

# The Great Physics Student Survey

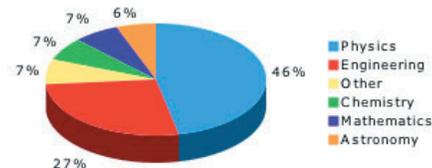
by Katherine Keller

Well it's here. The moment you've been waiting for. The results of the first ever UP News survey are in. **One hundred and forty-one** of you were kind enough to fill out our little survey, and UP News would like to thank you all. A few of you were even generous enough to leave us an odd comment. On a side note, we would like to scold the 19 of you who only filled out one side of the survey. And now on to the results!

Better ingredients really do mean better pizza. **Papa John's** would be thrilled to learn that it garnered the most votes for physics students' **favorite pizza joint**.

Over **60%** of physics students are planning on getting their **masters degree and/or doctorate**. **Thirty percent** of you will be going to **graduate school for physics**. We certainly are an ambitious group, and good luck to you all.

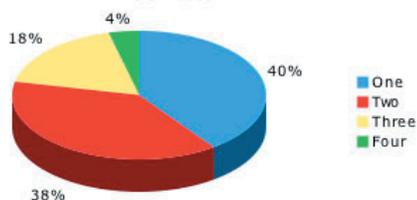
Majors of Physics Students



While **13** people did say that they had **contemplated moving into the SPS Lounge**, even more didn't know what the Lounge was. So here you are: the SPS Lounge is a room where physics students can hang out and study. It's located in room 2229 on the second floor of the New Physics Building. Stop in and say hi sometime!

For those **34%** of you who lose sleep at night **wondering what Hilbert Space**

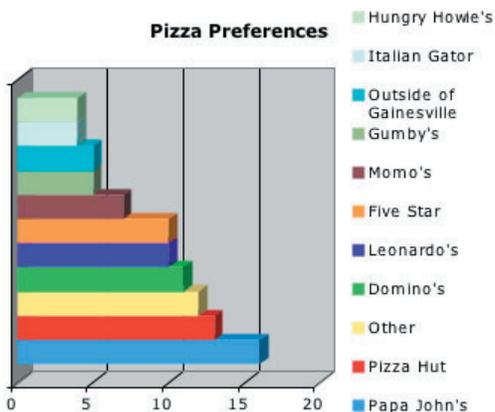
Number of Physics Courses This Semester



**is**, you will have to keep wondering. We had intended to include an article on this elusive topic in this issue, but cheer up, there's always next month.

It is generally accepted that about 20% of the population is left-handed but only **12.5%** of those surveyed **favor their left hand**. Apparently there is a shortage of lefty physics students. There is also **one ambidextrous** student among us. Perhaps there is a scholarship available for that?

Pizza Preferences



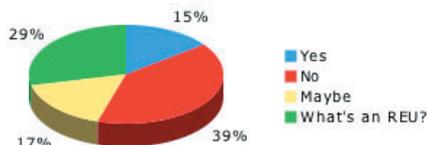
If a physics student were **part of a smore**, he/she would be the **chocolate**. I'm sure this symbolizes something, but exactly what it symbolizes has yet to be determined.

A note for the small number of you who claimed to have never used the

**physics bathrooms**: you are definitely missing out. **Forty-four percent** of physics students wouldn't mind **eating lunch in there** or perhaps trying some **frictionless experiments**.

**Thirty-seven percent** of you are involved in **research at the University of Florida** and fewer than **15%** are **applying to an REU** for this summer. If you're one of the **28%** who **don't know what an REU is**, that's Research Experiences for Undergraduates.

Applying for an REU this summer?



And now for the most important statistic of all: how many of you actually read UP News. **Thirty-two percent** of you **don't know what UP News is** and therefore will probably never know what became of that weird survey you filled out. **Fifty-one percent** of you will **read a newsletter if you come across one**. And our most devoted fans, those who **read every issue and visit our website**, make up **17%** of those surveyed.

## what's UP in this issue

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**SPS News: UF chapter of SPS awarded Marsh White Award for second year in a row through a proposal drafted by Linda Watson**

## 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.

# Professor Spotlight

by Erica Bolin

Khandker Muttalib

I recently had the chance to sit down with Dr. Khandker Muttalib for a discussion about his life and recent experiences teaching PHZ3113 – the infamous Introduction to Theoretical Physics course – where you learn the mathematical tools you'll need for the rest of your physicist life.

UP: So, I read online that you did your graduate work at Princeton, what made you come to Florida?

**M: The job. That's it.**

UP: So, what's made you stay here so long; you've been here since '87?

**M: It's grown to be a very good department, particularly condensed matter, where I work. Peter Woelfle (currently at U. Karlsruhe, Germany) was given the charge to build the Condensed matter group and I was his first recruit. Since then the group has really grown, and the department has grown.**

UP: So, tell me about your research in Condensed Matter, what's it all about?

**M: The main focus is what we call mesoscopic systems, which is somewhere in between the microscopic world and the macroscopic world. So, in microscopic physics you have a few number of particles, and you would like to know with as much accuracy as possible what each individual particle is doing in the system. In a macroscopic system, you have a large number of them, so you don't care what the individual particles are doing; you are happy with the average behavior. In fact, it's not yet possible to calculate each individual particle, but it's not important. It's basically irrelevant; the average properties are good enough. Mesoscopic systems are macroscopic in the sense that they have a large number of particles, but the average behavior is not good enough to describe the system. In fact, what happens is that the fluctuations or deviations from the average behavior is so large that oftentimes it is those rare events that happen with small probability that might dominate the whole property. So, physicists know a large number of tools to handle both the microscopic and the macroscopic worlds; we don't have many developed tools in the mesoscopic world. So, we know how to calculate average, maybe invariance, maybe a little bit of higher moment, but we don't know how to calculate distributions, for example – nobody does. These systems provide a challenge to actually develop those tools, and then try and understand what the real world looks like. That's what I mostly work on. I also work on how electrons**

**will propagate in a medium that is not macroscopic, but a mesoscopic system. You can actually make those systems in the laboratory. With nanotechnology, they're real – they're not artificial.**

UP: Ok, so it's not just theory?

**M: Right.**

UP: What would you rather be doing? I mean, if you had to choose between research and teaching?

**M: Well, research is what I do and teaching is what keeps me sane (laughs). Otherwise, I think...well, it's (teaching) rewarding. And there are so many frustrations in research that if you do only research, you will lose your sanity.**

UP: So, your favorite part of teaching would just be...your sanity?

**M: Well, yeah, students keep me honest and straight. It's really rewarding to have good students in your class; they teach you a lot also.**

UP: So, how long have you been teaching Intro to Theoretical?

**M: Four or maybe five times. Four times I think**

UP: So, what classes did you teach before that, and how did they compare?

**M: They usually let you teach the same course for three years. Then they rotate. I taught some graduate quantum mechanics course early on, then some of these large lectures downstairs, which are not actually teaching. I've also taught modern physics for undergraduates and this one (Intro to Theoretical), this is my favorite. This is a fun course. I think basically because only the best students take it, so they are all motivated and eager to learn. All you have to do is keep them busy. The rest is just fun.**

UP: When you were an undergraduate, what was your favorite course to take?

**M: Oh, that's a long time ago, I think I've forgotten. I did my undergraduate at Dhaka University which is in Bangladesh and we didn't have these semester systems; it was a three year course and then you had one examination after three years. Yeah, I don't even remember what the courses were, but all physics courses seemed fun. I think we still had Resnick and Halliday, the original version.**

UP: So, can you estimate how many papers you've been published in?

**M: About fifty-five.**

UP: So, what was the very first time you got your name on a paper?

**M: I believe it was built on my masters' thesis, actually, from Dhaka University. I didn't know anything about the paper, I just punched in numbers, tried to calculate something, and eventually, my professor said ok, it's publishable. That's all I know about that. The next one was my Ph.D thesis, and that's something I**

**worked on for four years on, very hard. It's a good feeling, but once you have published more than fifty, it's not as exciting.**

UP: Do you ever dream about physics?

**M: I think that's the only thing you dream. (laughs) Well, the only thing that you remember that you dream. Probably you dream many other things.**

UP: Is it like frustration, or is it like you've discovered the secrets of the universe, or what?

**M: I think it's mostly about the problem that you are thinking, and bizarre aspects of it that have nothing to do with the real world. But it tells you that your brain is subconsciously active on that particular problem. Everybody, I think, dreams of dreaming the solution of a big problem. I think everybody dreams, but not the solution—I don't think. (laughs)**

UP: So, what got you into physics in the first place?

**M: That's the only thing I could do, actually. I was bad at everything else. I don't know. I was not good in art, I was not good in music, I was not good in other things.**

UP: If you could be anywhere else, doing anything else, would you want to or what would it be?

**M: This is a fantastic job, and a good secret, I think. To do what you like to do and someone else pays for it. You don't get this anywhere else. (laughs)**

UP: Is there anything else you'd like to say; any advice you have for undergraduates, or anything?

**M: I've taught this mathematical physics course for four years, and I'm extremely happy with the type of students that we've had. I think that they are not sometimes challenged enough, but I have seen that if you challenge them enough, they are up to it. They will do a very a good job. They actually appreciate it; have you seen my 'prize trophy'? That's from the class of 2003. That's a real appreciation; I really like teaching that course.**



*Dr. Muttalib beside his "prize trophy," a cartoon replica of himself by a chalkboard that reads "Physicists call it intuition, Mathematicians call it random guessing" from his fall 2003 PHZ3113 class*

# UP News Celebrates First Birthday

.....by Cathy Yeh

## *Requisite self-indulgent rambling intro*

I originally intended to write about Hilbert space. If you filled out one of the UP surveys earlier this month, you might recall the question, "Do you constantly wonder about Hilbert space?" Well, it is comforting to see that 34% of my physics colleagues are similarly harassed by that question. Misery—or, in this case, ignorance—loves company.

After following a sequence of mathematical keyword links that threatened to continue ad infinitum on Eric Weisstein's MathWorld website and learning that what physicists refer to as "Hilbert space" is really "L2-space", and a Hilbert space is a Banach space, but the converse need not hold, etc. my brain began to flash its low battery warning, so I thought I should postpone the quest for enlightenment for another day/month/year/what-have-you.

In short, why write about Hilbert space when I can write about UP's first birthday?

## *Reflections*

It has been a year since UP News published its first issue. By the way, it's not "U-P News", but "UP" as in "what's UP in this issue" (yes, we delight in corny phrases). In the feature article, we interviewed physics major Becky Gorla about her incorporation of science into her volunteer work with the Girls Club of Alachua County. In addition to articles reviewing *Solaris* and recommending a programming class, we began our four part Undergraduate Advisor Spotlight series, which informed readers of matters of not-so-critical importance but great interest, such as Prof. Darin Acosta's favorite sport (cycling) and physics hero (Richard Feynman).

The staff that started the newsletter is still here...all six of us: Erica Bolin, Amruta Deshpande, Rahawa Haile, Katherine Keller, Linda Watson, and me. Considering the guy-to-girl ratio in the physics department, the staff seems to be suffering from curiously low levels of testosterone. But "suffering" is the wrong word. Working with the UP staff over the past year has been truly enjoyable, and the absence of the hairier sex has been less a source of grief than amusement.

We have been thankful for the support of our faculty advisor, Prof. Yoonseok Lee, and the sponsorship of the Society of Physics Students. Of course, we are most thankful

to you, our readers. It is you who gives life to our newsletter. We are grateful for the kind comments that have come our way. Maybe you don't know just how much your words mean to us. I'm especially glad to hear from the staffers about readers commenting specifically on their articles e.g. Rahawa and her Star Trek article (vol2 issue1) – I guess community really is something that Trek fans cherish – and Amruta's account of her pleather-panted scooting adventure (vol2 issue3), which has elicited quite a humorous response. We even have a self-declared number one fan, Chris Cook.

## *The Future*

Putting out the newsletter every month is only possible with significant contributions from each staff member. We would like to expand our staff. Especially needed are more writers, a photographer, and an assistant webmaster to maintain the online version of the newsletter. Joining UP News is a good way to get involved with the physics department and keep your English skills from atrophying away entirely. We also would like more outside submissions from undergraduates. The articles from guest writers have been excellent, and we look forward to seeing more.

Linda is graduating this semester, and the rest of the staff will follow suit eventually (we hope), but even after the original staffers have all gone, we hope UP News will remain. So if you are interested in getting involved, get in touch with us—either in person or email! We would love to hear from you.

## *And now on to the festivities!*

### *note:*

If there are any enlightened undergraduates out there who would like to bring the rest of us out of the dark about Hilbert Space, by all means come forward and submit an article to UP. We will publish it and possibly prostrate ourselves at your feet in awe and admiration.



# Tips on Attending a Scientific Conference

by Linda Watson

So, I went to the American Astronomical Society meeting, held in San Diego, CA in January. Suspecting that other scientific conferences are much the same, here are some things I figured out:

Don't be too nervous if you are giving a presentation or poster. Although it didn't hurt that I had a banner essentially saying "I'm an undergrad, don't yell at me!" emblazoned upon my nametag, most people who came to visit my poster listened intently as I explained my project and were more than willing to give useful advice and comments after I finished.

Keep track of the talks or posters you are most interested in seeing, but also make sure to randomly stop in on a few talks or pause at a few posters that have absolutely nothing to do with anything you have ever worked on.

Go to at least one talk a day where you understand a good third of the words in the title (sanity is actually quite nice).

Most importantly, as an undergraduate, you are expected to seek out the best free stuff on the very first day of the conference, compare notes with other undergrads that night, and search and obtain anything you might have missed on the second day. Then be prepared to cram all this newly acquired loot into your bags for the return flight, without concern for the strange looks you will undoubtedly encounter from fellow travelers when you are standing in the security line with ten posters, a ruler, some magnets, holographic postcards, and stickers. These askew glances should be the least of your concerns, however, since they can be remedied by simply explaining your research. Usually leaving anyone within a four-meter radius with that glassy-eyed look, you will be able to quickly dodge through the crowd. And finally, once you are back home, make sure to display your treasures for all to see...on your backpack, on your door, whatever works. Oh, and never forget to try out the ice cream if you are visiting a new place.

# Thirsty for Fluids?

.....by Amruta Deshpande

Fluid mechanics is a subject with which undergraduate engineers are well-acquainted, but undergraduate physics majors not so well. Traditionally, it is the study of continuum dynamics. It is mainly a macroscopic field which has its roots, as thermodynamics does, in microscopic elements. While mention of engineering subjects in general may not raise the interest of a physics major, fluid mechanics is a subject which deserves attention. The physics curriculum introduces undergrads to most of the major physical phenomena - electromagnetism, thermal, mechanics, waves, quantum mechanics, optics and various topics in modern physics. Fluid mechanics, however, fails to make any explicit appearance. To understand why, I poked and prodded and asked our physics professors a few questions. Turns out this subject isn't shy at all in the physics community and is one of the oldest topics of investigation.

Fluids have been investigated for as long as thermodynamics has been. In the early part of the twentieth century, fluid mechanics was a regular part of the physics curriculum. It was a follow-up to thermodynamics in which continuum aspects of the same macroscopic systems dealt with in thermodynamics were explored. The later part of the century saw a shift in the sequence of all macroscopic study to thermodynamics and statistical physics (macroscopic and microscopic studies). The middle of the century also saw the difficulties in solving the major equations, which were nonlinear partial differential equations. Whether or not this difficulty influenced the removal of fluids from the curriculum or not, investigations were definitely put aside for development of better computing techniques. Many people sat to the task of developing computing to allow further research to continue, Von Neumann, who is well known for his work in quantum mechanics, included.

With new computing software, fluids investigations came back to the physics scene, and the field broadened. What fluids studies go on in physics today? Fluids studies today look into things like flow characterization, pattern formation, and fluid behavior of granular systems. Applications land in the fields of biophysics, chemical physics and small scale physics (microfluids). Granular systems, like sand, flow just like fluids do, but are fundamentally different from ideal fluids in that, like bouncing balls, bouncing sand particles lose energy. Microfluids also challenge the ideal fluid assumption by approaching the

scale of differential volume elements, and thus behaving more like granular systems. A most interesting study is that of "Kitchen Physics". A term coined by professor of realogy in the engineering department, it refers to a study of non-Newtonian fluids. These are materials (such as polymers or loose dough) that behave like fluids at low speeds, but soon fall apart at higher velocities.

Patterns are HOT HOT HOT! Heating fluids, flowing fluids, fluids with different-shaped objects moving through them lead to all kinds of patterns which are easy to see but difficult to model and understand. Fluids are also used to help visualize predictions made in nonlinear dynamics. There are also applications in space physics. The recent findings of the Mars Rover, which show flow patterns indicating possible water flow, are soon to be under investigation. Engineers and physicists will compare notes to determine whether the flow was caused by a liquid, or by something else of a granular nature. Applications may not be endless, but are numerous.

So with all these hot topics, why isn't there a course to teach students the basics of fluid mechanics? Turns out we are not so much in the dark. While we may not get all the information in one package, we have learned many concepts already, along with basics which help derive the underlying calculations for fluids. We all have encountered drag force and pressure problems that highlight fluid statics. Furthermore, most of us have covered Bernoulli's and Archimedes' principles. We cover particle dynamics in our mechanics courses, which help lay the basic laws that apply to small volume elements of continuous fluids. We learn a little more in electromagnetism about vector fields (analogous to flow fields). All that remains is to put it together and slap a title on it, which we will do in graduate school.

For those who wish to delve further into fluid studies at the undergraduate level, there is a good introductory course, "Fluid Mechanics," offered by the engineering department. It uses a book of the same name as the course title that is comparable to the commentary of Dr. D. J. Griffiths in clarity. It is a good course that will help determine your interest level in the subject and thus help you get an early start on your research and future career.

Sincere thanks to the following physics professors for their discussions which contributed to this article: Profs. James Dufty, Selman Hershfield, Stephen Hill, and John Yelton.

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### Submissions

We welcome your news! Please  
send submissions to  
upnews@phys.ufl.edu by the third  
Monday of each month



Photo Credits: Leilanie Merrill

On January 11, 20, and 21, members of SPS, John Mocko, Drs. Henri van Rinsvelt and Robert DeSerio, and others volunteered to get kids excited about science. In this physics department outreach activity, the kids were given a tour around the exhibits on display in the lobby. The plasma ball and parabolic sound dishes were especially big hits. Over three hundred kids passed through the lobby within those three days. Talk about big science!