

Friday Night Stargazing

Public Nights at the Astronomy Teaching Observatory by Linda Watson



If you've ever contemplated the purpose of that funny little building on the hill southeast of the Physics building, you've found your answer! That's the Campus Teaching Observatory, where from 8:30pm-10pm every Friday night, the UF astronomy department holds Public Nights. We pull back the roof of the building and point an 8-inch Clark Refractor at the heavens. Not quite as dramatic, but still exciting, the observatory also brings out a few 8-inch Meade reflecting telescopes and a 12-inch Meade automatic reflector.

With these telescopes, Public Nights volunteers take visitors on a tour of the sky. In the fall, we typically point to clusters of stars such as the Wild Duck Cluster (M11), the Andromeda Galaxy (M31), planetary nebulae such as the Ring Nebula (M57), and of course, everyone's favorite binary star Albireo, or as many lovingly call it, the "Gator Star." This term of endearment was given to the star because the orbiting pair has one blue and one orange (well, almost orange at least) star.

As winter and spring roll around, the jewels of the sky come out: Jupiter and Saturn are amazing sights through the telescopes. One can see the bands on Jupiter, the Galilean moons (Io, Europa, Ganymede, and Callisto), and occasionally someone pledges that they have seen the Great Red Spot. Saturn is often thought to be one of those glow-in-the-dark stickers attached to the end of the telescope, but once the realization of seeing this majestic planet overcomes the whole sticker thing, we get many

exclamations of awe. One of my favorites, the Orion Nebula (M42), is also a winter/spring visitor. M42 is the nearest star formation region to us, and I can't even begin to tell you what a magnificent object it is to see.

Much observational research astronomy now relies on electrical equipment and computers to take and reduce images. Instead of looking through a telescope to find clues to the universe, we now get help from CCDs and IRAF. While these tools are great, it's sometimes nice to join the ranks of Galileo



Galilei and William Herschel and actually see the heavenly objects directly. Public Nights lets you connect to amazing physics with only a telescope between you and the stars.

Public Nights has lately been plagued by terrible weather, but as the semester wears on, it will likely be clearer more often, so definitely come out to see all these wonders for yourself. You can tell the volunteers whether you think Alberio is rightly named the Gator Star and get incredibly excited about a fuzzy blob that is actually a huge spiral galaxy 2.4 million light years away, harboring 300 billion stars. Bring a date, bring your roommate, bring your mom, all are welcome!

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UP is a monthly undergraduate physics newsletter sponsored by the University of Florida's chapter of the Society of Physics Students, for students, by students. We seek to strengthen the undergraduate physics community at the University of Florida by providing a forum for undergraduates to share their views and experiences with each other and acting as a source of information for opportunities and events in physics.

A Look Beyond the Classroom

by Youssef Faltas

Strange ideas in theoretical physics

Last spring semester, it was the time when the material in most of my classes was getting more and more familiar, and my interest in the topics was slowly fading. I was absolutely ready to read about something more interesting. I knew a little about General Relativity, so I thought I should go to one of the Theoretical Astrophysics group seminars here in the Physics Department. The speaker was Prof. Leopold Halpern, and he gave a talk entitled "Simple Groups and Gravitational Theory". I knew little about the Theory of Groups, but I hoped I could learn something new. Also, I wasn't familiar with the name of the speaker, but as it turned out, he was the last Assistant of Erwin Schrödinger, and after Schrödinger's death he became an assistant to P.A. Dirac. In case these names don't sound familiar to you, I assure you they will be after a couple of upper level undergraduate physics courses. In any case, I would be lying if I said I understood more than one third of the lecture, but I grasped most of the basic ideas. Halpern talked about his work on including torsion effects, sometimes called contorsion, into the General Theory of Relativity, thus enabling it to describe spin. General Relativity as Einstein formulated it only deals with translational motion due to the curvature of spacetime,

while torsion enables the inclusion of rotational motion (spin).

I wanted to find out if I understood anything at all, so after the lecture, I borrowed a book from the Science Library entitled Spin and Torsion in Gravitation by Venzo de Sabbata and C. Sivaram. To my surprise, I was able to understand a little more about the subject. What caught my attention was the title of one of the chapters: "Negative Mass and Torsion". Until then, I'd never come across the concept of negative mass in any of my courses or readings, and I think this also applies to most of you, so let me just introduce it briefly using ideas from the aforementioned book. First, neither the Special nor the General Theory of Relativity excludes the existence of negative mass particles. This is clear from the relativistic energy-momentum relation in which mass is squared, so negative mass is possible theoretically. I think you might as well open up your Modern Physics book if you want to follow these arguments. Note that we only get either positive or negative energy in the case of moving particles, but when the particle is at rest, the rest energy has the same sign as the mass. The author made it clear that Negatons, negative mass particles (as opposed to Positons, positive mass particles), are not related in any way to antiparticles, which have the same

mass, including sign, as the original particles, but other opposite sign properties, like charge or magnetic moment. He also made it clear that Negatons are not to be confused with Tachyons, particles of superluminal speed which have imaginary mass.

Another interesting property of Negatons that you might find puzzling is this: A positive mass source attracts both Negatons and Positons, and a negative mass source repels both Negatons and Positons. You can easily check this from Newton's law of gravity, which I am sure you are doing right now. You might think that this idea of repulsive gravity could solve, in some way or other, problems like dark matter or dark energy. However, as far I know, and of course I am no expert on the subject, the introduction of Negatons in the field of Gravitation has been unsuccessful in solving these problems. The rest of the chapter deals with topics like blackbodies of negative temperature with negative energy flux, and many more interesting ideas. If this very counter-intuitive idea of Negatons is to be proven wrong either theoretically or experimentally, it still shows the wealth of ideas, however strange, one can introduce, experiment with, and surprisingly sometimes utilize in theoretical physics.

So you want to do an REU...

by Cathy Yeh

Step 1. Sticking your toe in the water

Most REU application deadlines are not until February or later, but now is the time to start planning if you want to apply to any programs for summer of 2005. The first step is to visit the National Science Foundation website containing information on the programs: <http://www.nsf.gov/home/crssprgm/reu/>. For a list of REU subject areas and sites, click on the "Search for an REU Site" link. There are many fields from which students can choose. Some fields closely related to physics that have REU programs are "astronomical science" and "materials research." Look carefully through the listings in these other fields, because they also contain good opportunities in physics. For instance, the University of Florida has a physics REU program, but is only listed under "materials research."

Step 2. Choices, choices

The primary thing to consider when selecting an REU program is the quality of research you, as an undergraduate, can expect to do. I emphasize you because it is possible

that a professor who is doing great research may not be such a great advisor. Of course, having a great advisor is no use if a student does not put in the effort. Just skimming through student papers from past years (if they are available online) can be very informative. After research, some factors to consider include location, pay, and duration. For example, some exotic locales include astronomy in Hawaii or high-energy physics in Switzerland. Caltech's LIGO program pays a \$5000 stipend but doesn't include housing, while the University of Chicago pays a \$4150 stipend and includes housing. Most programs are around ten weeks long, but can vary from eight to twelve weeks (Kitt Peak National Observatory in Arizona).

Step 3. The Application

There is no standard number of sites to which a student should apply. Some people apply to one while others apply to ten. It's a good idea to at least have a "safety." More applications entail more work, and time is a precious commodity, so think hard

before you decide that fifteen is your magic number. It's also nice to have choices. Once you have made a decision, you need to ask for recommendations from your professors. These are one of the most important factors in your application, so take them seriously. One month's notice is good, two even better. Take into account the fact that you are probably not going to be the only one asking for a recommendation, and December can be especially hectic with finals and winter break. Professors are busy people—even busier than you or I (crrrazy!)—so make their lives easier by giving them all the materials they need to write your recommendation and plenty of time. A helpful site is <http://www.honors.ufl.edu/applicationprocedure.html>.

All this is just the tip of the iceberg, but don't let it scare you. It's really not such a big iceberg. For a little sweat, you can do good research, meet good people, explore new places, and get paid a cool three or four thousand. Good times.



Students gather in the SPS lounge for pizza after the October 18th meeting

photo by Chris Cook

SPS News & Events

At the October 18 meeting of SPS, Dr. Dorsey told us about the South Eastern Section of the American Physical Society (SESAPS) meeting that will be held in Gainesville in 2005. While he knows next year is at "t=infinity" for most of us, he would like us to start considering how we can help in hosting the meeting.

Dr. Dorsey also wanted to give a reminder about the Matthew Schreiber laser art show: "The Force." Schreiber was a physics student at UF before he decided on art. Held by the UF College of Fine Arts, the show will be open from November 19 through January 23. SPS members would be much appreciated in the set-up for this event, any time between November 9 and November 19. Contact Dr. Lee or Dr. Dorsey if you're interested.

Here are some other SPS dates that might interest you as well:

November 8: SPS General Meeting; Special Guest Matthew Schreiber

November 12: Physics is Phun show! Volunteers are welcome!

November 18: Deadline for the SPS T-shirt contest. The winner will receive a free T-shirt and a \$30 gift certificate to Olive Garden. All entries are welcome and I think it is safe to say that the nerdier the design the better!

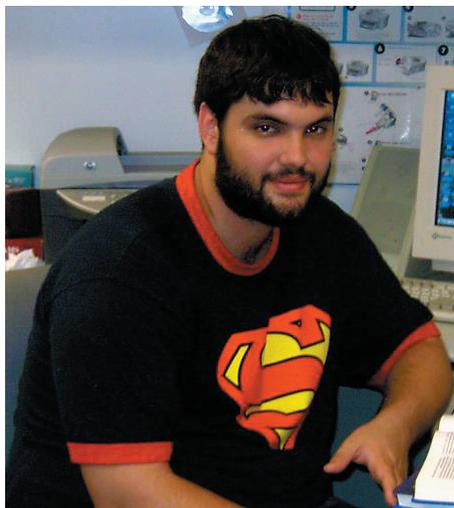
Preparing for the GRE

by Katherine Keller

We, the staff of UP Newsletter, thought a little insight into preparing for the Graduate Record Examinations (GRE) might be useful as the exam dates draw near. So we interrupted University of Florida senior Eduardo Calleja, as he was reviewing an old GRE exam, to find out how he was studying for the big test.

Calleja is a physics major who is currently doing research with Dr. Lee on the properties of He3 at low temperatures. He is taking two graduate level courses this semester and has lofty goals for his future as a graduate student. With plans to apply to Stanford, MIT, and Cornell, Calleja is looking to get top scores on the GRE. The University of Colorado at Boulder, one of his safe schools, had applicants whose GRE physics scores averaged 698 in 2000-2001.

Calleja is planning on taking the GRE on November 13th this fall. He says he chose this date because it gives him time to take the exam again if needed and still get his scores in to graduate schools on time. He is preparing for the exam by rereading his modern physics text book, taking the available practice exams, and



attending review sessions led by faculty members. He explains that these review sessions are extremely helpful since the faculty can often demonstrate easier ways to do problems. He also finds the practice exams to be a valuable aid to studying when taken like the real exam, saying, "I think it's much more effective to go through the exams and see where my weaknesses are."

All in all, Calleja seems to think that his education at the University of Florida has prepared him well for the future. About his undergraduate experience, he says, "I was really happy with the physics department here...they really care."

Scooting in Pleather Pants

by Amruta Deshpande

We're deep into the fall semester now and the days and weeks are blurring from repeated visits to the physics building. Last time I was there, I was cozy in pajamas doing Quantum Mechanics on the SPS couch. To break from this routine I did something a little out of the ordinary. Saturday, I left the physics building behind in a cloud of dust as I raced away on a 5 horsepower scooter clad in pleather pants and a black bandana.

I was on 24 hours of borrowed scooter time, thanks to a generous soul, and not a second of it was to be wasted. Saturday was my Christmas morning and I had a shiny new toy to flaunt. Everyone I knew was in for an unexpected thrill, and drivers on the road for an unexpected sight. I rode all around town fluttering a bandana and that shiny pleather, while trailing a line of cars and trucks. I pulled alongside Corollas and Accords, gave the scooter a raise and then whirred off to my destination.

It was all about the straights, bumps, twists and turns. If you want to get in touch with the animal in you, keep on a straight and experience how a dog feels riding in an open car window. Feel the wind swishing through your mouth, through your teeth, and hang your tongue out to dry. Feel the tears flow out in a line behind your ears, pulling at your eyes, begging them shut. Or for a less intense ride, just putter about swaying in the wind, bathing in the cool, crisp breeze. Either way, some eye protection in the form of snazzy shades is highly recommended. It's nice to be able to keep your eyes open to see the road given that a crash might help one realize one's dreams of flying.

I was able to realize my dream of flying without having to crash, thanks to pesky speed bumps. Broad speed bumps spread out and called to us, begging to be used as ramps. The key to getting



maximum air was to know just where on the bump to accelerate and to find the right speed with which to encounter the bump. Apparently this physics brain just doesn't know how to rest. Once I had the key, I was flying like a bat. A friend and I discovered an abandoned road lined with speed bumps every 50 feet or so. Every driver's nuisance was our playground. Sure enough, every 50 feet I heard a high pitched "woo-hoo!" from my friend in the back every time she was lightly tossed in air.

Being the driver, my pleasures lay not over bumps, but on turns. Zooming, zig-zagging, and leaning into turns was the best part of scooting. I could have been one of those bike racers who knee their turns, stretching the limits of balance. While scooters don't allow for such mean turns, a friend came rather close. He angled us close enough to the road so that if I bothered to reach out I would have felt asphalt rushing by at 20 mph. Here's a fun new way to look at the world from a different angle.

"I feel like I'm in a video game," said another friend. We were scooting in the openspaces behind plazas where shapes of buildings and roads approached us as trapezoids and triangles instead of rectangles and crosses. There were many little islands strewn about posing

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as obstacles in our way. There were also hilly spots that made our stomachs flip. There was always the occasional car that came speeding around a corner, trying to avoid traffic on the main road to keep us alert.

In addition to all this good fun, there are benefits to having a scooter. For instance, you'll save a ton on gas given that it gives 80 miles to the gallon. I filled up the gas tank and was only down a buck forty-five. It's perfect for routine tasks, and won't make you feel guilty if you take it out on an occasional spin. It's maneuverable and allows you to make full U-turns between rows of parked cars. No dead-end will ever be cumbersome again. Plus scooters are fairly cheap to buy as far as vehicles go. One payment will probably grant you full ownership, and if you get a 50 cc (5 hp) scooter, the law will even spare you the pain of registration. They're safe, assuming you don't decide to ride it down a flight of stairs or something, and plenty fun. Just think, I would have never worn pleather pants had it not been for this scooter.