



The Dilated Times

The newsletter of the Drew University Society of Physics Students

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Dr. McGee ... and YOU Summer Adventures 99

This semester the Drew University Physics Department is pleased to welcome Dr. David McGee to its staff of dedicated faculty. Dr. McGee came to Drew from Moravian College, and it was at this location that he began his research on the photorefractive effect which is a nonlinear optical mechanism. The concept of the research is that when atoms or molecules within a material which is photorefractive are hit by light, they will release electrons. The interesting part comes in when these electrons redistribute themselves. They redistribute themselves in a pattern which spatially resembles that of the light intensity striking the material. This distortion of the structure can be used to distort or bend new light waves which pass through the material, so that new waves going in can "read out" the information recorded by the distortion. This storing and redistributing of electrons can be produced in the form of holographic images. In order to pursue this interesting research, Dr. McGee is setting up his lab in the Hall of Sciences. This modern facility will allow him to encourage students to enroll as fellow researchers and sci-



The Physics Department welcomes David McGee

entists.

Dr. McGee is teaching Physics 1 this semester and two introductory lab sections. Also he is involved in one of his favorite past-times, aiding a student, Nimel Theodore in his research course. **DT: As far as your research is concerned, what aspects of Drew aided in your decision to accept the position?**

McGee: Over the last decade or so it has become recognized that students who participate in some form of independent study (honors, summer research, etc.) with faculty members are more excited about their education and generally have better job and grad school prospects. However, not all schools have the culture to support such activities. This culture includes an engaged student body, active faculty, and administrative support. I

James Davidson '00

This past summer I took part in a Research Experience for Undergraduates (REU) program sponsored by the National Science Foundation. My REU was with the Southeastern Association for Research in Astronomy (SARA), which is a consortium of five Universities. They include Florida Institute of Technology, Florida International University, Valdosta State University, University of Georgia, and East Tennessee State University. I worked with Dr. Gary Henson at East Tennessee State University doing photometric observations of a rapidly oscillating Ap star candidate. While at ETSU, I primarily worked on writing a program in IDL to reduce a few hundred images taken the previous year. However, I did no observations with the telescope on their campus, but was able to do some observations with the SARA 0.9-meter telescope on Kitt Peak. My observing run at Kitt Peak was unfortunately at the beginning of the monsoon season, and we only had half a night of clear skies under a waxing gibbous moon. For our particular observations, we needed very stable and clear skies since we were

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Dr. McGee ... and YOU

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was considering several offers from a variety of schools, but it was clear Drew had the right culture.

When you get right down to it, the success or failure of my research is dependent primarily on student attitudes. They are the partners in the work. During my interview I had lunch with at least eight physics and chemistry students and I had a chance to ask all the critical questions about academic life at Drew. Again, it was clear to me the students are excited about their work and realize that their education depends as much on their own participation as on the teacher's. Equally important in all this was the critical mass of physics students. As an undergraduate myself I derived a lot of support from being part of a strong SPS chapter, and that's what I was looking for at Drew. I found it.

DT: Any positive (or negative) experiences so far with your lab set-up here at Drew?

McGee: Setting up the lab has been quite a smooth process and is actually ahead of schedule. The support of the department was critical in this set up, particularly since moving a 1600 pound optical table into the room was not trivial. A crane had to be hired and the table was lifted over the greenhouse and through the window (with about two inches of clearance). We videotaped the event – come over and watch it sometime.

DT: What are some of your hopes for your future experi-

ences here at Drew (concerning your lab, student involvement, etc.)?

McGee: I can't say enough about how participation in undergraduate research can enhance one's appreciation and understanding of science. It was the singular reason I pursued and persevered through some rather difficult times as a student. On a practical note, my own undergraduate research was also a key factor in the several job and grad school offers I received (some before I had even graduated).

I am fortunate that my own research interests are developing at a time when optical technology, materials science, and computer technology are merging across disciplinary boundaries, presenting research opportunities for students that were not possible even five years ago.

At Drew, we are fabricating organic materials that change their optical properties in response to laser light. This leads to a number of potential applications in optical information storage, holography, and other diverse areas such as pattern recognition. We take an integrated approach to the research – the materials and the applications are studied in parallel, in hopes of matching the right material with the right application.

It's exciting research; we work with lasers, computer imaging systems, video, electronics, and optics, and there are plenty of opportunities for motivated students to participate in the work. In the past I have typically employed several students over the summer

as paid researchers, as well as 2-3 honors or independent study students during the academic year. This year is no exception; I am looking for students who can work with me this summer either as part of the Drew Summer Science Institute or possibly as part of other externally funded programs. My lab and office are always open to talk about this, so come on by!

Dr. McGee is a motivated professor with ambitious goals. We welcome him and his enthusiasm to the Physics Department here at Drew. With Dr. McGee and you, this research can go places!

Just What is SPS?

The Society of Physics Students (SPS) is a professional association explicitly designed for students. Membership, through the Drew chapter, is open to anyone interested in physics. Besides physics majors, our members include majors in chemistry, mathematics, computer science, biology, and other fields. Within the SPS, Sigma Pi Sigma, a nationally recognized scholastic honor society, elects members on the basis of outstanding academic achievement. This two-in-one Society operates within the umbrella organization of physics activity in the United States, the American Institute of Physics.

Locally here at Drew, SPS acts as our "physics club" with numerous campus activities. Student and visiting speakers are presented, videos shown, and field trips taken. Holiday parties and picnics with a distinct "physics phlair", and presenting SPS to prospective stu-

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Notes From the Outside

Hello, Drew Physics Folks! For those who don't know me (which is pretty much all students currently at Drew), my name is Larry Barisciano. I was a physics major at Drew, who graduated in 1996. Dr. F. asked me to write a few words about life on the outside.

I'm currently living in Baltimore, MD. I work in the mechanical engineering department at Lockheed Martin Launching Systems (LMLS) as a structural/stress analyst. It is a pretty far cry from what I thought I'd be doing as I entered my senior year at Drew.

I was one of those students who entered college with a sure-fire plan. I was going to be a physics major. After college, I was going to do research, win the Nobel Prize, etc. You get the picture (those who took Advanced Physics Lab with me are undoubtedly cracking up at the thought of me winning a Nobel Prize).

Well, after two summer research internships in physics, I came to the realization that a career in physics wasn't right for me. So, I began exploring other career options. A word of advice to all those in my shoes – 2nd semester senior year is a poor choice for a time to

have a career crisis! Anyway, I realized that theoretical physics was too "out there" for me. I like to be grounded in day to day reality. "Hey!" I thought to myself, "Engineering – That's the ticket!"

I began looking into engineering graduate programs – both civil and mechanical. I realized that although a physics degree prepares one to jump nearly every educational hurdle, there were definitely some basic engineering principles that I was lacking. With the extensive help of Dr. Supplee and Dr. F., I managed to divide my time during my last college semester between Drew and Stevens Institute of Technology. I took two basic engineering courses at Stevens. The courses I took were courses that I would have had to take before being allowed to enter any engineering graduate program. I highly recommend a similar path for anyone interested in making the transition from physics to engineering.

I was accepted into the Joint Institute for the Advancement of Flight Sciences (JIAFS), which is a joint mechanical/aerospace engineering graduate program between George Washington University and NASA Langley Research Center. I

specialized in theoretical fluid mechanics and acoustics. I performed research in the area of structural acoustics at NASA Langley. I left JIAFS with a Masters of Science in 1998.

So, what am I doing now? My current work has really little to do with physics, fluid mechanics, or acoustics! I've worked on a potpourri of different projects at LMLS. In addition to structural analysis of various missile launching system components, I've been able to dabble in missile hazard analysis, shock physics, and ship-board vibration analysis. All in all, it has been and continues to be a really great learning experience.

Every time I think about where I started and where I ended up, I have to laugh. I never thought I was one of those, "I have no idea what I want to do with my life!" people. But, seeing that I'm an educational mutt who knows a little about a lot and a lot of about nothing, I guess I'm one of those people after all! One thing I do know for sure is that you should appreciate and take advantage of your time at Drew. You may never have it so good again!

February Zone Meeting

Save Saturday, February 19 on your new 2000 year calendar. Drew's chapter of SPS will host students and faculty from Pennsylvania, New Jersey, Delaware, and New York for an all-day physics gathering. While plans are still in progress, SPS officers hope to present a top keynote speaker to lead off the day followed by student research papers, lunch and tours of the department, and a panel discussion on a topic of interest to SPS students. Past meetings here at Drew in 1994 and 1996 brought Freeman Dyson and Nobel Prize winner Russell Hulse, and 50 to 60 students from over 10 colleges. Students and faculty alike shared stories and experiences from their schools. Everybody's help will be needed to make this a successful and exciting day. Suggestions and ideas for the program are welcome. Details will follow as plans develop.

Summer Internships

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looking for mmag variations in our star with a period on the order of 6 to 15 minutes. While the data was not the best and was inconclusive, I did get a chance to explore the rest of the mountain. I also traveled to Tucson and visited the University of Arizona. While my experience was not what I was expecting, I found the SARA REU program to be very good and I

Nimel Theodore '00

This summer I participated in the Research Experience for Undergraduates (REU) at the University of Nevada, Las Vegas (UNLV). After the first week of seeing the various labs, I chose to work in the chemistry lab studying organic light emitting devices (OLED's).

Organic light emitting devices are organic compounds that give off light when photons or electrons excite them. When three compounds are found to efficiently emit the three primary colors of light (red, green, and blue), a new type of display, a flat-panel display, can be created. Currently most televisions and computer screens use technology discovered in the 1950's (cathode ray tubes). This new OLED flat-panel display would be faster, possess higher resolution, and last a long time while using less power. In Las Vegas, I worked primarily on synthesis of the compounds as well as classifying the compounds already created. It was difficult to join a group that had already been working on this project for a few years, and so I did more "filler" jobs as I

helped each of them with their own part. But, alas, my part was yet to come. . .

I was assigned to figure out how to analyze these compounds on an electronic level, and to do this, I was sent to the Advanced Light Source Lab in Berkeley, CA. Using high powered electromagnets, the ALS produces X-rays (and photons of all energies) by accelerating electrons in a circle to 99.99999% the speed of light! These X-rays knock out inner shell electrons of an atom, and then the rest of the electrons move to fill the lower-energy position. These movements release photons, which can be measured.

By participating in this program, I was not only able to learn a lot by bringing both my physics and chemistry strengths together, but also able to have a lot of fun! If you would like more information about my experience or to learn more about REU's or the ALS, please visit my webpage at www.

Chris Perry '00

I worked this past summer at Stevens Institute of Technology, in Hoboken, NJ, where I was hired as a research assistant to Prof. A. Belkind, in the Materials Science Department. Prof. Belkind was investigating the properties of Hollow Cathode Glow Discharges. The first week or so was spent reading and learning about vacuum technology and the properties of glow discharges, after which I began taking voltage/current data, which was my main job.

To give a short summary of the physics involved, a glow dis-

charge occurs across a region of very low pressure between the anode and cathode, when the current and voltage levels are right. I worked with pressures of about 0.5 - 4 torr in different gasses, including hydrogen and nitrogen. For hollow cathode glow discharges, the cathode is hollow, appropriately enough, and in my case shaped into an open cylinder which was pointed at the anode. Under the correct conditions, the glow discharge would appear to shoot out of the hollow cathode like a torch aimed at the anode, which was about an inch away. It was fascinating to watch the glow discharge slowly appear between the two pieces of metal, then suddenly be "sucked" into the hollow cylinder when the current reached a certain level.

For much of the summer, I was responsible for gathering data on pressure, current, and voltage while holding one parameter constant. Then I would graph the results and analyze them with Prof. Belkind. However, towards the end of the summer, I was responsible for setting up equipment for collecting spectroscopic data on the glow discharges. This was quite a challenge, and I luckily finished that project just a day before the summer ended.

Although final results were not achieved for this project by the end of the summer, I certainly got a lot out of my time there. In addition to learning about the physics of glow discharges, I also learned various aspects of vacuum and spectroscopic technology, how to

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Summer Internships

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troubleshoot problems with new instruments, and gained experience in data analysis outside of a classroom setting. This summer was a great learning experience, and I would certainly recommend such a project to any

Jodi O'Donnell '00

This summer, instead of going home, I stayed in New Jersey and with 9 other Drew students, worked at Cosmair, Inc. Cosmair owns many cosmetic companies including Loreal, Lancome, Maybelline, Redkin, and many others. I was assigned to work for Research and Development, in the Hair Color laboratory. In Hair Color, there were 5 chemists and myself who worked on the development of all hair dyes made by Loreal and Laboratory Garnier. The main project that I worked on was a new product for women with gray hair. I followed this project through the lab testing phases during which I made small batches of the dyes and tested the colors of them on sample pieces of hair as well as several other variables. After the samples were thoroughly tested I went with my mentor to Loreal's Technical Center in Manhattan and watched cosmetologists test the samples I made on volunteers.

Working at Cosmair gave me a much clearer view of what I can do with a degree in chemistry. There were many different opportunities there, for people with specializations ranging from microbiology to chemistry to engineering. Although the experience convinced me that working in industry is not what I want to do as a career, it was very valuable to show me future options.

Who is Rodrigues?

Left-fielder for the Toledo Mud Hens? That's not the Rodrigues I have in mind.

The Rodrigues I'm thinking of I encounter every time I teach mathematical physics. In Mary Boas's book, his name is on page 489. There it is: Rodrigues' formula. A one-liner. Just a single equation.

Rodrigues is no Legendre. Legendre is all over the place. There are Legendre polynomials, shifted Legendre polynomials, the Legendre equation, the associated Legendre functions, Legendre forms of elliptic integrals, the Legendre series and the Legendre transformation. I'm sure I missed one or two. Anyway, Legendre really has it made.

But hold on. Legendre owes Rodrigues something. Not only does Rodrigues' formula yield the Legendre polynomials but it can also be used to demonstrate their orthogonality, no mean task. Same for the associated Legendre functions. Not bad. Not altogether shabby.

I wanted to know something about Rodrigues so I looked him up. Nothing in the Encyclopedia Britannica; to those people Rodrigues is an island in the Indian Ocean. A French encyclopedia says Olinde Rodrigues (1794-1851) was a French banker and amateur mathematician, known (in mathematics) solely for his one formula, discovered by him at the age of 20 (nota bene). It was published in a paper entitled, "Memoir on the attraction of spheroids." In politics Rodrigues is remembered as the financial backer and disciple of Count de Saint-Simon, the founder of French socialism. Interesting? Maybe not.

Of course, the all-time giants in mathematics get "-ian" or something like it added to the end of their names. Think of the Laplacian, the D'Alembertian, the Gaussian, or the Hamiltonian. That's real class. Few have it.

Suppose your name is Shippicassee.* Wouldn't it be great if there was a multipole Shippicassee expansion? Or shifted Shippicassee polynomials? The words have a definite ring to them.

So, students, get busy. Dream up a function or a formula. Get your name attached to it. Your great grandchildren will love you for it. And don't despair. If you can't be a Legendre, you at least can be a Rodrigues.

* There was a dark-haired, dark-eyed girl in my third-grade class named Genevieve Shippicassee. I'll never forget her.

A. H. Carter



Upcoming SPS Events...

**Tuesday
December 7
HOLIDAY
TACO PARTY**

**Saturday
February 19
ALL DAY
ALL SPS!
ZONE 3
MEETING**

Check out the Physics Web Page at:
<http://www.depts.drew.edu/phys/>

SPS

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dents at admissions events round out our year. And at our annual awards banquet in April, the yearly nominees to Sigma Pi Sigma are inducted into the society.

Regionally, we are part of 18 geographic zones. Drew has traditionally been among the most active of the 53 chapters in our Zone 3 consisting of colleges and universities in PA, NJ, and DE, and this activity often wins us a nationally competitive Outstanding Chapter Award. Zone meetings are regularly held bringing students together from many chapters within a zone for physics activities (see related article on the upcoming Drew Zone Meeting).

Nationally, SPS is governed by a National Council meeting once a year in Washington. The Council, with student and faculty representatives from all 18 zones, formulates and establishes SPS policies for all chapters. Drew has regularly sent a student councilor to this meeting, an all-expense paid trip in late September.

Your membership in SPS is an opportunity to participate in the physics community, both on our campus at Drew and at the regional and national levels. And your local officers, Nimel, Dave, Tricia, Natalya, Corrie, and Becca, always appreciate your input for planning new and interesting activities.

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Address Correction Requested



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