students to do research in almost any branch of physics---from theoretical high energy physics to experimental condensed matter and AMO physics. I would strongly urge students to take advantage of them. (Ask Tom Gleason [Physics Undergraduate Advisor] if you need guidance here.)

Do you remember any problems that you faced while here?

Everything has its faults, but the problems that I can remember having to deal with were typically beyond the departmental level. Signing up for graduate physics classes was difficult as an undergraduate---which is an almost most, for theoretically inclined and curious students---and signing up for more than 16 credits, again, an almost must for motivated students. Especially for the multiple- major and/or degree students.