

Arkansas Physics

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Newsletter Editor: Gay Stewart. Please contact me with comments and suggestions, Dept. of Physics, University of Arkansas at Fayetteville,

Fayetteville, AR 72701; gstewart@uark.edu. Please forgive how late this is. My daughter is recovering well, but I panicked!

Featured Physics Department: This feature will come back next spring! The Physics Department at UA-F has begun a series of features

dealing with high school physics departments the state. Please send us a suggestion for another physics department to be featured in our fall newsletter.

PhysTEC – TIR: As the University of Arkansas at Fayetteville finishes their 5th year of the PhysTEC program, we are looking for a teacher to serve as the Teacher In Residence (TIR06). If you are interested in being a TIR for the 2006-2007 school year, or in the future, please contact David Young TIR '03

and master of our list serve or Gay Stewart at the UofA, F. More information about the project may be found at <http://www.uark.edu/depts/physinfo/phystec/welcome.html>, or <http://comp.uark.edu/~dyoung7/>-this site has a lot of useful stuff!

WHERE DO OUR STUDENTS GO? *We have now had a couple of undergraduates work at NASA, to go back once they graduate. Here is an essay from our current student, who will be here on High School Physics Day to answer any questions. He will graduate next December and start full-time at NASA January 07.* Sitting in the hushed control room, I intently watch astronaut Danny Olivas working on the wing leading edge sample. Several of the large projector screens at the front of the room, just past the last forward row of consoles, are displaying various camera views of him as he works. Danny is inside vacuum chamber B right now, wearing a fully functional, Class 1 EVA (Extra-Vehicular Activity) suit. The chamber is pumped down to the same level of vacuum as what is measured in low-earth orbit (3x10⁻⁶ Torr), and although the sample he is working on is close to room temperature, the walls of the chamber are at -350 degrees Fahrenheit. I briefly look around myself at all the engineers and technicians gathered in the control room, and smile as I think about where I am and what I have the privilege of working on. It's late October, the fall of 2005, and I have taken off a semester of school at the University of Arkansas to work at NASA's Johnson Space Center (JSC) in Houston, Texas.

As I watch, Danny practices a new repair method on a sample of the reinforced carbon-carbon (RCC) panel to which we have purposely inflicted damage. Since the Columbia tragedy of 2003, NASA has focused intently on not only the prevention of damage to the orbiter, but also the capability to repair damage on orbit should something, whether it be launch debris or an on-orbit impact, threaten the shuttle's safe return. The panel crewmember Olivas is repairing is made of the same material (and damaged in what we suspect is a similar manner) as what was on shuttle Columbia. I was given "ownership" of that specific test article just two weeks prior, and since being charged with the design of the test stand that it is sitting on, and all the requirements that it needed to meet for the chamber run, I have worked day and night on the design, fabrication, and installation of the sample. During that two-week period I also got to know Danny, and helped in preparing him for his "EVA" inside the chamber. Just a week before I was even the "test subject" in the non-vacuum dry run where the test directors, chamber operators, and rescue techs come together to practice the techniques for removing a crew member from the chamber in the event of an emergency. I had the privilege of wearing a suit and getting to walk around inside the chamber, then pretending to have an emergency requiring evacuation.

The division I currently work in is known as the Crew and Thermal Systems Division, or CTSD. My branch of CTSD owns and operates the vacuum chambers here at JSC. The amazing thing about CTSD and my branch is that we come to work every day as the world's best for simulating the space environment. We can put a crew member inside one of the chambers and give them the most realistic training exercise they can get without being in space itself. In this job I have seen so many examples of classic physics and chemistry come to real life. The suits that the crew members wear are cooled by virtue of water's characteristics under vacuum. The chamber they train in provides beautiful examples of the ideal gas law, cryogenics, thermal expansion and contraction of materials, and countless other textbook topics all rolled into an exercise stretching the length of a single day. Although these are real-world phenomena that we experience every day, when a vacuum chamber is pumped down these effects are especially highlighted.

Johnson is an amazing place, our nation's home of manned space flight

as such, it is a place where I have seen how engineers and scientists can come together to "push the envelope" of human capability, applying their minds, their creativity, their hopes, and their dreams so that we may go beyond what is commonly possible to something once thought impossible. Science and engineering as academic fields can be exceptionally challenging, and as careers I believe they can be especially rewarding.

Crewmember Olivas has just finished the repair on the wing leading edge sample. Since it's a "curved panel" sample (imagine the curved front edge of an airplane wing), he rolls it toward the infrared heaters that will simulate the heat of the Sun and cure the repair material. Danny locks the sample in place, and proceeds to his other repairs. My part in this EVA is done, and I relax as I realize the test went off without a hitch. Now, it's time to "go back to the drawing board" and continue work on some of my other projects.

My name is Jesse Buffington. I grew up on a farm near a small town in northwest Arkansas, and after high school I came to the University to study Mechanical Engineering. My freshman year I took University Physics I, and after that declared a double major in Physics and Mechanical Engineering, with a minor in mathematics. The summer after my freshman year I worked in physics department's machine shop, building optics equipment for the laser labs in the department. The next school year I applied for and was accepted as an undergraduate research student in the University's Arkansas Center for Space and Planetary Sciences, and worked there the following summer, through the school year in my free time, to the conclusion of the summer of 2005, after which I moved to Houston. The previous spring I had had the luxury of traveling with the Space Center to Houston, where I was given the opportunity to present the research I had conducted my first summer with them. It was on that trip that I interviewed at JSC, and a few months later received the offer to join the cooperative education program in which I currently work.



High School Physics Day Registration Form

Teacher's Name _____ School _____

School Address _____ Teacher e-mail(s): _____

City/State/Zip/Phone _____

We are PreRegistering _____ students @ \$2.50 each for a total amount of \$ _____

Make checks payable to the UofA@F Physics Department by March 10, 2006. Check each contest your school will compete in and indicate the number of teams you will have for each event. **Please print participants names on the back of this form.**

Water Rockets, # of Teams: _____;

Photography, # of Teams: _____;

Egg Drop, # of Teams: _____;

Archimedes Boat, # of Teams: _____;

Physics Demonstrations, # of Teams: _____

Arkansas High School Physics Teachers Alliance: We now have about 130 teachers on the ARPHYSICS listserve. Thanks to Lynn Hehr for setting this up for us, and the UofA@F for hosting the list. If you would like to join the alliance or get on the listserve, email David (dyoung7@uark.edu) or visit the Alliance

Some grant information compiled by David A. Young, TIR '03 and master of our physics teacher list!

Need a grant for classroom technology? Here's a start: Edutopia News.

To subscribe: <http://www.edutopia.org/products/edutopianews.php>

Olympus and Tool Factory Classroom Grants Olympus and Tool Factory will award ten grants to educators whose classroom projects and curriculum ideas illustrate "effective and creative use of digital cameras and software resources." Grantees (five in winter 2005 and five in spring 2006) will receive \$3,550 in prizes, including three Olympus D-545 4.0-megapixel digital cameras, Tool Factory project-building software, thirty digital camera workbooks, and \$500 cash. To complete an online application, click the link below. <http://email.e-mailnetworks.com/ct/ct.php?t=1025524&c=565387511&m=m&type=3>

Susan Jones (Susan Jones <susan@MEMORYAIDS.COM>) Toyota Tapestry Ambassador, State of Arkansas posted this information: I just received the 2006 \$10,000 Toyota Tapestry Grant applications from NSTA. If you have an innovative idea to enhance science education and would like an application, please email me your home or school address. The deadline for receipt of proposals is January 19, 2006. \$2,500 mini grants are also available. Please feel free to email me if you need advice or tips as you work on your proposal.

techLEARNING.com: Technology & Learning - The Resource for Education Technology Leaders

<http://www.techlearning.com/resources/grants.jhtml>

WebPage (<http://comp.uark.edu/~dyoung7/Alliance.htm>) for more information. We are also trying to update our list of teachers of physics in Arkansas, so send us any names of teachers you know, and/or correct our snail and email addresses for you. Hope to see you at an alliance meeting this year!

For female science students going to college next year: The Association for Women in Science Educational Foundation awards a \$1,000 scholarship to a female high school senior (U.S. citizen) who intends to study astronomy, geoscience, biology, mathematics, computer and information science, engineering, physics, chemistry, or psychology in the next academic year. They must plan to attend a college or university in the United States; have a 3.75 high school grade point average; plan a career in research and/or teaching; and have achieved a score of at least 1200 on the SAT (math plus verbal) or a composite score of 25 for the ACT. Deadline: 01/19/2006 Contact: Dr. Barbara Filner, AWIS Educational Foundation, 7008 Richard Drive, Bethesda, MD 20817-4838, E-mail: awisedfd@awis.org Program URL: <http://www.awis.org/careers/edfoundation.html> About two to five undergraduate scholarships are awarded to high school seniors each year. In addition, Citations of Merit (\$300) and Recognition Awards (\$100) may be given.

We are taking off one newsletter from our series on featured high school programs from around the state-should be back in the Spring!

HIGH SCHOOL PHYSICS DAY

Special Announcement! HIGH SCHOOL PHYSICS DAY TO HAVE A SPECIAL FM BROADCAST STATION The University of Arkansas Department of Physics will host its annual High School Physics Day on FRIDAY March 17, 2006. It will have a special low-powered FM radio broadcast station set up for the day's events.

- The radio station will be operated by High School Physics students and will be broadcasting music, schedules and other information for the day's events.
- The transmitter will be set up and adjusted to operate under FCC part 15 rules which in part allows for operation at low power levels which will not interfere with other local stations.
- Interested students should contact Steve Kelly to be considered for the DJ/Announcer position at: sckelly@uark.edu

The faculty and members of SPS (Society of Physics Students) invite students and teachers from your high school to participate. Note that a small registration fee is required, which includes a pizza lunch, making the fee well worthwhile. Checks may be made payable to "Department of Physics". There will be prizes in every category, and a classroom prize for the best school overall. Please submit a list of names of your students when you send in the Registration Form (print them on the back, or on a separate sheet) if possible. Let us know the names of the kids on your teams as soon as possible. We hope that this day will encourage the pursuit of physics as a career itself or as a valuable asset to a large number of possible careers by providing an opportunity for detailed projects to be carried out in a light-hearted (and hopefully light-landing) manner. We also hope to give students and teachers from across the state an opportunity to get acquainted, better inform them about our undergraduate physics programs, and show that physics is fun.

SCHEDULE OF EVENTS AND RULES

8:00 - 8:45 Registration (1st Floor Lobby) Rockets, Egg Drop Apparatus, Demonstrations and Photographs must be registered.

8:45 - 10:00 Rocket Launch (Old Main Lawn - Near Ozark Hall)

10:00 - 11:30 Research Labs Tours (guides collect groups at launch)

11:30 - 12:30 Lunch provided by SPS (1st Floor Lobby)

12:30 - 1:30

1:30 - 2:30

2:30 - 3:30

3:30 - 4:00

4:00 - 4:30

Boat Contest (SCEN 110 &111)

Physics Demonstration Contest (SCEN 111)

Egg Drop (Kimpel Hall Parking Lot)

A student's view of NASA (PHYS 133)

Awards Ceremony (PHYS 133)

Detailed rules will be available at the department webpage, <http://www.uark.edu/depts/physics/highsch.html>, below are brief descriptions.

EGG DROP: No restraining devices or aerodynamic devices may be attached to the container. The container itself may not be an aerodynamic device. The maximum height of drop will be 60 to 80 feet. The winner is the container with the most eggs surviving the drop. In the event of a tie, the container with the least volume wins. Each container must hold **two** raw, unfrozen, untreated/unsprayed chicken eggs. Please bring your own eggs. Containers may be of any material but must fit into a cube 50 cm on each side. Containers that may chip the asphalt target will be disqualified. The containers must be opened to check the eggs after the drop. Unbroken eggs will be broken to determine if qualified. **Limit 3 entries per school.**

PHYSICS DEMONSTRATIONS: Design a demonstration that illustrates physical concepts or phenomena and enter it into the contest. The design must not have been presented or judged previously. It will be judged for originality and fidelity to the physical principles that are being illustrated. **Maximum two students per team.**

PHYSICS PHOTOGRAPHY CONTEST: Entries are limited to one photograph per person, and must be the work of the entering student. Black and white or color, traditional or digital photographs are allowed. Photos should be submitted as 8" x 10" or 8.5" x 11" prints. An essay of 250 words or less describing the physics in the photo should accompany the submission. The essay should have a title and must be written by the student. **Maximum two students per team.**

ROCKET LAUNCH: Students will modify a 2-liter soda bottle to be launched with 0.5 to 1.0 liters of water at an air pressure of 60 psi. Rockets will be judged for greatest time aloft and originality of design. The angle of the launch will be the same for each team, and determined by the judges at the launch pad. Multiple bottles may be used in the construction of the rocket. However, the main bottle must not be altered in any way. The bottle opening must not be tampered with, as the launcher must be clamped to the bottle opening. **Limit 3 entries per school, maximum three students per team.**

ARCHIMEDES BOAT CONTEST. Each team will construct, on site, a boat using only a 300 mm by 300 mm piece of Aluminum Foil. We will provide the foil and the pennies. Your goal is to make a boat that will carry the most washers. The boat must float unloaded for at least 77 seconds to count as a boat. Your team will have a limited amount of time to build, float and load your boat. **Limit 3 entries per school, maximum two students per team.**

HOW TO PARTICIPATE: Please fill out the Registration Form and return it before Monday, March 10, 2006. Awards will be given for first, second, and third place in the five competitions. Entries by **individual** high school students and by **teams as described above** are welcome for all contests. Provisions will be made so that each team member receives an award. Everyone is encouraged to participate but anyone can come to observe. Judges' decisions are final. In the event of a tie, the points will be split between the teams.

NEWSLETTER
Department of Physics
University of Arkansas
Fayetteville, AR 72701

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