

10-3-2006

## Arkansas Physics Times, October 3, 2006

Society of Physics Students (American Institute of Physics)

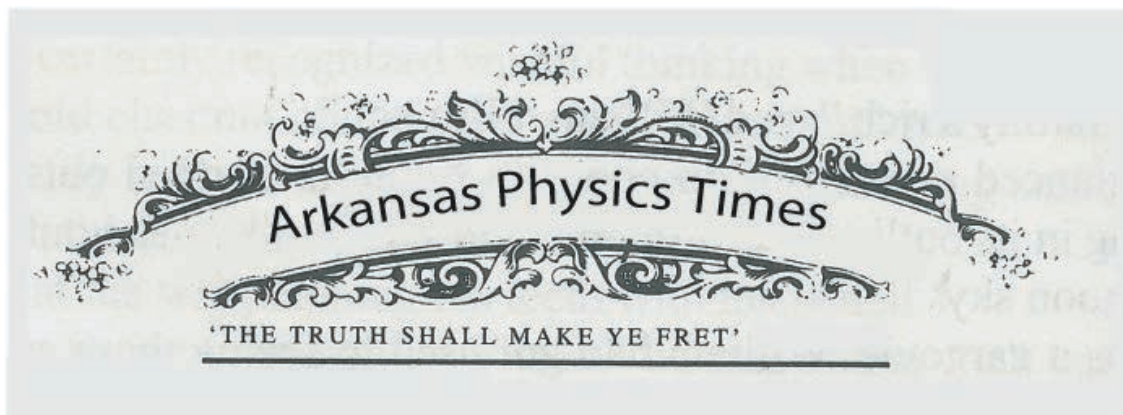
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#### Calendar of Events

- \* Friday Oct. 13th - Deadline to join the physics/math intramural soccer team.
- \* Oct. 26th - Prep for Haunted Lab
- \* Haunted Lab Oct. 28th and 29th - Volunteers needed!
- \* Nov. 3rd-4th - InBRE conference
- \* Meeting Nov. 7th, ELECTION DAY - Join us after you have voted!
- \* For more information check out our website, <http://www.uark.edu/depts/physinfo/wiki/>

**Mystery Solved!** - For centuries scientists have wondered what would happen if you hit a 350 degrees below zero head of lettuce with an aluminum baseball bat.

### THE VINDICATION OF DEMOCRITUS

By Josiah Walton  
Sophomore Physics Major

On a cool morning just before dawn, at a time of day which I had not seen the likes of for some time, I had the opportunity to sit down and talk with Dr. Gregory Salamo about an exciting and new addition to the physics department's repertoire of advanced imaging machinery: the incor-

poration of a state of the art Transmission Electron Microscope (TEM).

But what exactly, you may ask, is a TEM? In a short answer, it is a machine that harnesses the power of electron microscopy to produce astounding images of objects on the order of 0.1nm or 1 Å; that's roughly the size of an atom! "This opens up the door to see single atoms and to some degree to identify the atom," Dr. Salamo said. The image of the specimen is made by focusing a beam of electrons onto the specimen and allowing them to

transmit through to a fluorescent screen behind where they are then displayed on a screen. Traditional light microscopes, however, can only resolve features that are comparable to the wavelength of light used; a major drawback if we want to image single atoms. With the new TEM, resolving the images of individual atoms will prove vital to the further study and design of semiconductor structures; it will put us in a greater position for research in semiconductors and photonics.

While the new TEM will be used extensively by physics faculty, it will also be an important tool for the investigation of biological structures by faculty of the biological and chemical sciences. Dr. Salamo feels, as do others, that there are striking similarities between a cell and a semiconductor surface and that physics has much to offer: “The surface [of the semiconductor] is playing the role of DNA – it presents a way to self-assemble the atoms [along it]. These are exactly the same rules going on in the cell; the same basic physics. There is a new conceptual understanding required at this level. Physics has much more to contribute to biology than just instruments.”

In addition to providing valuable research opportunities for the physical and biological sciences, the physics department intends to help prepare students with greater technological skills in the work place: “[There is a large] need to create a more advanced workforce of people with the skills to succeed in this advanced technological age,” Dr. Salamo said.

Moreover, the TEM we are acquiring will be unlike any at any other school in the nation according to Dr. Salamo’s current knowledge: “there is at most one other school in the country that has this [TEM],

and maybe not even as advanced as ours.” Unlike standard TEMs, the new microscope will have a valuable set of correcting lenses that fix certain aberrations which occur during the imaging process; this is known as High Resolution Transmission Electron Microscopy (HRTEM).

The many reasons why the TEM is being brought in all refer to an overarching idea: “this is about entering a new era in science in which the growth and manipulation of structures at the nanoscale will be pivotal to future advancements in technology” as Dr. Salamo stated.

Although the new TEM will give us an edge in nanoscience research and the ability to train a more technologically adept workforce, we must not take overlook the actions of the individuals who are making this all possible. Since the equipment is very expensive (a reasonable estimate is around \$3 million), it has taken the tireless efforts of Dr. Salamo and others along with important outside sources, such as the 2000 Clinton Nanoscience Initiative, to really help make this project a reality. Dr. Salamo explained that the original planning for the TEM began back in 1995.

SPS would like to thank Dr. Salamo for setting aside time to talk about the TEM apart from his already busy schedule. Dr. Gregory Salamo is currently a professor of physics in the physics department at the U of A. He has won numerous awards and honors and just recently won the “Distinguished Professor” award and the “Joe N. Basore Professorship in Nanotechnology and Innovation” in 2005.

*For more information contact Dr. Salamo at [salamo@uark.edu](mailto:salamo@uark.edu) or check out his page on the physics website.*

**Graduates: Where are they now?**

by Dr. John Stewart

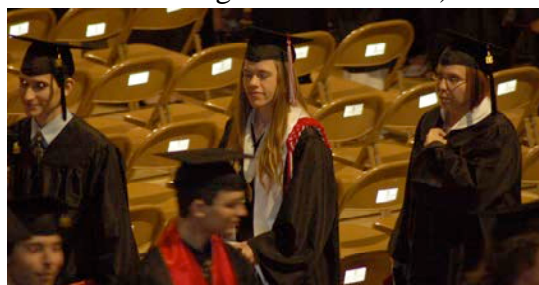
**Graduation May 2006** – We said good-bye to a lot of old friends this May. From left to right below: Becca Claus (Industry 3M), Forrest Denger (Computer Technician), Leslie Embry (Medical School), Jason Lee (Grad School Physics – Oregon State), John Vickers (Grad School microEP), Bernadette Stewart (Grad School English – NYU), Ken Vickers and Gay Stewart (Still Stuck Here), Justin Vines (Grad School Physics – Cornell), Chris Wells (Grad School Math – Oklahoma State), Bryon Western (Grad School microEP), John Wong (Grad School – Arkansas). Not pictured, but at graduation Ryan Marsh (Grad School Economics Here). Not at graduation; Tyson Lawrence (Grad School Physics Here), Robert Shaw (Industry - Engineering), and Jay Lasey (Industry – Engineering).



We will see if we can get reports about Cornell from Justin.



Let's not forget Becca Claus (3M Minneapolis) and Jessica Clanton (MA Physics and future high school teacher).



**Honors graduation.** From left to right, Justin Vines, Bernadette Stewart, Ryan Marsh, John Vickers, Jason Lee, Chris Wells, and John Wong.



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**STUDENT BIOS by Shawn Ballard**
**Lady Hannah DeBerg**

The local physics celebrity and Goldwater scholar plans to graduate this spring. Next fall brings new challenges in graduate school. Hannah hopes to attend Duke where she participated in an REU, an experience she recommends to all physics undergraduates.

SPS: What do you consider your most interesting detail?

HD: Given the interviewer, I'm reminded of the scar on my eyebrow from a certain golf ball accident.

Explanation: Back in high school one summer, we were hanging out in Shawn's pool diving for golf balls when Shawn threw one over her shoulder in such a way as to defy all the odds in physics and hit Hannah's forehead sending her to the emergency room for that clear glue stuff they use instead of stitches on small cuts. An incredibly freakish accident that haunts Shawn wherever she goes.

SPS: Fun question: If you could have any super power, what would it be and why?

HD: I'd want to be able to fly. Saving money on travel would be great so I can get more use out of my Spanish major.

Hannah also works in Dr. Salamo's lab doing research with laser tweezers and Raman spectroscopy to examine how yeast cells change as they age.

**The Legend of Nightvid Cole**

Changing his name from David to Nightvid began as a joke, a convenience even because his father is also named David, but now the name has become part of the mystique. Nightvid asks the questions others might not even consider.

SPS: If you could have any one super power, what would it be and why?

NC: I would want to be able to read minds. Knowledge really is power. Plus, I think it has the highest power to corruption ratio, which is something I'd like to maximize.

SPS: Your favorite thing in physics?

NC: I'm really into gravitational waves, which is actually my current research project. I'm talking with Dr. Kennefick about the possibility of detecting man-made gravitational waves. Most physicists think such a small effect isn't worth looking at, but everything is smaller these days, so hopefully I'll find them in the not so distant future.

SPS: What would you say is the most interesting detail about yourself?

NC: I'm always thinking about things, especially physics. No amount of thinking is too much, even though it crowds other stuff out of my brain.

Nightvid plans to graduate in May 2008. After that, his plans are unsettled. Everything depends on his research, the economy, and other factors.



**Physics Student Opens Door, Wins Nobel Peace Prize**  
from the Daily Facetious News Network, September 2006

For Shawn Ballard, UA physics and English double major, Friday, September 1<sup>st</sup> was just another day until she made history as Arkansas' youngest Nobel laureate.

For several years now, it has been common practice for denizens of the science, math, and engineering departments to attend classes armed to the gills with the creative weapons of their various trades; trebuchets, rail guns, taser enabled calculators, and other menacing contraptions. Dr. Chaim Weinstein of the mathematics department notes that "it has become a kind of rite of passage for the frosh and a source of bragging rights for the upperclassmen."

This year is no exception, especially with the greatly increased freshman population. As a result, the halls in science and engineering buildings have become increasingly formidable.

On the day in question, Ballard was traversing the Science and Engineering building on her way to Linear Algebra when the following scene unfolded.

The southwest entrance into SCEN through Ferritor Hall had become deadlocked with students trying to enter and exit through only one of the three available doors. The only logical solution possible for the disgruntled herd was to establish opposing militaristic forces on each side and blast their way through. Two engineers appointed themselves generals with numerous Greeks serving as grunt infantry. Projectiles and protractors drawn, the bloodbath would have most certainly erupted all over the sidewalk had not Miss Ballard cleverly opened the adjoining double door and pushed the handicap access button simultaneously. The masses being thus appeased, everyone continued to class peacefully, on schedule and unharmed.

Only by a great stroke of luck did Ballard's feat not pass by unnoticed like the recent brawls over parking in various lots around campus. Nobel scouts were on campus touring the physics department when they witnessed Miss Ballard's heroism. Goldwater scholar, Lady Hannah DeBerg, commented to the swarming paparazzi, "I always knew Shawn would be involved in a major military conflict. I'm just glad she was awarded the Nobel instead of jail time."

Ballard herself was delighted to accept the award and title and has since entered into negotiations with Chancellor White trying to use her status to reallocate funds from the football program into academics. There have been no reported developments yet, but Ballard says she is hopeful.

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**PHYSICS LOOKED GRIM FOR A HOG'S WIN AT AUBURN**

By Matt Naglak

(**NOTICE:** This is how theoretical physics can be entirely disproved by experiment...)

Polls and rankings notwithstanding, physics itself has an equilibrium position to restore with the Arkansas Razorbacks. Over the last two games, physics has saved the Razorback season, with classical Newtonian physics chipping in to secure victory for the Hogs. Two games ago at Vandy, gravity and kinematics reared its head, dropping the game-losing ball inches short of the field goal bar. **Continued on Page 6**

It was velocity, inelastic collisions, and momentum saving the day against Alabama, causing their kicker Tiffin to “miraculously” miss three field goals and an extra point. We know the truth, however; it was all physics.



Every action must, on the other hand, have an equal and opposite reaction. And that reaction is most likely going to come this week when we travel to Auburn, the #2 ranked team in the nation. The latest in Mattonian physics does not present a pleasant outlook for our beloved team. The following formula says it all...

To find Auburn's score one finds the solution to the Schrodinger equation for a football in a nearly infinite potential (about the same amount Auburn has) field of length 100 yards. Taking this equation and adding it to the triple integral of the internal energy of Irons (Auburn's primary running back) yields the little known aspect of the 5<sup>th</sup> Maxwell's equation (Arkansas can't beat a ranked team on the road). With this completed, it is a simple matter to find the angle of total internal reflection necessary to blind the Razorback defense and divide it by our current turnover margin. This surprisingly yields the number 42: not only the answer to the Ultimate Question of Life the Universe and Everything, but also the number of points Auburn will

score.

Arkansas' score is much simpler. Due to the Nutt Uncertainty Principle, stating it is impossible to know at any exact point in time who is really calling the next offensive play (Nutt or Malzahn), coupled with the kicking woes we ourselves have suffered leaves us with an uncertain point total between 14 and 20 (with missed field goals or extra points entirely possible).

Razorback fans can take hope, however, in the fact that all of this is extremely cutting edge physics and could be entirely wrong. It has been the case in recent years, however, that just as an electron returns from its excited state to its ground state, the level of least potential, so have the Razorback fans and teams lost energy and hope after disappointing losses in big games.

## **TERRY PRATCHETT QUOTE OF THE MONTH** **edited by Dr. Gea-Banacloche**

"Education at the University mostly worked by the age-old method of putting a lot of young people in the vicinity of a lot of books and hoping that something would pass from one to the other, while the actual young people put themselves in the vicinity of inns and taverns for exactly the same reason." - Terry Pratchett

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## NEWS IN BRIEF

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### Crisis in Science Education

Trained scientists and future doctors Dhaval Shah and Juan Chipollini barely hold their own against pre-teens showing once and for all the deplorable state of science education in our nation's universities. For this nation to hold its own in a technical marketplace more emphasis must be placed on the fundamentals; dribbling, defense, and the three-point shot. Shocking.



### Physics Rides I

The first annual (although we are considering spring too) physics bike ride was held at Pea Ridge National Military Park on September 24. While the weather was unseasonably cool, the park really showed its stuff. Riders had to wait on the road while a group of deer crossed the road. The riders below are refueling with a nutritious snack of cream horn donuts.





**FUN AND GAMES**

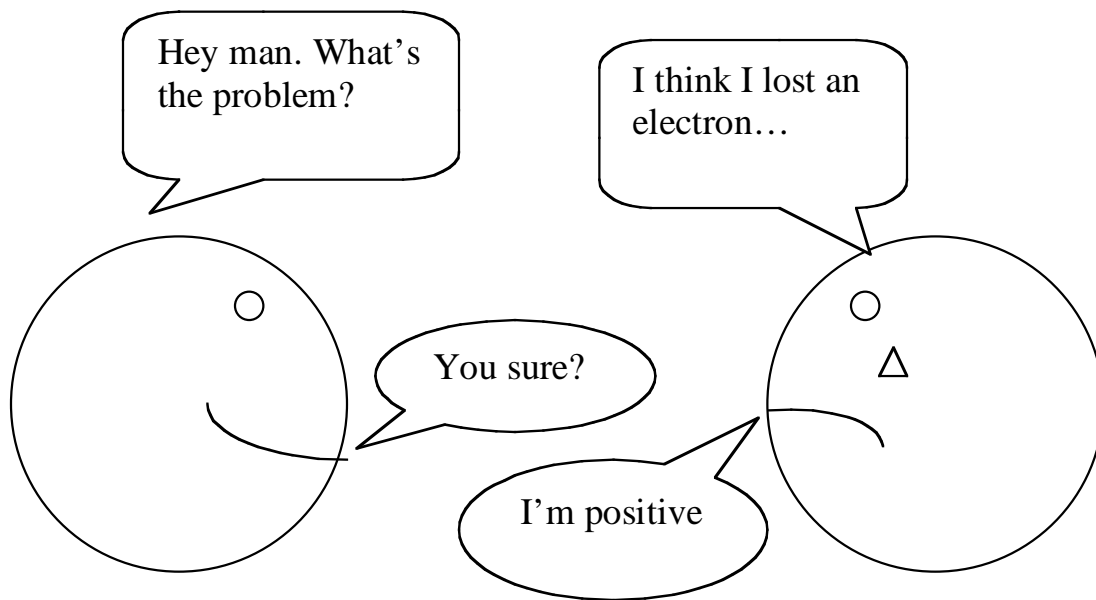
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5	2		4				7	3
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Daily SuDoku: Tue 3-Oct-2006

medium

**Sudoku-** Fill in the grid so that every row, column, and 3x3 box contains the digits 1 through 9.



**By Matt Naglak and Josiah Walton**

# OCTOBER HOROSCOPES

by Shawn Ballard and Ashley Stewart

*Traditionally, astrologers have used the 12 zodiac signs based on the 12 zodiac constellations boundaries in which the sun travels through in a year. These boundaries have since been redefined by astronomers and the modern path of the sun takes it through 13 zodiac constellations each year. The 13th zodiac constellation is Ophiuchus, the Serpent Holder.*

**Aries (April 20 - May 13) - 7** - Take time off for yourself or with some close friends. There's time to turn things around, but you have to start slow. Put off E&M homework for another day. Say yes to pampering and extra dessert.

**Taurus (May 13 - June 21) - 8** - Business is booming in work and your personal life. Watch out, though, too many new flames could start a huge fire. Frugality now will pay off later.

**Gemini (June 21 - July 20) - 5** - Your two personalities will be in dire disagreement. Think logically and accept the good with the bad to find your balance for success. Fish like you.

**Cancer (July 20 - August 11) - 4** - Hiding alone in your room will only get you from bad to worse. Take others' criticism as constructive. You have great input to offer, too. Just have courage. Remember, Maxwell knew all modern physics was false.

**Leo (August 11 - September 18) - 6** - Over-aggression can seriously harm your success rate. Minimize internal corruption to maximize your profits. Look for new opportunities for advancement in work and play.

**Virgo (September 18 - November 1) - 7** - A relaxed and mellow outlook has always taken you far, but get more active and involved for great rewards. New friends and new possibilities are on the horizon.

**Libra (November 1 - November 22) - 5** - You are balanced as always, but you can feel better by simply ignoring the naysayers. Stay the course and logic will see you through. Look for luck in love at last.

**Scorpio (November 22 - December 1) - 9** - You're on top of the world, but watch out, others may not understand. Take your time and explain clearly to avoid conflict. Attached is nice; single is better. Double space that paper and be done with it.

**Ophiuchus (December 1 - December 19) - 7** - Past regrets may want to hang over you like a cloud but remember what's done is done. Look forward to tomorrow. What will happen will happen.

**Sagittarius (December 19 - January 19) - 8** - Attention to detail dominates your focus, but perfection isn't everything. Have fun activities with new people. This can be your time to shine if stress doesn't get you down.

**Capricorn (January 19 - February 18) - 6** - Go for it in that great Halloween costume. Things will certainly be looking up if you can get through the initial rough spots. Don't let yourself get discouraged.

**Aquarius (February 18 - March 13) - 9** - You have great legs, but watch out. Being too pretentious can really turn other people off. Learn new things about old friends for some good times.

**Pisces (March 13 - April 20) - 3** - Sucks to be you.

## SPS October Meeting Highlights

The SPS wiki page is up and running at [http://www.uark.edu/depts/physinfo/wiki/index.php?title=Main\\_Page](http://www.uark.edu/depts/physinfo/wiki/index.php?title=Main_Page). All SPS members are welcome to create a page or edit the existing information. If you have suggestions for SPS activities or meeting topics, please add them to our page. We'll be posting more information about upcoming activities there.

Robert Housley reported on the formation of groups to build two Tesla Coils as demonstrations for the department. If this year's small coils are a success, they may get to work on a more dangerous project next year.

SPS is having a physics shirt design contest. The winner will receive a free shirt. Designs are due in the SPS mailbox in the Physics office by Halloween. We will vote at the November meeting.

Turn out for the physics bike rides in Pea Ridge wasn't large. Suggestions for improvements included not planning rides on Sunday or in the morning, helping students who don't have bicycles find someone to borrow one from, and meeting on campus to carpool. The next bike trip will be in the spring. Ice skating at the Jones Center was suggested as a winter activity. It's fun and free.

Volunteers are needed for the InBRE undergraduate research conference November 3<sup>rd</sup>. Please contact Dr John Stewart or SPS if you'd like to help.

Dr. John Stewart presented information about job opportunities for people with undergraduate degrees in Physics. He suggested that extensive lab experience and some knowledge of statistics is

especially helpful. Contact him for more information.

Dr. Stewart proposed setting up an undergraduate colloquium. He suggests having professors spend half an hour every other week presenting a lecture on topics of general interest that aren't emphasized in the undergrad curriculum and research at the U of A, such as dark energy and string theory.

The Haunted Lab, our major outreach activity for the fall, will be the evenings of October 28<sup>th</sup> and 29<sup>th</sup>. We'll set up nifty physics demonstrations, play with liquid nitrogen, and teach people. If this sounds like fun, please contact Ashley Stewart or Elaine Christman or add your contact information to the Haunted Lab wiki. We will arrange a training session for volunteers so they understand how to safely use and explain the demos.

The SPS lounge should be open soon. SPS members will receive an email when keys become available.

## Contact information

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