undergraduate physics newsletter

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PROFESSOR SPOTLIGHT

Dr. Amlan Biswas

by Larry Camarota

Question: What do radiative processes, manganites, and the X-men have in common?
Answer: All are interests of Assistant Professor Amlan Biswas.

Professor Biswas, while not the oldest member of the UF faculty, has lead an interesting life. He grew up, both physically and educationally, in India. He has done research both in India and in the United States. He has noted some differences in working in India and in the United States. While at the Indian Institute of Science, he noted that the physics community was really close knit. Everybody knew each other, and it was not uncommon for the physics building to still be full at 3 or 4 in the morning. While doing research at the University of Maryland and here, he noticed that the physics community is much larger, but not as close. Additionally, he noticed that things get done quicker here, which he credits to American professionalism.

Professor Biswas earned both his Masters and PhD at the Indian Institute of Science. While there, he did a lot of research with low temperature manganites. At low temperatures, manganites exhibit very strong ferromagnetic properties. The ferromagnetism of these manganites tends to be stronger than most ferromagnets.
These manganites also have one direction of electron spin. As a result, these manganites could potentially be used to replace the magnets in a computer hard drive reader, for a much faster reading, and much clearer signal.

Currently, Professor Biswas is performing research in both ferromagnetic and antiferromagnetic properties of manganites. While doing research at the University of Maryland, he found the first direct evidence that manganites can be both ferromagnetic and antiferromagnetic. Now, he is trying to find perturbations that convert manganites from one state to the other. One use of this would be in magnetic Liquid Crystal Displays. If you are interested in his research, you can find information on the Biswas group page at http://www.phys.ufl.edu/~amlan/researchintro.html.
If you are interested in working on this research, then talk to professor Biswas, or one of the students already working on the project. Professor Biswas prefers students who have completed advanced lab I.

However, research isn't all that professors ever do, and Professor Biswas is no different. While at UF, he has taught Mechanics I and II, and currently teaches Physics I. One of his favorite parts of teaching these courses is the demonstrations that are possible. When he was still taking classes, his favorites were radiative processes in astrophysics, and general relativity.

Being an Assistant Professor is hard, and takes a lot of time and effort. However, physics has been a hobby and a love of Professor Biswas' from a young age. His advice to anybody thinking about a career in physics teaching, "It looks hard, but if you are interested, that interest will carry you through." He still has time play on a soccer league, and work out, as well as watch the television show 'Heroes'.

who we are

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.

SPS Meeting

Monday, March 26th

6pm in NPB 2205

with a presentation by Dr. Clavelli from the University of Alabama

FREE PIZZA

what's UP

in this issue

CAMARDA DISCUSSES COLUMBIA CRASH

by Amruta J. Deshpande

Tuesday, February 2nd was a real treat for students and professors alike at our neighboring Aerospace Engineering Building. Here, the aerospace department hosted a special speaker: Astronaut Charles J. Camarda, who spoke on the Columbia Shuttle investigations. Deputy Director of Advanced Project for NASA, Dr. Camarda achieved a two-fold purpose of inspiring students and informing faculty with his speech. He met with students at 9:30 and at 4 pm gave his talk. The talk was encouraging as it presented successes resulting from diligent effort toward careers and multi-million dollar investigations with closing remarks about the social scientific habitat.

Dr. Camarda's educational and research track was referred to as a model for undergraduates to follow as it contained a balance of both research and higher education. He began research in the summer at NASA Langley as an intern, and then proceeded to find work that agreed to subsidize his graduate studies. Through this experience he decided to go into research and has since built an impressive resume beginning in a TPS position, and continuing to administrator, astronaut, special projects, space flight, and finally his current position as deputy director.

He opened the talk by commenting on the importance of researchers as people. Quoting a colleague, he said, "People are the Prime Resource," in an effort to guide students in the audience. Later on, he would address social aspects of scientific work and its impact on lives.

His most recent adventure was the return to flight mission, STS-114, which was the final test for solutions obtained from the Columbia Shuttle investigations. On this mission they tested some repairing procedures by repairing panels and seeing how well they withstood re-entry into the atmosphere.

Since the recovery of shuttle fragments (40% recovered), efforts focused on determining damage done to the leading edge of the shuttle wing by foam impact. The leading edge is made of reinforced carbon-carbon (RCC) panels, which is a strong material whose impact resistance was unknown. Consequently, impact testing commenced.

Upon confirming that vacuum impact yielded same results as measurements at atmospheric pressure, tests were first carried out using small pieces of foam shot at small square pieces of RCC. At 400 feet per second (fps), there was not much damage, but material gave way at the expected shuttle speed of 700 fps.

With these tests complete, a real scale finite element model was undertaken to model the shuttle leading edge under foam impact. This is an enormous computational task, and it confirmed the results of the small scale testing on the actual scale model. As a final touch, scientists decided to test an actual panel (at cost $1 million per panel). A pressurized tube shot foam at 700 fps and the same breakage pattern was observed. Confident of these results, scientists proceeded to make modifications and discuss repair techniques.

Foam was first removed from the bipod region from where it fell off on Columbia. Then, re-entry conditions were also modeled for an RCC panel with cracks and it was determined that cracks grew allowing excessive heating of the region inside the wing's leading edge.

Solutions included re-caulking observed cracks in space using newly designed caulking guns, and plugs for larger cracks. The plugs were a concern as during re-entry flow would break over the discontinuity between the edge of the plug and the surface of the shuttle and cause excessive heating. STS 114 astronauts took cracked panels up into space, repaired them and came back safely. The integrity of the caulking material is now under investigation, while the repair procedures were deemed successful.

Finally, Dr. Camarda referred to a book which was a case study on the social causes of the Challenger crash. He emphasized that students should have faith in their knowledge and speak up to their supervisors if they are concerned about any safety or other matters. The talk ended with emphasis on openness and courage, as well as good news such as the total low cost of the shuttle investigation (<$30 million).

RESTAURANT REVIEWS

by Joe Gleason

Backyard Burgers $5 - $7

West side of 34th street just south of Archer Road

Being a fan of the Schlotsky's franchise, I had largely ignored what new establishment took the place of the Archer road location when Schlotsky's sadly closed its doors a couple years ago. Recently though a colleague mentioned a new place he liked called "Backyard Burgers" and in describing its location to me it became clear that this must be the business that parlayed the iconic red brick building of my favorite sandwich maker. Putting my nostalgia aside, I gave it a try and with pleasant results. My first impression was that the prices were very reasonable, $5.00 for a sit-down-restaurant-sized burger and soda is cheap these days. Just as its namesake suggests the burgers have the same extra-charred taste you may remember from you last camp out barbeque. Sadly, I cannot say the same about the fries that, regardless of which version you get, will be battered (a practice that should be outlawed). This aside however I feel as though a need has been filled in Backyard Burgers, seconded only by the absent 'Hardees', for an alternative to the much too popular lower rung of pocket-sized prepackaged burger makers.

Joe's Place $9-$20

South side of 39th Avenue about ½ a mile west of 43rd Street

Having no affiliation with this reviewer, Joe's Place actually makes the trifecta for the owners of Steak and Pasta Works, and Grillmasters; the latter of which you may have seen in a past review. Although you will find the same drab and uninspired décor as the other two partners I am pleased to say they got the food right on this one. Joe's place is arranged as half sports bar, half restaurant. It boasts a small but well stocked salad bar and steaks that can compete with any others in town. Upon my first trip to Joe's Place I tried the rib-eye (my old standby), which I considered superior to that of the overrated and overpriced Outback Steakhouse. Recently I also sampled their prime rib roast for which, just like its other two partners, there is a weekly special (around $9 with a side and salad bar). It was more average than great but at a price that leaves you unable to complain. If you live close by, Joe's Place could become a habit.

ERIC HELLER OF HARVARD GIVES VIBRATIONS TALK

by Stephanie Lewkowitz

Dr. Heller relaxed a bit as he heard himself commended for his good reputation and high citation record. He was always nervous before giving this particular talk, because it was, in effect, one of the greatest risks he took in regard to his professional career. With each speech he jeopardized his hard earned rapport and even his Harvard tenure in order to help implement the surreptitious motives of a secret society. A few of its leaders had approached Dr. Heller in private to make their case clear. Dr. Heller would be wise to contribute to their global movement, and in return Dr. Heller would gain deep insights into nature's truths.

The speech began calmly and cautiously. He offered to his audience a "table of contents" for the upcoming talk, which would be dominated by science, art, history, and mysticism; and while he made his innocent crowd laugh along with his witty inclusion of "inert ingredients," Dr. Heller inwardly calmed his nerves.

"Ok everybody," he enthusiastically addressed, "I'd like to tell you about a very special type of resonating device that each of you carries for as long as you live. Please raise one hand up to your cheek, draw your index finger under your thumb, and….ping ping ping!" As Dr. Heller flicked his stretched mouth, his audience joined his amplified drumming and filled the auditorium with sound. These were the personal Helmholtz resonators, and this was a key lecture tactic to ease up his participants for the crucial part of the ceremony.

Dr. Heller rubbed his hands together swiftly. "I would now like to tell you about an 18th century German scientist named Ernest Florenz Friedrich Chladni, who earned great renown during his days and was even invited to the court of Napoleon to show his fantastic discovery. In Napoleon's words, Chladni made sound visible, and now you will get to see what he meant!"

The metal plate, electronic signal generator, and amplifier were set up. The demonstration was projected on the overhead. Inert poppy seeds began to bounce on the plate as soon as steady waves were transferred to the system, and each time resonance occurred between the rising pitch and the vibrating plate, the poppy seeds collected in the nodes, and beautiful, clear geometric patterns were formed. The quiet crowd was awed. A handful of secret society officials silently oversaw from the back of the auditorium, pleased with the number in attendance. The changing patterns captivated the audience, quite literally, though this was unbeknownst to the onlookers. Each wide eyed participant was falling deeper into the potential well of the Cult of Vibration (the secret society). Each was becoming a harmonic particle of the threads that wove that Cult. A final high pitched tone rang out loudly.

"Pretty neat, huh," Dr. Heller asked, turning down the device. Then he went on to share information about other scientists, whose fascination in waves led them to make valuable achievements, including the acoustics of Wallace Sabine, the mathematics of Sophie Germain, and the atom transporting microscope of Don Eigler. Dr. Heller concluded by sharing some of his newest work, which artistically communicates the visual results of flowing electrons. All in all, the lecture was exciting for those who were listening. The students who attended the luncheon on the following afternoon mysteriously disappeared from the physics building for a solid three hours. When approached, Dr. Heller eschewed questioning and carried on as if he knew nothing. Hence, Dr. Heller finished without disclosing his true purpose, and the Cult of Vibration earned about 300 new lifetime members.

CRYOGENICS: *the coolest class around*

by James Stankowicz

Cryogens play an integral part in areas ranging from magnetic imaging to rocketry to ice cream making (if you're an SPS member), and refrigeration in general has had such an all encompassing impact on humanity that the only way to truly appreciate it is to pause and think of where we'd be with no A.C., no ice on demand, no refrigerators, and on and on.

Superfluid liquid helium flows with no viscosity. This allows it to display quantum wave properties on a macroscopic scale – one of the only substances known to do so – one might say it is currently a hot topic in quantum physics.

The Microkelvin Lab is the coolest place in the universe. Seriously. With the average temperature of space somewhere around 2.7K, the milli-Kelvin and micro-Kelvin temperatures produced just next to the Hub are in a league of their own.

Every time you walk around campus, you're walking on top of several kilometers of piping used in UF's helium recovery system – a system that serves as a model for universities across the country.

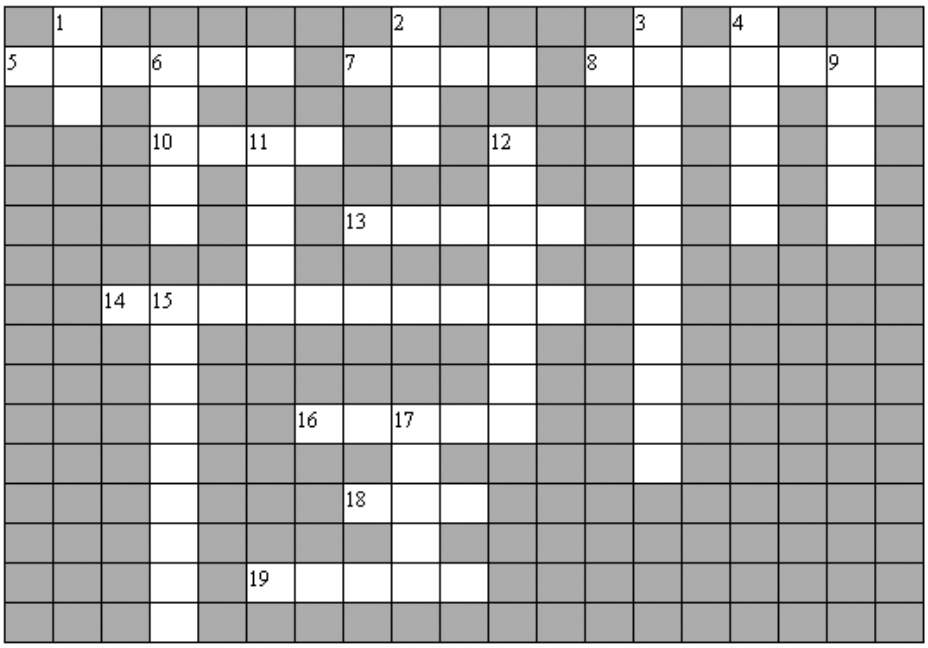
All these factoids come straight out of the material covered in Cryogenic Engineering (PHY4550/PHY6555C), a split undergraduate and graduate course taught by Dr. Gary Ihas during the Spring semester. This is a three-credit course scheduled to meet two periods Tuesdays, and one period Thursdays. The department says that the course requires two semesters of chemistry, two semesters of physics, and partial differential equations – although personal experience has been that P.D.E. isn't particularly useful, and some background in quantum mechanics and thermal physics goes a long way. If you're interested in taking the course but don't meet the requirements, talk to Dr. Ihas and chances are you can work something out. There are no exams, and the percent breakdown goes: 40% for class participation, 10% for homework, and 50% for a 10 minute presentation on a library-research paper each student gives at the end of the semester at the 'Cryogenic Mini-Symposium'. The book used for the course is somewhat expensive – but it is the hottest seller on the market.

The lectures are done from Power Point, and it is one of the few science classes where that is actually a satisfying medium. The aim of the course is different from many other undergraduate physics courses in that the point is not so much learning how to solve problems (although there is a little of that) as it is to get a good foundation in the history and basic principles of making stuff cold. Homework is assigned every two weeks or so, and Dr. Ihas uses the assignments as material in class, which ensures variety. For instance: one assignment was to write a few pages (in the three-ish range, but including pictures) on a cryogenic disaster, which Dr. Ihas presented in the 'safety' section of the course. Finally: there are field trips. The first was a tour of the cryogenic facilities on campus. Later Dr. Ihas has one planned to the MicoKelvin Lab, and one at the end of the semester to the National High Magnetic Field Laboratory in Tallahassee. Be forewarned, though: as an undergrad you're expected to finance your own way.

This is a fantastic upper level class to take in the physics department. So long as you put in some time and effort, there should be no GPA strain, and, more importantly, it covers the coolest materials in all of physics. (I apologize for the abundance of puns, but, what can I say? I think they're cool.)

PHYSICS CROSSWORD

compiled by Steven Hochman



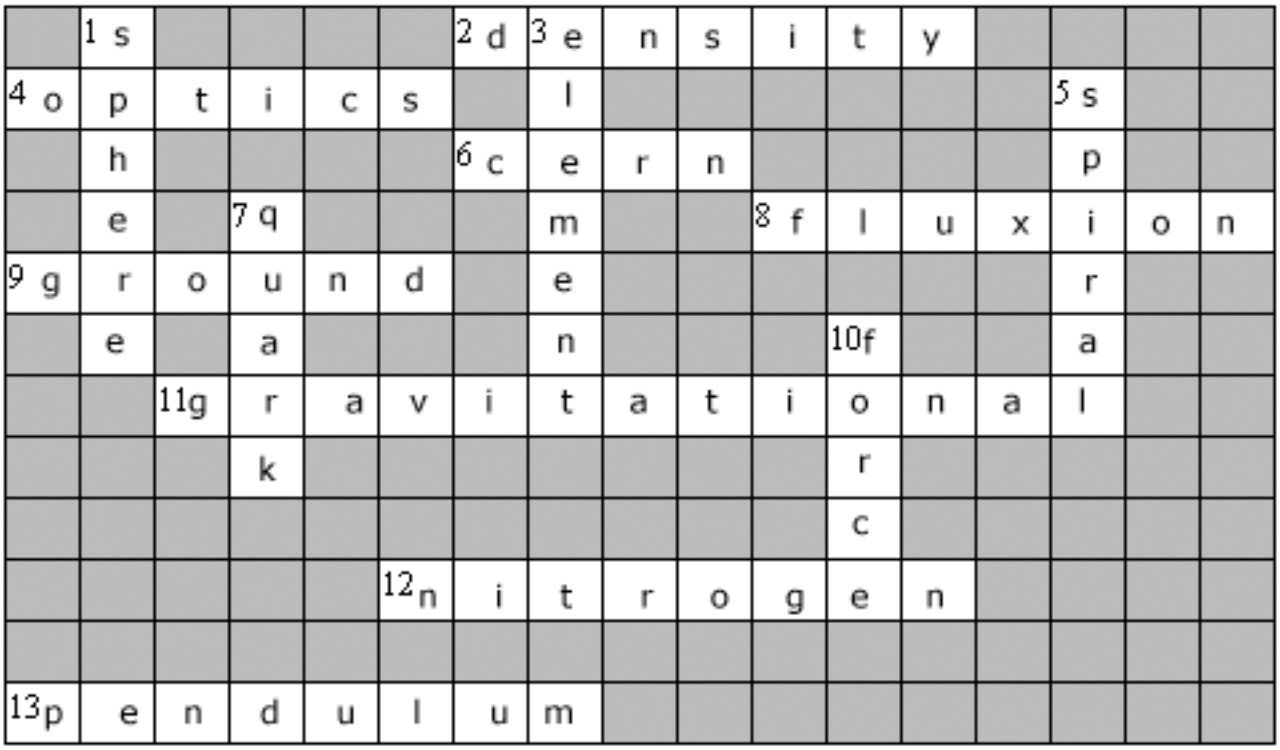
ACROSS

5. Tense, _____, Tensest
7. _____-particle duality
8. a more furry series
10. measure of dropping potential
13. here lies Heisenberg: _____ (Did you read the last issue?)
14. this index equals 1 in space, more than 1 elsewhere
16. wave parameter used as input to the sinosoidal function
18. will present exciting news in April re: gravity
19. unit of speech equaling one word per year; named for mathematician

DOWN

1. before and after: Dude,you're getting a _____ operator!
2. catholics have it, photons do not
3. direction of wave oscillation
4. proved Poincare conjecture
6. the number of temperature puns that appear in the cryogenic course review
9. e^i*pi + 1 = 0 identity
11. created from bouncing many photons off mirrors
12. type of wavelength used for massive particles
15. why you can't have two Paulis in the same room
17. greek letter, decay

Answers for Last Month



CALL FOR WRITERS

UPNews is always looking for undergraduates who want to contribute. If you'd like to get involved, e-mail us at upnews@phys.ufl.edu (no experience necessary)