

The Dilated Times

The newsletter of the Drew University Society of Physics Students

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Editor: Elizabeth Bendler (Whoops, I mean Bannon)

Physics Department Welcomes Dr. Laurie Morgus



Perhaps you have seen her wandering the halls of the Physics Department, or sitting in her warm space-heated office next to Dr. F's. Perhaps you are

even lucky enough to have her teaching your introductory physics (non-calculus based) class or your intro lab. Either way, Professor Laurie Morgus's presence as the new professor in the department is well-known.

Professor Morgus began in the field of physics at Moravian College in Bethlehem, Pennsylvania, where she did her undergraduate work. She actually was not sure that she wanted to continue with physics after college until she took part in a summer program at Lehigh University called Research Experiences for Undergraduates (REU), and had a great time doing research in molecular physics. Be-

tween 20 and 30 students were invited, and were given housing and a generous stipend for helping out in the lab. Professor Morgus highly recommends taking advantage of similar opportunities, especially during the summer between sophomore and junior year. She found the experience helpful as a way of clarifying in which branch of physics she was truly interested and wanted to continue in, as well as an excellent opportunity to meet other physics students. In fact, she enjoyed the program so much that she decided to go to Lehigh for her graduate studies as well. Today, her area of expertise is Atomic Molecular and Optical physics (AMO), for which she periodically attends conferences. However, Professor Morgus tends to concentrate more on atomic and molecular physics rather than optics, which is evident in her PHD in molecular physics, and her current

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It's not too late to endow your very own lab chair for the Advanced Lab!

Eight Drew alums and friends have already taken advantage of this unique opportunity to have a named chair as the physics department moves to replace the original wooden lab stools with new, comfortable, and ergonomic lab chairs. Student reviews of those already in service are extremely favorable. Bring back your memories of A-Lab and make your Drew contribution now directly to the needs of the physics department before these chairs are all taken.

Thanks to our initial investors: Ashley H. Carter, Thomas Zielinski, 2004, Steven Gausepohl, 1992, Charles B. Schoening, 1985, Barney Pezzuti, 1985, Barry Fenstermacher, 1969, Bob Fenstermacher, 1963, Leonard C. Feldman, 1961



Name: _____ Year: _____

Address: _____

E-mail: _____

To endow a laboratory chair, send this coupon and a tax-deductible check for \$200 (yes, lab stools actual cost this much) for each chair made out to "Drew University Department of Physics" and mail to:

Dr. Bob Fenstermacher, Department of Physics, Drew University, Madison, NJ 07940

Mid-year Goodbyes Rock Department

Woodward to Return to Lehigh

Coming to Drew, I knew exactly what I wanted to do. I came for physics, although the physics department didn't know it yet. My first great physics class in a long line of them was with Dr. F and was a blast, only making me feel better about my decision to come to Drew. Soon I was officially signed up for the major, attending Dr. F's Physics picnics, conferences and various talks, but that was only the beginning.

My first summer of research I came to a building of rubble and construction, where I spent the first week helping make additions to our telescope. Upon the completion of the construction, a fellow student and I helped design an experiment for the New Jersey Governors School. Soon I fell into place as a research assistant and a physics major, a place I would stay for the next couple of years, spending summers and free time during each semester in a dark room running and watching equipment. Do not worry however, your eyes will get used to going from dark to light every fifteen minutes eventually. It was there that I learned

the intricacies of physics research, in which a task you expect to take the shortest amount of time always takes the longest, and some of the most difficult problems are solved immediately. Every day brought a new challenge to be faced, but made each day interesting as well.

In addition to the research, my favorite part of being a physics major was tutoring intro physics courses a couple of nights a week to groups of 2 to 13 students. This was rewarding on many levels, although thoroughly challenging as well. This past summer a Dr. McGee and I went to Lehigh University for research, where I acquired a small taste of what graduate school would be like. This year I have brought the research back from Lehigh, which I hope will open up more research opportunities to our

students. I enjoyed my summer work so much that I've decided to go back and apply to Lehigh for this spring as a PhD. prospective. I will never forget my experiences at Drew University, but inside and outside the physics department. Thank you and farewell.

Nate Woodward

Surreal Thoughts with Christina

Graduating seems almost unreal to me. I honestly thought I would never make it this far. Part of me is still waiting for the registrar's office to call and tell me I have some missing credits and I'm not really leaving Drew. These past 4.5 years have been very unpredictable for me. I entered college with no direction and no idea what I would do here. I somehow stumbled across Dr. F's How Things Work class and signed up. It turned out to be such a cool class, I signed up for Physics 11 not knowing what I was getting myself into. Somehow or other I ended up declaring as a physics major. I'm not going to lie; I probably ask myself everyday what I was thinking. I realize that I could have picked a much easier, safer major. I wonder why I'm in the library while my 5 roommates are partying. I constantly wonder if physics is just too hard for me.

Then I realize how lucky I am that I picked physics. Yes, it is hard, but it's doable and everyone is willing to help you. It is far more interesting and satisfying than any other major I know of. Every day we are let in on some of the secrets of the universe. And, how good does it feel when you get the right answer after hours of scribbling down ideas on your paper, or when you finally get a lab to work? I don't know that I would get that satisfaction elsewhere. And come on, after all this I get to tell people I majored in physics. How impressive is that?

This is all great, but the best part of being a physics major at



Drew is the family I have become a part of. I honestly believe that I would have given up if I weren't at Drew. The professors and students are constantly helping me. I can never remember a single time when someone was too busy for me. I have had many, many hard times in my 4.5 years that everyone helped me through. When I was sick in the hospital everyone made sure I knew that they were thinking about me. Dr. F even came to see me bearing a giant Minnie Mouse balloon. When I returned all the professors helped me make up material over the summer.

I'm relatively certain that this does not happen at your normal college. If you haven't figured this out yet: talk to the professors. They are amazing and have an endless amount of knowledge to share with you. Their doors really are always open even if you need to talk about things that have nothing to do with physics or school. I know I've probably cried in each of their offices more than once about God only knows what.

I'm not sure what I will be doing when I leave. I plan on finding a job and hopefully starting a career. Hopefully life will somehow lead me down a fulfilling path like the one I stumbled upon at Drew. I want to thank all the professors for not letting me give up. I also want to thank all the students for helping me and letting me get to know you all. And remember, if I can do it, you certainly can. (Dr. F will back me up on this).

Christina Conzentino

Win a Physics Department T-Shirt!

Do you have what it takes? Solve the problem correctly, and you'll be entered to win a physics t-shirt!!! Winner and answer will be published in the spring. Thanks to Dr. Morgus for helping to initiate this! Good luck!

While home for Thanksgiving Break, you decide to go to the mall to purchase a birthday present. The road that leads to the mall has a steep hill. Suddenly a cat runs across the street in front of you. You immediately slam on your breaks, which leaves huge skid marks 60 feet long on the street. Fortunately, your car comes to rest in the nick of time and the cat makes it safely across the street having lost one of its nine lives. Although shaken, your mind focuses once again on the task at hand—to get that birthday present at the mall. However, a tap at your car window breaks your train of thought. The person tapping on your window is a policeman who claims that you were speeding.

You find the policeman's accusation to be questionable so you begin to think about the situation. You determine that the street makes an angle of 10° with respect to the horizontal and that the coefficient of kinetic friction for rubber tires on dry pavement is 0.4. Furthermore, the owner's manual for your car claims that your car weighs 1200 pounds. A witness to the event tells you that the cat weighed 10 lbs and took about 4 seconds to cross the 20 foot wide street. If you weigh 140 lbs and the speed limit on the street is 25 mph, should you challenge the ticket?

Rules: One winner will be picked at random from correct submissions. Students, whether past, present or future, are encouraged to submit solutions. Send answers to Dilated Times T-Shirt Contest, c/o Dr. Robert Fenstermacher, Drew University, Madison, NJ 07940.

Who said that???

"I almost killed someone with a hammer once"

Dr. F. during a lecture on electricity

Carra: Can I still call it a photocopier?

Dr McGee: No, don't ever say that.



Need Some Money? Ask Dr. McGee!



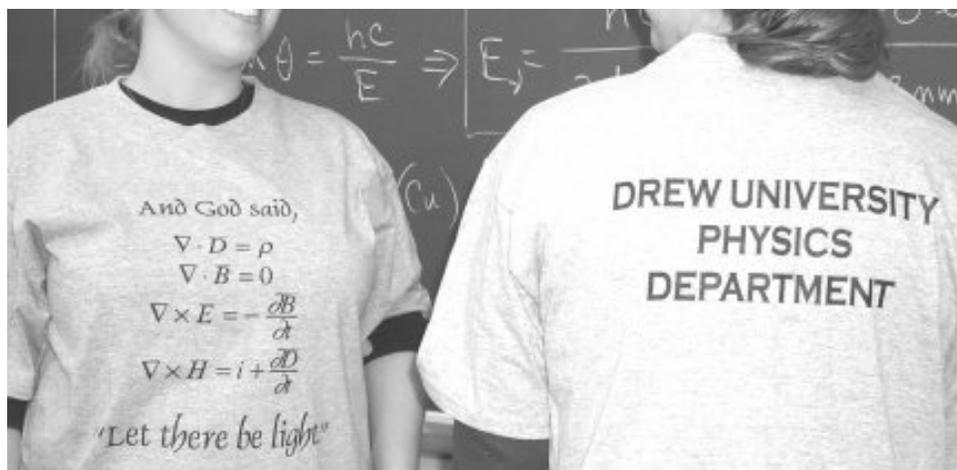
After spending the summer putting together a research proposal to the National Science Foundation, Dr. David McGee was delighted to find that his work had paid off. Over the next four years, Dr. McGee will be receiving a total of \$340,000 in grants from the NSF. "I'm ecstatic for having received this", he commented.

The funds will come in the form of two separate grants, which are going towards Dr. McGee's continuing research with optical applications of organic polymers. The project has been ongoing for approximately seven years, and over that time he has collaborated with numerous chemistry and materials science departments in this model of interdisciplinary research. Currently, he is working with Dr. Alan Rosan of Drew University and chemists from both Johns Hopkins University and the University of Wisconsin. Together they hope to create an organic polymer that can be used for applications in fiber optic communications but is cost-efficient as well.

"Even though fiber optic components are commonplace, they are still very expensive, which motivates a lot of our research," McGee stated. The polymers being tested come in the form of

dyes imbedded in a host polymer. They are synthesized by McGee's chemistry and materials science collaborators and then optically characterized at Drew. The eventual goal is to create a dye that is inexpensive, reliable, and easy to fabricate in a variety of geometrical configurations.

An essential component throughout the project has been involvement of student assistants. At least ten Drew physics and chemistry students have contributed to the optics lab research since the project began, and this was cited by the NSF as one of the factors for why Dr. McGee received the grant; "We heavily advertised the undergraduate input in our proposal, and that was noted as one of the reasons that the project was funded. I'm actually in the hiring mode for a student who's looking to contribute to the project; someone who could join for more than a semester would be great." McGee notes that a Drew student participating in the research will work with faculty and students from a variety of graduate-level institutions, and will gain valuable exposure and contacts sure to be useful in post-Drew life. Any students interested can contact Dr. McGee at dmcgee@drew.edu.



"A NEW SLOGAN: DOUBLE
BLINDINGS MAKE GOOD
FINDINGS! SPREAD IT
AROUND!"
NATE WOODWARD

SPS Election Results!!!

President – Jacquelyn Haynicz
Vice President — Rebecca Keith
Activities Coordinator – Paul-Michael Huseman
Newsletter Editor – Elizabeth Bendler

Welcome Dr. Morgus

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example, Dr. Fenstermacher knows the sort of schools Drew students have gone to for their graduate work, and which ones students have been most happy with, while Professor Morgus is perhaps more familiar with what being an undergrad today is like. She also mentioned that being a woman, she helps the Drew physics department appeal to female scientists, as it is important for the faculty to represent all aspects of physics.

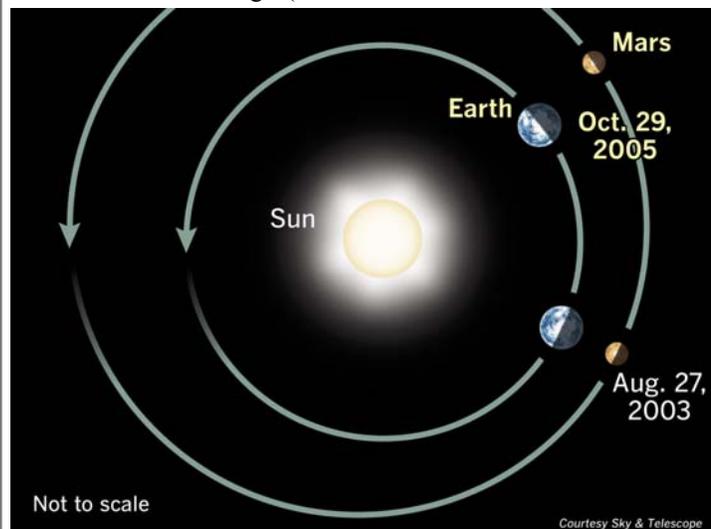
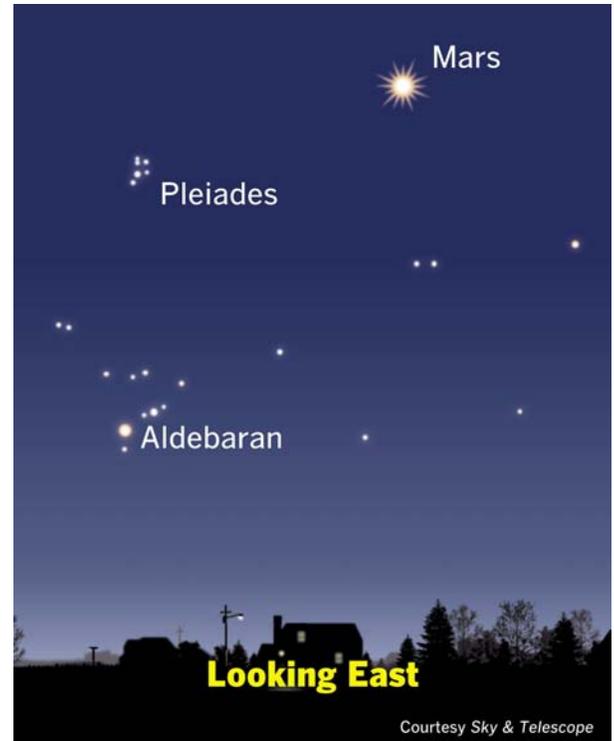
In addition, Professor Morgus has plans to become more involved with Drew students one-on-one. Next summer, the demonstration prep room (the room next to the main lecture hall used for large classes) will be converted into a new lab. Professor Morgus will use this lab to work on her research project in atomic physics, and is currently looking for students who would be interested in helping out in the lab. She hopes to run things in her lab in a similar manner to how things are run in Dr. McGee's optics lab, where students could work on independent study or honors projects. Currently, she is not sure when the lab would be completely ready for use, but if students are interested, they can help her set things up. Also, this summer while the lab construction is in progress, Professor Morgus has suggested that any student interested in doing research with her can work at Lehigh, in the REU lab where she herself worked as an undergrad. Although her old advisor is still working in that lab, the students would be primarily working with her. So definitely let her know if you are interested in any of the above options! Also, for those who are not interested in research in the near future, Professor Morgus will be teaching Introductory Astronomy II: Stars, Galaxies, and the Cosmos in addition to the second semester of non-calculus based introductory physics and its corresponding labs, and is always up for a chat in her office. So now that everyone knows a little more about "that new professor", let's give Professor Morgus a warm welcome!

Laura Barclay, '08

Mars in Opposition

The skies of this summer and fall are presenting us with a great opportunity to observe the planet Mars up close and little bit personal. The orangey colored planet is the fourth from the Sun, in the next orbit beyond Earth. When it is in opposition it forms a line with the Earth and Sun, being directly behind or opposite to the Earth's nighttime hemisphere. Given the period of each planet's orbit, oppositions occur a little more than two years apart. These are the times that the two planets are closest together and of course visible to us all night in our nighttime sky. It's also true that the orbits of the planets are elliptical and that means the distance between the two planets at opposition will vary depending on the distances of the Earth and Mars from the Sun at that time. In 2003 Mars came as close as 34.7 million miles from the Earth, the closest in 60,000 years. This opposition will bring it to within 43.1 million miles on the evening of October 29, making its angular disk size in the sky about 20 seconds of arc, and its magnitude -2.2. It will not appear this large again to us until the summer of 2018. This opposition also has Mars traveling higher in our nighttime sky than in 2003, farther above the light pollution near the horizons and making for better visual contrast and stability of the telescope image. While 20 arc seconds is not huge (the diameter of a

penny at 620 feet), the disk is large enough in small telescopes to see features on the planet such as darker surface regions and polar ice caps. While watching it this week



and seeing a large dark triangular region in one hemisphere, I thought of Sir Percival Lowell in the early part of the 20th Century staring at the same planet and then sketching out all those canals that he imagined he could see. The Earth has now sent robotic emissaries to Mars many times with incredible images coming back mapping most of the surface. Sadly no canal network was found and we continue to explore for any signs of life on the planet, intelligent or otherwise. If you have a small telescope, take a peek during the month of November before its size becomes too small again for any features to be seen. Let your imagination run wild!

Dr. Bob Fenstermacher



Jackie and Rebecca Go Political



Courtesy of SPS National Office

“end of physics”. We also spent a portion of the day broken up into smaller committees on the topics of physics education research; publications and communications; ethics recommendations from last year’s Congress; under-represented groups; and ComPADRE, The Nucleus, and the Scholarship Clearinghouse. The committees will continue to work together through the year. The day was a bit tiring (I’d never taken part in a twelve hour meeting before!), but interesting and enjoyable nonetheless.

Saturday morning we met in the hotel for a wrap-up to our meeting from the previous day. The

discussion focused mostly on stimulating activities for SPS chapters, especially making sure every zone was having a zone meeting. Then, we were handed a tote bag full of physics treats and descended on the Mall in D.C. to spread physics joy in the form of physicist trading cards, key chains, World Year of Physics pins, and “rainbow glasses”. We also had a chance to visit the museums and monuments, and I definitely recommend a stop at the Einstein memorial next time you are in D.C. It is possibly the most photogenic statue ever! We ended the evening with dinner at a nice restaurant in D.C.

To those who will be SPS members next year, I strongly encourage you to run for the position of AZC. It is an all-expense paid, wonderful experience, and we need keep up the Drew tradition!

Jackie Haynicz, ‘06

From September 22-25 I had the pleasure of taking part in the Society of Physics Students National Council Meeting in Washington D.C. Each year, one student is elected to the position of Associate Zone Councilor to represent each of the eighteen zones of SPS. Drew University is in Zone 3, which is made up by New Jersey, Delaware, and about half of Pennsylvania. This year I was fortunate enough to follow in the strong Drew tradition of winning this seat. Besides attending the conference, the main responsibilities of an AZC are to facilitate communication between SPS chapters and encourage their involvement in SPS activities.

The council meeting began on Thursday night with dinner and ice breakers. It was interesting to meet physics students and faculty members from all over the country and to learn the differ-

ences and similarities between our chapters. I was especially surprised to learn that several chapters had plans to build a trebuchet, which Ali Steele and some others had been begging to build a few days before at our fall picnic.

On Friday, we had a day-long meeting at the American Institute of Physics during which we discussed and made decisions on many SPS matters. I was surprised to learn that the dues we pay to SPS cover only 10% of its actual costs (the rest is largely funded by AIP). Also, recent years have seen a decrease in SPS membership despite an increase in the number of physics majors. We discussed (and discussed and argued about and discussed) the theme of the next SPS and Sigma Pi Sigma National Congress, which will be held in 2008 at Fermilab, eventually deciding on a combination of “physicists as citizens” and the possible

teacher. What are the odds?? Well, okay. Maybe he’s having a hard time in physics? No. He’s twenty-eight, and he’s complaining about a teacher from years ago. On the first day the teacher used that old scare tactic: “Look at the person on your left. Look at the person on your right. Of the three of you, one will pass this course.” Mike was one of the two who didn’t. Mike gives me some background: “I did all the homework. I went to the T.A. I got help. I attended every class.” Then, “On the first test I got a seven. Seven! Out of a hundred.” The professor told him to learn physics from a tutor first, and

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Free Drinks for Physicists

So, here I am writing about what happened to me a mere three days ago, and every word is true.

I walk into a bar in Hoboken to hear open-mic blues. It’s a cool system: musicians put their names on the blackboard, and the host calls five or six names and those people jam together. I’m listening partly because I want to gauge how long it will be before I am ready to step up. I’m guessing a couple of years yet; these guys are good.

I’m alone, and I sit next to a stranger. His name is Mike. He introduces himself, and starts complaining about his physics



Notes From the Outside

Increasing a Kernel of Knowledge



It all started at the APS conference in Minnesota in 2000. My graduate school advisor Dr. Daniel C. Hong had gone to one of the conference's general talks. Dr. Hong was an outstanding theoretical physicist. I was always amazed at how easily he could model very complex situations with the simplest of models, usually explaining how the system worked qualitatively. He was always trying to apply physics and its theories to everyday observations of the real world. Something at this particular talk had inspired him to think about applying thermodynamics to various cooking processes seen in the kitchen.

At about 10:00 pm, just when we were returning to our hotel room, Dr. Hong asked us if we had ever thought about popcorn. Joseph Both, Dr. Hong's other graduate student, and I were not sure what he was trying to ask. Sure we had thought about it. Every time we were watching a good movie, but never much more than that. This began a discussion on how popcorn could be modeled as an adiabatic expansion. Dr. Hong was quite convinced that using this thermodynamic model, it was possible to predict an increase in size of the popped kernel. We discussed it for about an hour and then went to sleep, never thinking the discussion would lead to anything.

Two weeks later, Dr. Hong talked to Joseph and me in the hall and mentioned a paper he was thinking of writing. At the time, I was nearing the conclusion of my thesis work at Lehigh University, so Dr. Hong continued working on the theory behind increasing the size of the popcorn with Joseph. Together, they wrote a paper that theoretically predicted an increase in the size of the popped kernels by simply lowering the surrounding pressure. The paper was published in *Physica A* (*Physica A* 289 557(2001)) in 2001.

After submitting the paper, the summer was approaching, and Dr. Hong had a summer student assigned to him through the REU program at Lehigh University. Dr. Hong, Joseph, and

I had talked about who would supervise the summer student as well as what we would do with them. That's when Dr. Hong suggested we try building an apparatus to qualitatively prove his theoretical prediction, that popping under low surrounding pressure will increase the size of the popcorn. Joseph and I didn't think it was going to work, but Dr. Hong was insistent that an effect would be observed. We all agreed that it would be a decent project for a summer student to work on. So Joseph and I set about working with our machinist, Joe Zelinski, to design and build an experimental testing apparatus.



Joseph spent most of the summer working directly with the new apparatus and supervising the summer student. After little to no success on the project, Dr. Hong asked me if I could work with Joseph and try to figure out what was going on. At first, Joseph and I just thought that Dr. Hong was unwilling to accept the inevitable, that the real world system was too complex to be explained with his simple adiabatic model. However, we began to think and come up with some ideas to make the apparatus work. It was clear to both of us that the method of heating was extremely important in determining how the popcorn popped. In the experiments run during the summer, the popping was done simply by placing the kernels on the bottom of the pot, dry without any oil, and letting them pop. When a

run was completed, many of the kernels were dry, burnt or asymmetrically popped. We figured this was due to the uneven distribution of heat to the side of the kernels touching the pot bottom. Trying to make the distribution more even, we manufactured a metal grid for the inside of the pot that would raise the kernels off the bottom while minimizing the amount of metal touching the surface of the kernel.

Joseph and I still had our doubts as to whether this would work, but we decided to give it a try anyway. When we did our first run, we were amazed to see that the apparatus actually worked, and visibly quite well. We started by running a sample of about 100 kernels at atmospheric pressure. This produced one cup of popcorn with about 20% of the kernels left unpopped. When we hooked up the apparatus and removed the pressure, we suddenly had two cups of popcorn with less than 5% of the original sample left unpopped. It was quite exciting to actually see Dr. Hong's simple model proven correct in a qualitative sense. Because of the success of changing the heat distribution, we decided to try another more common method used by most people. We decided to cook the kernels in oil and see how they were affected by removing the air pressure. Sure enough, the same result was observed. The volume was more or less doubled with a significant decrease in the number of wasted kernels.

From this point on, we decided to design a specific regiment of tests and document our findings to the scientific community. Dr. Hong achieved a lot of press coverage on this subject, but did not want to write anything up until a complete set of experiments was performed. We were even interviewed by the T.V. program *Discoveries and Breakthroughs in Science*. As the fall semester of that year wore on, Joseph and I both got busy with our thesis work, and the popcorn project was put on hold for quite a while. Joseph and I both went on to get our PhD's, and the apparatus sat in the basement of the

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Kernel

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physics building. Two years later, Dr. Hong became ill and unfortunately passed away. While going through his office after the funeral, I happened upon some old notes of his referring to the popcorn project. After reading through what we had done, I decided to take a look in the basement to see if the apparatus was there. Sure enough, there it was, sitting and collecting dust. I had just recently been employed at another university, Kutztown University, also in Pennsylvania. I decided that when I started teaching in the fall, I would finish the experiments that we had designed and publish the results. So from a small idea and a late night conversation, this project grew and led to a publication in *Physica A*.

Dr. Paul Quinn
Professor Quinn is an Assistant Professor of Physical Science at Kutztown University in Kutztown, PA. He graduated from Drew in 1994.

Free Drinks

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then try the course again the next year.

Having already confessed to being a physics professor, and having asked that he not take out his anger on me, I tell the simple truth: "It's not that way at Drew. We all teach as helpfully as we know how. People help each other. And courses aren't curved. If everybody does well, everybody gets a good grade." Mike yells to the bartender, "Christine, get this guy a drink." Whadda ya know? A free drink in a bar for simply trying to teach my best.

When I get home, I tell all this to my wife. Her advice is that I keep going to this bar. Maybe god is speaking to me through this bar. My wife thinks the message is excellent: Teach as helpfully as I can.

I'll try my best. I swear.

Dr. Jim Supplee

Career Corner

Sooner or later, your teachers (or your parents) will ask the question: "Well, what are you going to do with your life?" To which the correct answer is: "I'm going to be a physicist". How does one get to do physics for a living? There are many, many ways that would take up the rest of this issue to discuss. Perhaps the most obvious consideration is whether to obtain advanced physics training through graduate school, or to enter the workforce directly after your bachelor's degree. Statistics indicate approximately half of physics bachelor degree recipients enter the job market after graduation. So, how exactly does one enter the job market with a BA in physics?

An excellent place to start is the American Institute of Physics. The AIP has a membership of over 100,000 and is the representative professional society for physicists. Note that we're not talking about merely physics faculty at universities- AIP provides a broad spectrum of services for physicists doing pretty much anything with their physics degree. High school teachers, scientific patent attorneys, and medical physicists are just a few examples of professionals who can find excel-

lent career resources at AIP.

College-level physics students should start by looking at "Who's Hiring Physics Bachelors?", which is a state-by-state searchable list of the employers who have recently hired new physics bachelors degree graduates. It shows the variety of companies that hire physics bachelors and offers an introduction to some of the opportunities available in your state. You can find this popular resource at:

http://www.aip.org/statistics/trends/emp_trends.html

AIP has also pulled together a collection of information for undergraduates and physics bachelor's recipients, including a look into the skills that physics bachelors are using in their work, typical salaries, initial employment paths, status 5 years after graduation, and much more. You can find this information at:

<http://www.aip.org/statistics/trends/career.htm>

Of course, don't forget about one other resource- your friendly neighborhood physics department. Drew physics faculty come from an unusually diverse range of career backgrounds, so talk to us!

Dr. Dave McGee

My, What Busy Students You Have!

This summer, six of our students were fortunate enough to participate in summer research around the country. From Long Island to Kansas, the topics were diverse but all had one thing in common. The experiences were both extraordinary and fun!

Welcome to the State of K



I spent this summer in Manhattan. No, not that Manhattan. Manhattan, Kansas, known to its residents as "the Little Apple". I learned two things very quickly: 1) eastern Kansas is definitely not flat! and 2) while most Kansans have heard of vegetarians, they have never experienced one in person. So, you might be wondering why I chose to summer in the middle of nowhere, home of 100 degree midnights, and more tornado warnings than I could count. The answer: to try my hand at physics education research, of course! I had the pleasure of working with Dr. Sanjay Rebello in the Kansas State University physics department as a part of the Summer Undergraduate Research Opportunity Program (SUROP). Throughout the program I felt I

was treated as an equal with the actual graduate students and was given a great deal of autonomy and authority, as well as a crash course in a really interesting field.

The aim of physics education research is to improve the teaching and learning of physics. My research focused on whether exploring the topic of electricity within the context of common electrical devices would make learning more enjoyable and more productive for introductory physics students. In Phase I, of the research, we asked students which electrical devices they found interesting and to explain the functioning of those devices. A wide variability in devices cited by the students was observed, with students focusing mainly on electronic devices and usability. In Phase II, we investigated introductory physics students' conceptions of the functioning of a blender, and introduced demonstrations to help develop a mental model of an electromagnet motor. In addition, I consulted undergraduate physics majors and faculty to gain a wide view of the effectiveness of the

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demonstrations. In the future, the demonstrations will be modified based on the findings from Phase II and then tested in a class setting.

I thoroughly enjoyed both the people I worked with and the project I worked on at K-State. The experience helped me to decide that I would like to pursue physics education research in graduate school. I doubt there is any better way to decide what you would like to do in life than to jump right into a field that interests you for a summer research experience.

Jackie Haynicz, '06

Guiding Waves



Last summer I spent 10 weeks at Lehigh University completing a research experience for undergraduates. I was joined by Dr. McGee in the optics lab at Lehigh. I worked with LiNbO_3 , a crystal which responds to ultraviolet light waves to create waveguides. Waveguides are used in modern day communications and someday might replace electronic circuits in many devices such as computers. I learned a technique for creating waveguides as well as testing them. The testing technique involved Fabry-Perot Etalon theory. It was a rather successful summer, leading to exciting research that I am continuing here at Drew, and hope to continue as I head off to graduate school next year.

Nate Woodward, '06



Would you like a "Big Mac" with your ions?

My work this summer was through an REU at Stony Brook University which proved indispensable to my education. This REU involved work in relativistic heavy ion interactions at project PHENIX at Brookhaven National Laboratory and photocathode production using cesium iodide evaporation in high vacuum.

One of the detector upgrades planned for the PHENIX experiment is the Hadron Blind Detector (HBD). The HBD detects the Cherenkov light produced only by high-velocity electrons, hence the term "hadron blind". The light detector uses a novel technique that is part phototube and part wire chamber. By evaporating a thin film of cesium iodide onto a gas electron multiplier (GEM), a non-charge sensitive photo-

detector will have been created. The major difficulties in creating such a detector involve maintaining a clean environment, evaporating under the proper vacuum conditions, transport from evaporation area to detector assembly, and mass production.

In order to produce the quantities necessary, and in order to ensure that the proper conditions are upheld, the "Big Mac" scattering chamber in the Nuclear Structures Laboratory will be converted into a multi-purpose evaporation and quantum efficiency test station. As a preliminary measure, a small scale apparatus was developed to test the feasibility of achieving high quantum efficiency in such a large vessel. The overall purpose for this small system is to provide proof of principle for the larger apparatus. The quantum efficiency of small test samples were measured at Brookhaven National Laboratory and adjustments to the system were made as necessary.

Megan Linzey, '06

Hallo, Guv'nor!



This past summer I did research within the Drew Summer Science Institute and I was a counselor for the New Jersey Governor's School in Sciences, held here at Drew University. For the DSSI I studied information theory with a concentration on the mathematics of data compression. Working along with Dr. James McKenna of RISE, my research partner and I first learned the fundamentals of discrete probability theory. This was necessary because all of data compression and information theory is rooted in probability theory. With this necessary background we were able to understand the probabilistic nature of information theory, as developed by Claude Shannon. This probabilistic view allowed us to understand the nature of lossless compression algorithms, and the mathematical proofs of the optimality of specific algorithms, most notably those of Huffman and Lempel-Ziv.

As a counselor for the Governor's School, I was both friend and taskmaster to the Scholars, the 100 best science students in the high school class of 2006. Over the course of four weeks beginning in mid-July, I TA'ed a Physics of Microscopy Lab, taught by Dr. Miyamoto, a Modern Physics course, taught by Dr. Fenstermacher, and I led a team project in archaeology, headed by Dr. Masucci.

This was a tremendous experience because I plan becoming a teacher, and the Governor's School provided me with a crash course in teaching, even grading papers. There is nothing quite as fun as being a nerd at Nerd Camp.

Paul-Michael Huseman, '07



Knitting SOCKs with your ComPadre's

This past summer I spent 6 weeks in College Park, MD working at the American Center for Physics as an SPS intern. As an outreach/policy intern there were 2 main projects that I worked on; the Scholarship Clearinghouse and the SPS Outreach Catalyst Kits. SPS wanted to provide a scholarship clearinghouse geared towards physics majors on The Nucleus, www.compadre.org/student/ which is part of the National Science Digital Library Program that is funded by NSF. The scholarship clearinghouse would join the Summer Research Opportunity Clearinghouse, which had already proven successful. I spent most of my time finding applicable scholarships to be posted on the Nucleus.

Searching for scholarships was my main assignment but I also spent time working on the SPS Outreach Catalyst Kits. These kits were developed by SPS to help SPS chapters start outreach programs. The SOCKs contain sample lesson plans, giveaways, and toys to use for demonstrations during an outreach event. Another intern and I had to develop an interesting way to include a way to celebrate the World Year of Physics as well as order and organize the contents to be included in the SOCK. We also organized and analyzed data from the previous year's SOCK. Through my internship I was able to meet House Representatives, a Nobel Laureate, and do outreach for the first time. Though it did not include a lot of physics it was a remarkable experience.

Rebecca Keith, '07

Let Me Engineer You



I was fortunate enough to be invited to participate at an international competition at Princeton University, more specifically the lab of Dr. Ron Weiss. Dr. Weiss is a synthetic biologist and the competition was also in the field of synthetic biology. What is synthetic biology, you ask? The goals of synthetic biology include learning about biological

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systems from the ground up. To do this, we applied engineering concepts to our systems to produce novel behavior in cells. What was a physicist doing in a bio lab, you may be pondering? Well, I was not the only physicist there. Dr. Weiss is an electrical engineer by degree. In fact, I've found that the engineering concepts I learned over the summer are appearing in my classes now.

For my project, we attempted to develop a strain of yeast that would play Conway's Game of Life, which is a simple population dynamic simulation. To do this, we had to take genetic sequences from many different locations and put them together. While we hadn't much success by the end of the summer, I learned a tremendous amount about new ways of looking at biology and have been invited back to continue my research in my spare time.

Additionally, as this was a competition, I spent this past weekend at MIT presenting my results to the other 12 schools. I'm not yet sure of the results of the competition, but I can say without doubt that I already feel like I've won, for the experience has truly changed my life.

Elizabeth Bannon, '06

Upcoming Events

November 11: Science Day

Come meet Dr. Morgus and see how Dr. McGee has been spending his money!

December 12: Taco Party

If you come, you'll leave with a cool physics toy!

February 25: SPS Zone 3 Meeting

Drew is hosting this year's zone meeting! Join us for a day of Physics Phun!

Things to look for in the spring semester:

Our year end banquet and induction into $\Sigma\Pi\Sigma$, Dr. F's annual picnic and graduation!

Don't forget to visit the physics department website at:

<http://depts.drew.edu/phys/>

The Dilated Times

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Address Correction Requested

inside...

Hello to Dr. Morgus, Goodbyes to Nate and Christina, scientific poetry, popcorn, Mars, and much, much more!!

Contributors...

Laura Barclay, Elizabeth Bendler, Dr. Ashley Carter, Christina Conzentino, Dr. Robert Fenstermacher, Jackie Haynicz, Paul-Michael Huseman, Rebecca Keith, Megan Linzey, Dr. Dave McGee, Dr. Laurie Morgus, Dave Newby, Dr. Paul Quinn Dr. Jim Supplee, Nathaniel Woodward

