

## Longtime Physics Professor to be named Professor Emeritus at May Commencement Ceremony

### Dr. Robert Brown



**Dr. Robert Brown** arrived at ERAU in the fall of 1971. At that time, there were very few open teaching positions anywhere. **Brown** was a solid state physicist using tools like a two crystal spectrometer. In the early days, ERAU was not at all involved in research. He told his wife that they would only be here for a short time, and then they would move to a "real university."

Embry-Riddle Aeronautical Institute (as it then was known) offered only four Physics courses: PS 103, PS 201, PS 202, and Modern Physics. There were about 300 students enrolled. The library was in a trailer over near the airport, and the administration buildings were located in old army buildings not far away.

During Christmas vacation 1971, **Brown** was asked to coach baseball and he did so for the next five years. During that time, Riddle played such teams of Harvard (the previous year's national champs), MIT, U. of Delaware, Florida Southern, and FIT.

**Brown** has been involved in two accreditations with SACS and helped put the first few advisory boards for EP. Brown served as the Advisor for Sigma Chi and as the faculty rep for the intercollegiate sports for ERAU. He was able to present a number of papers on various teaching methods and he was instrumental in getting the ICE (Instrumental Curriculum for Engineering) program on campus.

Over the years, **Brown** served on almost all committees on campus, and he chaired many of them. The short time he thought he was going to be here has lasted for 35 years. The university did grow into a "real university". He currently resides with his lovely wife of 40 years in Ormond Beach. He has one son who graduated in Microbiology at Gainesville and is currently a male nurse in Ormond Beach.

At the end of the Spring 2007 semester he will retire and at the May 7 commencement ceremony he will be honored as a Professor Emeritus.

*Bob Brown has served this University for almost 35 years in all academic roles (as a dedicated and caring teacher, as an effective Dean of all academic programs, as a champion of growth of academic programs in the Physical Sciences, as a leader in promoting the establishment of the Engineering Physics program, as a volunteer coach for the University's baseball team, etc.) He is fully deserving of the Emeritus Professor status and I hope he will continue to play an active role in the development of our programs."*

Comments from Abas Sivjee to the Faculty Senate in support of Dr. Robert Brown's nomination a Professor Emeritus.

# NEW FACULTY

## Dr. Karariina Nykyri



**Dr. Karariina Nykyri** comes to Embry-Riddle from Imperial College, London, where she worked as a postdoctoral researcher in the space and atmospheric physics group for little over 4 years. Her research involved analyzing data from the four Cluster spacecraft that fly in a tetrahedral formation in Earth orbit, and also generating numerical simulations of the space plasma. With the help of these 4 Cluster spacecraft she was able to show observationally that magnetic reconnection occurs within Kelvin-Helmholtz waves, some 40 000 kilometers across. **Nykyri** received a M.S. in Computational Physics and Ph.D in Physics in 2002 from the University of Alaska at Fairbanks, and a B.S. and M.S. in Theoretical Physics in 1998 from the University of Helsinki, Finland. For her Ph.D she developed numerical MHD and Hall-MHD simulations to study the Kelvin-Helmholtz instability and its role in plasma transport. In addition to Kelvin-Helmholtz waves and magnetic reconnection, **Nykyri's** research interests include small-scale plasma waves and turbulence in the funnel-like magnetospheric cusp regions about 60 000 km from the surface of the Earth. She is currently studying the formation mechanisms for this turbulence and structure in the cusps. Her research is published in *Annales Geophysicae*, *Geophysical Research Letters* and *American Geophysical Union Monograph-series*.



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<http://www.erau.edu/omni/db/academicorgs/dbpsd/currentnews.html>

## 2007 Elston Memorial Lecture set for April 7



Lee Smolin of the Perimeter Institute will give the sixth Elston Memorial Lecture on Gravitation on April 7, 2007 at 7 pm in the IC auditorium. He will also deliver a colloquium at 4 pm in IC 104. Smolin is world famous for his contributions to quantum gravity research, and has published three popular books on physics.

Lee Smolin is a theoretical physicist whose work is concerned with the problem of completing the revolution in physics started early in the 20th Century by the discoveries of special and general relativity and quantum mechanics. His main contributions have concerned the problem of quantum gravity, which is the problem of unifying quantum theory with gravity and space time. He has worked on several different approaches including loop quantum gravity, string theory, dynamical triangulations and causal set theory, although he is perhaps best known for his work on loop quantum gravity. He has also worked on problems in cosmology, elementary particle physics, the foundations of quantum theory and theoretical biology, and he has a strong interest also in philosophy.

# EP Senior Design Teams

## S.T.O.R.M.S.

Structureless Telescope Observing and Resolving Multistar Systems)



Team Members: (L-R) Benjamin Schreib, Jason Poe, Kristin Showalter, Jonathan Ruel, Jessica Wolfrum, and Devon Goforth.

The goal of project STORMS is to set up a cluster system of satellites to gather new data on multiple star systems. A structureless telescope allows flexibility in the positioning and distances between the satellites in the cluster. Coulomb forces will be used to control the relative motion of the satellites. The large number of satellites used in the cluster will allow for a large range of baseband interferometry measurements. The swarm of satellites composing the structureless telescope will be located at the Earth-Moon L2 point in a halo orbit to collect the necessary data. This data will then be sent to the existing Lunar Outpost to perform digital interferometry in support of our scientific exploration mission.


# **P.I.R.A.T.E.**

**(Picosatellite Integrating Revolutionary Attitude and Thermoelectric Experiments)**



Team Members: (L-R) James V. Crosby, Bahman Gorjidooz, Justin K. Thompson, and Adam J. Fifth.

The PIRATE satellite is being designed and built in accordance with the CubeSat concept: Mass is restricted to 1 kg and size is restricted to a cube of 0.1 m on all sides. The PIRATE satellite group builds on the work of the original TEMP design, the pronounced winners of the 2005-2006 FUNSAT Competition. The primary objective for this mission is to design and test a thermoelectric power generation (TEG) system which will utilize heat gradients created by the sun within the spacecraft while on orbit. Further objectives include the design and testing of a necessary Active Attitude Determination and Control Subsystem (ADCS) which will keep PIRATE properly oriented with respect to the sun while on orbit, and the utilization of an on-board commercial-off-the-shelf global positioning system (GPS) to determine orbital parameters and infer about the atmospheric characteristics of the 650km to 700km range.



**Hear ye! Hear ye!**  
**All students majoring in Engineering  
Physics, Space Physics and graduate  
students in Space Sciences are invited to  
the Town Meeting to be held on Tuesday,  
April 10 at 5:30 pm in room W-308.**  
**Free Pizza and Heavy Discussion about our programs will be in order.**



## **AASPIRIN**

### **Asteroid Assay Satellite for Path Identification, Research and Investigation of the Near Earth Object Apophis**

Members: (L-R) Christopher Perez, Molly Mae Potter, Aaron Stromski, Dorian Muench, Scott Haeffelin, and Team Leader Krystal Puga.

Near Earth Objects are subjects of great interest in the scientific community as they provide insight into the history of the universe. They also pose a threat to the safety of our planet. As a scientific and technical society, we are obligated to expand our knowledge and formulate strategies for dealing with these objects.

The asteroid Apophis, approximately 300 m across, was discovered in 2004. Initial observations indicated that it may collide with Earth in 2029 but subsequent refinements showed that it will narrowly miss Earth at this time and instead experience an orbit-changing slingshot, possibly placing it on a collision course with Earth in the year 2036. Unfortunately, the orbit and the physical properties of this asteroid are vague. Current data suggest that it has a diameter of 320 m and is a chondritic meteorite. Current orbit observations have a large margin of error because of the asteroid's small size. Further investigation is required to determine to what the extent this asteroid threatens Earth.

The primary purpose of our research is to design a satellite, named AASPIRIN, which will rendezvous with Apophis and precisely determine its orbit. This knowledge of Apophis' orbit would make possible more accurate estimations of any collision threat posed to Earth.

The secondary mission is to collect scientific data concerning the physical properties of Apophis. Data on Apophis' properties such as absolute magnitude, tri-axial body dimensions, gravitational mass, bulk density, rotational period, and spectral type, will be required if a deflection design is necessary. Furthermore, the scientific data will add to our knowledge pertaining to Near Earth Objects. Finally, this venture and the methods used for tagging, tracking, and collecting data can be used as an initiation point and guide for future projects.

As designed AASPIRIN will have a launch window in 2012, at this time Apophis makes its first close flyby to earth. A final orbit would place AASPIRIN trailing behind Apophis, where all remote sensing will be conducted. Abiding by the AIAA requirements data necessary for facilitating a deflection mission is required by 2017. By this time we must be able to determine within a 10 percent margin whether Apophis will enter an area in space labeled the Keyhole, where it might encounter the orbit change. Upon completion of the first two requirements a final maneuver will be designed to land on the asteroid and to further investigate its composition.



## NEAD

### Near Earth Asteroid Deflection

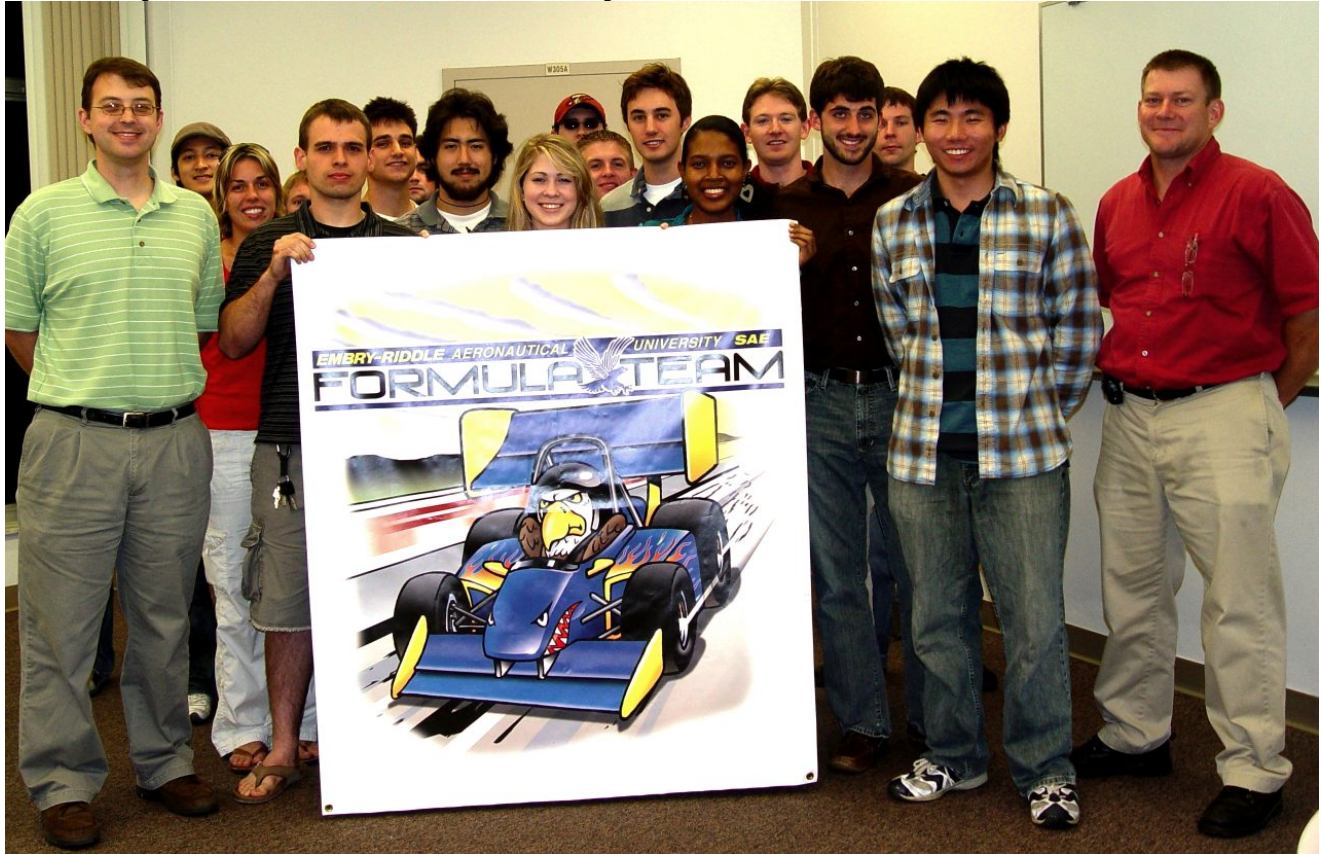
Team Members: Jeff Swaim, Marc Lucas, Shane Clark, Team Leader Eric Spitler, and Dan Snyder

There are over 10,000 known near-Earth asteroids, with countless others as yet undiscovered. In 2004, astronomers discovered an asteroid whose orbit around the sun intersects that of the Earth. After tracking its movement, they discovered that in 2029 the asteroid will come so close to Earth that it will actually pass within the orbit of Earth's communication satellites. So close, in fact, that its orbit will change dramatically and may even put it on a collision course for 2036. The saving grace is that the asteroid will only have a chance of impacting Earth if it passes through a 600 meter wide "keyhole" as it passes in 2029; if it is outside this area, the risk of impact is nearly gone. This asteroid is named "Apophis" after the Egyptian god of war.

Project NEAD (Near Earth Asteroid Deflection) is a mission designed to prevent the Apophis impact in two phases: Phase 1 – deflect Apophis enough to ensure it does not pass near the keyhole, Phase 2 – perform a long orbit-altering mission to prevent any future impacts.

Phase 1 will be accomplished by using ion thrusters to stabilize the asteroid and then give it the small push required to speed it up enough to avoid the keyhole. This phase will be launched in 2021 to allow ample time for Apophis to travel at the increased speed. The more time that is spent in Phase 1 before 2029, the greater the distance it will be from Earth. Phase 2 will begin immediately after the first phase, and will apply solar sail technology to provide long-duration, fuel-free forces on the asteroid. The solar sail will continually pull the Apophis' orbit outward from the Sun, effectively eliminating the intersection of its orbit with Earth's.

# Embry-Riddle Formula Hybrid Team



Team Members (L-R): Darris White, Dian Sumiskum, Heather Martin, Tom Smith, Craig Czapinski, Stuart Chaplan, Andrew Geers, Manuel Calleja, Lauren Mehr, Paul Davison II, Mike Hauptfear, Michael Lind, Sheila Morales, Ryle Maxson, Eric Kvam, Richard Walther, Yishi Li, **Jack Mckisson**. The EP students are: Heather Martin, Craig Czapinski, Manuel Calleja, Lauren Mehr, Sheila Morales, Eric Kvam, Yishi Li

The Embry Riddle Formula Hybrid Team has been assigned the task of designing and building a hybrid electric-gas racing vehicle. The team is comprised of senior design students from mechanical, aerospace, and physical science departments as well as students from the Society of Automotive Engineers (SAE) club. The main purpose in designing and building a hybrid car is to show that hybrid drivelines are viable to conventional power vehicles in high performance applications. By referring to 'high performance applications,' acceleration is the key concept.

Students are concentrating on the electrical aspect of the racecar. These individuals must design an electrical system capable of generating electric power and storing the charge in an energy accumulation system. This competition, this type of racecar, is not only new for ERAU, but new for the Society of Automotive Engineers. Such an endeavor will broaden the subject field usually associated with engineering-physics students. No longer are EP students just rocket scientists. We can now tag on the title of automotive engineer.

The competition will be held at the New Hampshire International Speedway during May 2007. Embry-Riddle SAE Formula Hybrid Team contends with other universities from both the United States and Canada. For more details you can visit the main SAE formula hybrid website at [www.formula-hybrid.org](http://www.formula-hybrid.org).

The Team would like to thank our sponsors: Dave Robertson, Gulfstream, Gene Haas Foundation, Belden, Weld-Craft, Red-line oil, Hy-per lube, Mathworks, Stancor, Autometer and Haynes.

# What is ABET Accreditation?

In the United States, accreditation is a non-governmental peer review process that ensures educational quality. Educational institutions or programs volunteer to periodically undergo this review to determine if minimum criteria are being met. Accreditation verifies that an institution or program meets the criteria, ensuring a quality educational experience.

ABET began in 1932 as the Engineers' Council for Professional Development (ECPD) and was formed to promote the status of the engineering profession and enhance the quality of engineering education. In 1980, the ECPD became the Accreditation Board for Engineering and Technology (ABET), focusing its efforts on the accreditation of educational programs. In the United States, ABET, Inc., is responsible for the specialized accreditation of educational programs in applied science, computing, engineering, and technology.

While the program conducts its self-examination, the appropriate ABET commission forms an evaluation team to visit the campus. A team chair and one or more program evaluators make up the evaluation team. Team members are volunteers from academe, government, and industry, as well as private practice.

During the on-campus visit, the evaluation team reviews course materials, student projects, and sample assignments and interviews students, faculty, and administrators. The team investigates whether the criteria are met and tackles any questions raised by the self-study. Following its campus visit, the team provides the school with a written report of the evaluation. This allows the program to correct any misrepresentations or errors of fact, as well as address any shortcomings in a timely manner.

At a large annual meeting of all ABET commission members, the final evaluation report is presented by the evaluation team, along with its recommended accreditation action. Based on the findings of the report, the commission members vote on the action, and the school is notified of the decision. The information the school receives identifies strengths, concerns, weaknesses, deficiencies, and recommendations for improvements. Accreditation is granted for a maximum of six years. To renew accreditation, the institution must request another evaluation.

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## **In Progress**

The Engineering Physics program at Embry-Riddle was granted full accreditation by the Engineering Accreditation Commission (EAC) of the ABET in the 1995 and 2001 general review. The Engineering Physics program at Embry-Riddle is now undergoing the initial processes necessary to seek reaffirmation of ABET accreditation.

See the Engineering Physics Program Educational Objectives and Program Outcomes on page 2.

# **ENGINEERING PHYSICS PROGRAM EDUCATIONAL OBJECTIVES AND PROGRAM OUTCOMES**

The Bachelor of Science in Engineering Physics program is designed to produce graduates with the knowledge and skills of both scientists and engineers. Combining the fields of space systems engineering and space physics, this program focuses on the scientific challenges and planning associated with mission design and research related to the exploration of the space environment. Because of the strong emphasis on fundamentals, the Engineering Physics program provides not only an excellent stepping stone into the space program, but also the flexibility to enter a broad variety of engineering and physics applications and graduate programs.

The Engineering Physics degree program has a full engineering accreditation by the Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology (ABET). This program supports the University's purpose "to provide a comprehensive education to prepare graduates for productive careers and responsible citizenship with special emphasis on the needs of aviation, aerospace engineering, and related fields."

## **Engineering Physics Program Educational Objectives**

The Program Educational Objectives (PEOs) of the Engineering Physics program ensure that our graduates:

- Effectively use mathematical, scientific, and modern engineering tools in the professional practice of engineering.
- Pursue successful careers built upon understanding of ethical and professional responsibility, good citizenship, and on the ability to be a life-long learner.
- Demonstrate oral and written communication skills, and the ability to work in teams across disciplines.
- Demonstrate the ability to identify, formulate and solve real-world technical problems, incorporating political, economic, and environmental considerations.

## **Engineering Physics Program Outcomes**

Eleven Program Outcomes (POs) stated by ABET form the foundation for the outcomes of the Engineering Physics Program. Graduates of the EP program are expected to have:

- an ability to apply knowledge of mathematics, science and engineering.
- an ability to design and conduct experiments, as well as to interpret data.
- an ability to design a system, component, or process to meet the desired need.
- an ability to function on multi-disciplinary teams.
- an ability to identify, formulate, and solve engineering problems.
- an understanding of professional and ethical responsibility.
- an ability to communicate effectively.
- the broad education necessary to understand the impact of engineering solutions in a global and societal context.
- a recognition for, and the ability to engage in, life-long learning.
- a knowledge of contemporary issues.
- an ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

These eleven outcomes are in concert with the educational objectives described above.

# Physical Science Department News

## Meetings Attended/Presentations

**Dr. Robert Fleck** presented a paper on “A Magnetic Mechanism for Outward Planet Migration” at the “From Stars to Planets” conference in April 2007 at the University of Florida, Gainesville, FL.

**Dr. Mahmut Reyhanoglu** delivered a talk titled “Switched Feedback Tracking Control of a Nonholonomic Mobile Robot,” the 32<sup>nd</sup> Annual Conference of the IEEE Industrial Electronics Society, Paris, France, November 2006.

**Dr. Mahmut Reyhanoglu** delivered a talk titled “Tracking Control of an Underactuated Surface Vessel Using Switched Feedback,” the 32<sup>nd</sup> Annual Conference of the IEEE Industrial Electronics Society, Paris, France, November 2006.

**Dr. Mahmut Reyhanoglu** delivered a talk titled “State Feedback Tracking of a Nonholonomic Control Moment Gyroscope,” IEEE Conference on Decision and Control, San Diego, California, December 2006.

**Loughmiller, P. J.**, M. C. Kelley, and **M. P. Hickey**, "Observational and Modeling Study of Mesospheric Bores", COSPAR, Beijing, China, July, 2006.

**Yu, Y.**, and **M. P. Hickey**, “The Numerical Simulation of Gravity Waves Propagating Upward Through the Middle Atmosphere Forced by Latent and Convective Heating”, COSPAR, Beijing, China, July, 2006.

Walterscheid, R. L., and **M. P. Hickey**, Acoustic Waves Generated by Gusty Flow Over Hilly Terrain”, EGU, Vienna, Austria, April, 2006.

**James Wanliss**, Robert Rankin, John Samson, and V. Tichonchuk (2007), “How thin does the magnetotail really get during substorm growth phase?” THEMIS Launch Conference, Titusville, Florida.

**Wanliss, J. A.**, V. V. Anh, and Z.-G. Yu (2007), Multifractal Analysis of INTERMAGNET Stations: A First Step Toward Global Characterizations, Chapman Conference on Mid-latitude Ionospheric Dynamics and Disturbances, 3-6 January, Yosemite, CA.

**Wanliss, J. A.** (2006), Space Storm as a Dynamical Phase Transition, Eos Trans. AGU, 87(52), Fall Meet. Suppl., Abstract NG23A-05.

Martin, P., N. Turner, and **J. A. Wanliss** (2006), Auroral Substorm Oscillations and Field Line Resonances, Eos Trans. AGU, 87(52), Fall Meet. Suppl., Abstract SM31B-0328.

Dobias, P., and **J. A. Wanliss** (2006), Substorms as Nonequilibrium Systems, Eos Trans. AGU, Fall Meet. Suppl., Abstract SM51B-1398.

## Refereed Journal Articles/Proceedings Published/Accepted for Publication

D. H. Berger, **J. P. Aufdenberg**, N. H. Turner, "Resolving the Faces of Stars", Sky & Telescope, 2007, 113, 40-45. (February 2007)

Gies, D. R., Bagnuolo, W. G., Jr., Baines, E. K., ten Brummelaar, T. A., Farrington, C. D., Goldfinger, P. J., Grundstrom, E. D., Huang, W., McAlister, H. A., Mirand, A., Sturmman, J., Sturmman, L., Touhami, Y., Turner, N. H., Wingert, D. W., Berger, D. H., McSwain, M. V., **Aufdenberg, J. P.**, Ridgway, S. T., Cochran, A. L., Lester, D. F., Sterling, N. C., Bjorkman, J. E., Bjorkman, K. S., Koubsk, P "CHARA Array K'-Band Measurements of the Angular Dimensions of Be Star Disks" Astrophysical Journal, 2007, 654, 527-543.

Wittkowski, M., **Aufdenberg, J. P.**, Driebe, T., Roccatagliata, V., Szeifert, T., Wolff, B. "Tests of stellar model atmospheres by optical interferometry. IV. VINCI interferometry and UVES spectroscopy of Menkar", Astronomy and Astrophysics, 2006, 460, 855-864.

Wittkowski, M., Hummel, C. A., **Aufdenberg, J. P.**, Roccatagliata, V. "Tests of stellar model atmospheres by optical interferometry. III. NPOI and VINCI interferometry of the M0 giant Sagittae covering 0.5-2.2 microns", *Astronomy and Astrophysics*, 460, 2006, 843-853.

**Won, Y.-I., G. G. Sivjee, S. M. I. Azeem**, and Q. Wu, Tidal features in the northern high-latitude mesospheric temperature and neutral winds, *J. Atmospheric and Solar-Terrestrial Physics*, doi:10.1016/j.jastp.2006.10.012., 2007

Chung, J.-K., Q. Wu, Y. H. Kim, **Y.-I. Won**, S. Solomon, J. U. Park, and B. G. Choi, Enhancement of OI 630.0 nm Emission during an Intense Magnetic Storm in the Mid-Latitude, *J. Atmospheric and Solar-Terrestrial Physics*, in press, 2007.

**Yu, Y.**, and **M. P. Hickey**, Numerical modeling of a gravity wave packet ducted by the thermal structure of the atmosphere, *J. Geophys. Res.*, in press, 2007.

Huang, T.-Y., and **M. P. Hickey**, On the Latitudinal Variations of the Non-periodic Response of Minor Species Induced by a Dissipative Gravity-wave Packet in the MLT Region, *J. Atmos. Sol-Terr. Phys.*, in press, 2007.

**Yu, Y.**, and **M. P. Hickey** (2007), Time-resolved ducting of atmospheric acoustic-gravity waves by analysis of the vertical energy flux, *Geophys. Res. Lett.*, 34, L02821, doi:10.1029/2006GL028299.

**Dr. Chris Vuille's** paper, "Exact solutions for plane symmetric scalar fields in general relativity, with cosmological constant", has been accepted for publication by *The International Journal of General Relativity and Gravitation*. This work includes exact solutions of Einstein's equation leading to rapid inflation in the early universe and continued exponential expansion thereafter, reminiscent of the effect of dark energy.

"A Quarter-Century of Satellite PMC Measurements", M.T. DeLand, E.P. Shettle, G.E. Thomas, and **J.J. Olivero**, *J. Atmos. Solar-Terr. Phys.*, 68(1), 9-29, 2006.

"Spectral Measurements of PMCs from SBUV/2 Instruments", M.T. DeLand, E.P. Shettle, G.E. Thomas, and **J.J. Olivero**, *J. Atmos. Solar-Terr. Phys.*, 68(1), 65-77, 2006.

**Wanliss, J. A.**, and J. M. Weygand (2007), Power law burst lifetime distribution of the SYM-H index, *Geophys. Res. Lett.*, 34, L04107, doi:10.1029/2006GL028235.

Dobias, P., and **J. A. Wanliss**, Nonlinear Stability of the Near-Earth Plasma Sheet During Substorms, Substorms-8, Proceedings 8th International Conference on Substorms, Banff, Canada, 49-53, 2006.

## **Textbooks**

**Dr. Chris Vuille** received a contract on a new physics book from Thomson Publishing as sole author. This is his third book, a calculus-based text that will be shorter than competing texts yet more comprehensive. It is due out in 2011.

## **Community and K-12 Outreach Activities**

**Dr. Irfan Azeem** visited a third grade class at Tomoka Elementary School to discuss Antarctica in February 2007.

**Prof. Charles Bishop, Dr. Irfan Azeem, Dr. John Mathis, Dr. John Hughes, Professor Emeritus Elliot Palmer, and Professor Emeritus Robert Dunmire** were judges at the Tomoka Regional Science and Engineering Fair in February, 2007. **Prof. Phyllis Salmons** reported the event for the Daytona Beach News Journal.

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**Calling All EP Alumni!** We feel it is very important that we stay informed about your career progress and we want you to know about developments in the Engineering Physics Program. If you have not been in touch lately, or if you know of others who we may have lost contact with, please drop us a line and update your contact information at [engphys@erau.edu](mailto:engphys@erau.edu)



## ERAU grants Special Awards at the 2007 Tomoka Regional Science and Engineering Fair

Three special awards were made possible with kind financial support from the Provost's Office at Embry-Riddle Aeronautical University (ERAU), College of Arts and Sciences, Department of Physical Sciences and the National Science Foundation through research grant #ATM-0449864 to ERAU.

### Engineering Award

Title: *A Homemade Solar Panel? No way!*

Ashlee Eve, 14  
Freshman, DeLand High School  
Career Plans: Missionary to Germany  
College: Not sure but plans to major in Foreign Language  
The \$250 award is in the bank  
Pictured (L-R), Principal Mitch Moyer, Ashlee Eve and Biology Teacher Cindy Rosso



### Earth and Space Science Award

Title: *What region in Port Orange exhibits the greatest amount of erosion after a wildfire?*

Krista Brager, 17  
Senior, Spruce Creek High School  
Career Plans: Air Traffic Control  
College: ERAU  
The \$250 is in savings for college books  
Pictured (L-R), Krista Brager and Principal Tim Egnor



### Physics Award

Title: *Gauss Rifle: A Magnetic Linear Accelerator*

Patrick Lloyd, 16  
Sophomore, Spruce Creek High School  
Career Plans: To focus on computer science and engineering  
College: Undecided  
The \$250 is in savings for a computer  
Pictured (L-R), Patrick Lloyd and Principal Tim Egnor

