Drew Alumnus Wins Early Career Award
By Michael Jokubaitis ‘10

The Drew Physics Department received wonderful news last November, when it was announced that Dr. Jonathan Spanier ’90 was a recipient of the prestigious Presidential Early Career Award for Scientists and Engineers (PECASE). According to the National Science and Technology Council (NSTC) – the government body that created the award – the PECASE is “intended to recognize and nurture some of the finest scientists and engineers who, while early in their research careers, show exceptional potential for leadership at the frontiers of scientific knowledge during the twenty-first century,” and is “the highest honor bestowed by the U.S. government on outstanding scientists and engineers beginning their independent careers.” PECASE recipients are chosen from participating government agencies, including the National Science Foundation, the National Aeronautics and Space Administration, the Department of Energy, and the Department of Defense. The prize includes a $1-million grant to support continuing research critical to government missions.

Dr. Spanier was nominated by the Department of Defense for “innovative research in materials science and engineering to improve synthesis strategies to produce novel and advanced hybrid nanostructures with specific properties and multifunctional capabilities.” He was also cited for “his exceptional teaching of graduate and undergraduate students from diverse backgrounds” at Drexel University, where he is an assistant professor in the Department of Materials Science and Engineering (MSE), is the Associate Department Head for MSE (since 2006), and holds an affiliated position in the Department of Electrical and Computer Engineering. The Dilated Times was fortunate to garner an interview with Dr. Spanier during which he discussed the work that led to the PECASE, his feelings about the award, and his plans for future work to be supported by the PECASE. During the interview, Dr. Spanier elaborated on the

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In Memoriam • Ashley Hale Carter • 1924-2008

Dr. Ashley Carter, director, The Charles A. Dana Research Institute for Scientists Emeriti (RISE), and Adjunct Professor of Physics, died April 6 after a brief battle with lung cancer. Dr. Carter taught upper-level physics and mathematics courses at Drew since 1975. Known by all at Drew for his classic hand-tied bowties and caring demeanor, he was beloved by his students and always demanded the very best from them. He joined the RISE program after retiring from Bell Laboratories in 1990, becoming its director in 1997. A specialist in quantum scattering theory and thermal physics, Dr. Carter authored the text, Classical and Statistical Thermodynamics, used in colleges and universities throughout the world.

Dr. Carter was a regular contributor to The Dilated Times and wrote his last article, appropriately related to his being a physicist, for this issue in March. His student, Laura Barclay ’08, has also written in this issue about her experiences working with Dr. Carter. A special issue of The Dilated Times will be devoted to the memory of Dr. Carter in the early fall. We welcome your thoughts and remembrances for that issue. They can be sent to rfenster@drew.edu, or to the physics department via regular mail.

A memorial service for Dr. Carter was held on Sunday, May 4, at 2 pm in Craig Chapel, Seminary Hall, at Drew. Donations in his memory may be made to the Charles A. Dana Research Institute, Drew University, Madison, NJ 07940.
work conducted by his research group at Drexel. According to Dr. Spanier, “The work that I did for the Army Research Office, and that I am continuing to work on, relates to materials science and, in some ways, applied physics and physical chemistry, involving Ferroelectrics, which are a class of materials that have a spontaneous but reversible dipole moment per unit volume or a polarization.” He went on to explain that one of the primary goals of the research he and his group have conducted is to “understand what the finite-size limitation of Ferroelectricity is and what the mechanisms are that determine that limitation.”

Since his group is concerned with the practical applications of the finite-size limitations of Ferroelectric effects, questions including “can one make a crystal so small that the cooperative effect of dipoles inside the solid cease to exist,” are of great interest. The answers to such questions have significant ramifications when it comes to the ability to store memory in a non-volatile format at “vanishingly-small volumes.” During this research they “stumbled upon some … candidate mechanisms, and one candidate mechanism [in particular] that really caused us to ask the question in a different way: was there even a minimum size below which Ferroelectricity would cease to exist? If we made a film that was a mono-layer, or two, or three thick, would it exhibit Ferroelectric effects?”

These are the questions that Dr. Spanier and his group were investigating for the Department of Defense, which has had an interest in Ferroelectric effects, and nanotechnology in general, for years. This was the case when Dr. Spanier was nominated for and received the US Army Research Office (ARO) Young Investigator Award in 2004. This honor “put me in a pool of people […] to be considered for this additional distinction – namely the PECASE.”

When asked about how he felt on hearing that he received the PECASE, Dr. Spanier sighed and with a chuckle said, “I was exasperated. […] But I feel very grateful. I know that there are a number of people who deserve this kind of recognition that sometimes is just a matter of carrying out certain work people are interested in. I’m grateful for it and grateful for the opportunity it gives me to stretch out and do research that may be a little bit riskier […] engaging in research that is higher risk but potentially has a higher reward.”

Looking toward the future, Dr. Spanier and his group “want to use what we have done in making nanostructures that have several different components and use these for some test structures that demonstrate device operability at small scales that people really haven’t realized before.” Also, there are several “opportunities involving Ferroelectric materials” that really haven’t been exploited such as “the presence of a remnant field – an electric field that is always there by virtue of the fact that there are displacements between anions and cations.” This phenomenon has possible interesting “material applications outside electronics and photonics.”

Even with his success in the study of Ferroelectrics, Dr. Spanier is quick to point out the other work conducted by his group, including the field of nanoplasmonics – how electrons behave collectively – particularly in semiconductors, the contributions of his colleagues, and the support of his professors at Drew and in graduate school. The interview ended with Dr. Spanier saying that he wants to encourage Drew students to explore these areas of research. He would be “very excited if Drew students wanted to hop in the car, hop on the train, hop on the bus – one or ten – and visit the lab for a day, a week, or even a summer program. […] If students are interested in the kinds of things we are doing, we would be thrilled to host.”

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**SPS Election Results**

The results of the 2008-09 Drew University SPS Chapter elections are in. Congratulations to the new officers:

- Brian Kelly ’09 - President
- Kyle Nugent ’09 - Vice-President
- Melissa “Missy” Louie ’10 - Activities Director
- Michael Jokubaitis ’10 - Newsletter Editor/Secretary

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**2008 ΣΠΣ Inductees**

The Drew Physics Department proudly announces the 2008 inductees into ΣΠΣ, the National Physics Honors Society:

- Dr. Robert Murawski
- Brian Kelly ’09
- Michael Jokubaitis ’10

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ΣΠΣ

Sigma Pi Sigma

Physics Honor Society
I remember first hearing about Dr. Carter as a professor who was a difficult grader and assigned a lot of time-consuming work. Those rumors proved to be true, but what I wasn't told was the effect he would have on me. We all felt that Dr. Carter was a genius, and somehow he had missed the memo that we were not. We spent hours working on his math-phys homework sets each week, only to give up in frustration when we found ourselves staring at yet another difficult integral. Eventually Dr. Carter became fed up with our incomplete assignments, so one day he brought to class a recommendation letter he had written for another student. He read a part that praised the student’s thorough problem sets. “She did more than just solve the problem; she made the math her own,” Dr. Carter read. He then looked all of us squarely in the eye and asked us, “Does that sound like any of you?” That day he severely humbled us all. It was probably the best gift he ever gave us. None of us ever gave up on a problem in his classes again. He expected only the best from us, and we in turn rose to the challenge, learning more than any of us thought possible.

Early in my first semester with Dr. Carter, I skipped his class. Later that day, I received a concerned email from Dr. Carter, asking if everything was OK. Before our next class, one of my classmates showed up at my door with a photocopy of Dr. Carter’s notes from his entire lecture. I felt incredibly ashamed. As time went on, I noticed Dr. Carter never missed a class, no matter what. After his lung collapsed this semester, Dr. Carter came back to class, dressed in his button-down shirt and bowtie, telling us, “While I was waiting to have a CT scan this afternoon, I wrote up some notes on Green’s functions.” That was simply his way. When he felt a sense of duty, nothing could stop him.

Math-phys and thermal physics were the first classes that seemed impossible to me, no matter how hard I tried. I began to reevaluate my decision to stick with the physics major, falling back into the trap of feeling inadequate. In desperation I visited Dr. Carter for help with my homework. I am not sure how he managed to do it, but somehow he convinced me that understanding the material was indeed important for my future, and that I did have the ability to do so. He sat with me for about two and a half hours each week for the rest of the semester guiding me through problem sets and swapping stories. That semester, Dr. Carter transformed me back from the disenchanted shortcut-seeker I had become, to the enthusiastic physics student I used to be in high school. Only this time I did not have the naive idea that physics is easy. Last summer, Dr. Carter called me at home to ask me to work on a research project involving an archival collection about Einstein from the Drew Library. This fall, we bonded over those papers, laughing at the scandal of Hans Albert Einstein marrying the interviewer’s cousin and arguing over correct word usage in my paper. He always valued my opinion, which surprised me, the inexperienced undergraduate student.

Over only a short span of a year and a half, Dr. Carter became like another grandfather to me. If it were not for him, I would not be going to graduate school in physics, much less trying for a doctorate. I would probably still think I was too dumb for physics. If it were not for him, I would not have the courage to strive for the best, even if there is a good chance of failure. I have never known a man who had accomplished so much during his lifetime and had so many crazy stories. I can only imagine how many other lives he has touched. I am sorry to have only known him for so short of a time, but the time I had with Dr. Carter will remain with me forever. It was an honor and a privilege to have him for a professor. It was a joy to have him for a friend.
This spring, Dr. Robert K. Murawski was selected for a tenure-track position in the physics department here at Drew. The faculty all felt confident in their decision. Just as important, we students are equally pleased with the department’s decision. Those of us who were lucky enough to have Dr. Murawski for electrodynamics found his teaching style to be clear and well-organized. We had quite an adventure with our first exam, which took twice as long as originally planned, but by the end of the semester, tests were just as well-timed as they were fair. Above all else, Dr. Murawski always warmly welcomed us into his office, whether we had a question about our homework or we just wanted to chat about graduate school. Last fall, Dr. Murawski quickly became an integral part of our community. When we heard that he had been selected for the tenure-track position, we were all very relieved to know that we would not have to say goodbye to one of our favorite professors.

Because Dr. Murawski will now get the chance to have a more long-term influence on the department, a discussion of research has been brought up. Dr. Murawski’s graduate school research was on a special kind of semiconductor laser called a Quantum Cascade Laser (QCL) which typically works in the mid-infrared region of the spectrum. His dissertation was to test the potential for optical switching of the laser output. He used the output of a near infrared laser (at 1310 nm) to control the current flow inside the QC laser. It was an all-optical switching mechanism i.e. light controlling light. The idea was to push the limits of fast switching inside the QCL without current injection but instead with optical injection. His postdoctoral research was in ultra fast femtosecond lasers. These are lasers that produce light pulses whose time width is on the order of tens of femtoseconds. With such short pulses it is possible to do interesting nonlinear optics because the intensities are so high. The project he worked on was building an anthrax spore detector by using these short pulse lasers. Dr. Murawski really enjoyed this project, so if you are interested in learning more, he would be more than happy to give you the details!

When asked about how he plans to combine his area of research with the current research of the department, Dr. Murawski answered, “I would like to get involved with what Dr. Dave McGee is doing. We talked a bit about his chromophores and it looks like I can maybe contribute to his research. I hope to. Anyhow, I think what he is doing is great because its so multi-disciplinary (a little bit of materials, chemistry, optics, physics, and molecules). My experience with Raman and molecules may have some overlap with his problem.” He has also become interested in variable stars after talking to Dr. F. Dr Murawski explained, “They are interesting objects because, as far as I know, the reasons why certain stars vary is an open question. It would be great if Drew could get involved with other groups who are also variable star hunters. The goal should be to learn something about astrophysics and to publish a result.”

Dr. Murawski also believes that getting students involved in research is very important. If any student would like a theory project, he has a leftover calculation from his dimensional scaling research at Texas A&M. The student would need to be comfortable with or willing to learn mathematical computer software (for example Maple, MathCAD, Mathematica or possibly a programming language). Another choice is in mathematical physics. With the help of his colleagues, Dr. Murawski invented a kind of expansion that is used to find the ground state energy of a Hamiltonian. The systems that he looked at are in a class of problems called strongly correlated electron systems. Ferromagnetism and anti-ferromagnetism are examples of these systems. Once Dr. Murawski has access to a lab, he would like to start off with basic Raman scattering of molecules. Applications for Raman scattering include looking for life on Mars, and Surface Enhanced Raman Scattering (SERS), which is currently a hot area of research. He would like to get a Ti:sapphire laser and do some ultra fast experiments, such as probing the fast dynamics in certain molecular process, as well. Dr. Murawski also expressed interest in maintaining collaborations with groups at Stevens who are doing QCL's and SERS and people at Princeton who are still doing CARS (and QCL's). Finally, he would like to use the telescope for research. Dr. Murawski stated, “I would like to help Dr. F’s program of variable star research. Perhaps someday we can get a spectrometer for the telescope and measure spectra coming off these variables or other objects.”

Dr. Murawski has many great ideas for research, and all the enthusiasm that we students loved in him last spring when we first met him. Congratulations, Dr. Murawski! We are very happy for you, and happy for ourselves since we will get to benefit from all the excitement you have planned for us.
In my experience, the question is usually posed with a tone of respect, occasionally bordering on awe. Sometimes the veneration is really exaggerated: “What are you, some kind of Einstein?” Einstein is the celebrity of physics, of course, and we have come to worship celebrities.

Often, the query is followed by a sort of apology: “Physics was never my strong suit. I just couldn’t understand what my teacher was saying. It was all Greek to me!” I try to be tactful: “The language of physics is mathematics. So learning physics is like learning a language.” I’m not sure that anyone ever buys that argument.

Some have a need to explain why they are not physicists: “I almost flunked physics in high school. I had a lousy teacher; in lab he kept moving blocks around on an inclined plane.” I’m always tempted to reply, “I can see why you might have been bored. But do you remember what you measured? It was the acceleration of gravity of a falling body, a constant of nature that is virtually the same everywhere on the face of the earth.” The response to this is, “Huh?”

Lately I’ve become less tolerant of those who feel that they cannot grasp physics. I am inclined to say, “What a terrible pity. Physics is the basis of all of chemistry and probably all of biology as well.” Statements of this kind, however, fall on deaf ears when I’m talking to a member of a generation who doesn’t know what a molecule is or what causes the seasons to change. How many people are there who use cell phones constantly and haven’t the slightest idea of what goes on when they make a call? (There are a few exceptions – those who take Dr F’s great course entitled How Things Work.)

Sometimes nonscientists are put off by the mistaken notion that physicists are primarily absorbed by the great unsolved (and nearly incomprehensible) problems discussed in Scientific American – the nature of the Higgs particle, or the source of an anti-gravity force that is causing the galaxies to fly apart. Perhaps we should be doing more to advertise the power of physics to address much more mundane but nonetheless fascinating phenomena.

Harvard professor L. Mahadevan and his students are publishing papers on such topics as how houseflies can stick, and then unstick, to ceilings and walls; and the similarities between the patterns formed by crumpled paper and the formation of mountain ranges. Such research won’t lead to Nobel prizes, but it shows how scientific curiosity can be its own reward.

When I was in graduate school, I was asked to give a lecture on the relaxation oscillator. I came across a wonderful paper that showed that the flutter of a flag in a breeze is analogous to the conversion of DC current flow to AC in an electrical circuit. (The steady flow of the wind is converted into oscillations of the flag.) I find such parallels pretty exciting.

Finally, we must respect the sensitivities of those in the fine arts. Certainly, they have a special way of seeing the world. I’m reminded, however, of an exchange of views between Richard Feynman and an artist friend of his. The two traded lessons in drawing for lessons in physics. The artist argued that scientists destroy the beauty of nature when they pick it apart and turn it into mathematical equations. Feynman replied that a physicist who understands how a rainbow is formed or why a full moon appears larger when it is near the horizon appreciates the beauty of nature in a far more profound way than the artist does. He wrote, “There is a generality you feel when you think about how things appear so different and behave so differently and yet obey the same physical laws. It’s an appreciation of the mathematical beauty of nature, of how she works inside; a realization that the phenomena we see results from the complexity of the inner working between atoms. It’s a feeling of awe.”

Enjoy your vaulted status and just feel lucky to be a physicist!
Physics in Germany
Dr. David McGee

In December 2007 I went on a fascinating weeklong tour of physics facilities in Germany. The trip was sponsored by the German Academic Exchange Service (DAAD) and had the alluring title “Physics in Germany: New Developments in Research, Interdisciplinary Cooperation, Higher Education, and Industrial Application.” The trip was intended to help academic physicists from North America better understand the changing landscape of German physics education and to encourage greater US-German collaboration. The title was indeed accurate, and perhaps even a bit understated. This was a whirlwind journey that put 20 physicists on a bus and took us through 5 universities, 2 corporations, and 3 research institutes spread over 7 cities in southern Germany.

The trip started at the Technical University (TU) of Darmstadt where we toured the superconducting electron linear accelerator (S-DALINAC) facility, and learned about the university’s strength in nuclear structure physics. Also in Darmstadt was the GSI facility, a massive federally funded nuclear research facility similar in scale to Brookhaven National Laboratory. The next stop was Kaiserslautern, where we visited the TU-Kaiserslautern and the Fraunhofer Institute for Image Processing. The Fraunhofer Institutes are one of many public-private research institutes in Germany. Mid-week we arrived at the University of Karlsruhe, home of the Karlsruhe Research Centre, a government-funded research lab with several thousand employees exploring everything from nanomaterials to nuclear safety. One highlight was putting on a hard hat and touring the KATRIN lab. The KATRIN experiment is an attempt to measure the mass (if there is one) of the electron neutrino. It is essentially an evacuated electron drift chamber about the size of Baldwin gym. Seeing this gave me an entirely new perspective on the occasional vacuum problems we encounter in Advanced Lab. One highlight of this part of the tour was dinner with Eberhard Umbach, the president of the German Physical Society.

From Karlsruhe we continued east to Stuttgart where we visited the Max Planck Institute (MPI) for Solid State Research. Here we learned about the structure of the Institute, which is spread across 77 separate facilities throughout Germany. They are basically research campuses in the spirit of Bell Labs, although with funding provided by the German government. After Stuttgart we headed to Munich for visits to Ludwig Maximilian University and the Max Planck Institute for Quantum Optics. This Max Planck facility was entirely devoted to lasers and optics, and it was somewhat humbling to sit in a huge cafeteria surrounded by several hundred international scientists all of whom are working in this field. The tour concluded with a daylong visit to the Siemens corporate headquarters. Siemens is the German version of General Electric, with a long history of R&D in X-ray devices and medical technology.

The scale and diversity of the physics research we saw was overwhelming. Fortunately, our sponsors (DAAD) did a wonderful job of mixing business with pleasure. Every city had a beautiful outdoor Christmas market, with Mariensplatz in Munich taking on an almost magical quality. Of course, dinner in a traditional Munich beer hall was a must, making the final evening of the trip especially memorable.

Throughout the tour, one recurring theme was the many opportunities for collaboration. DAAD was particularly interested in making contact with American undergraduate science majors for their RISE program (unrelated to the Drew RISE program). This program pairs US students with a German PhD student for a summer of paid research. Last summer, 250 students participated in the program, and DAAD made it clear they were anxious for more participants. In addition, many of the universities had their own in-house summer research programs for international students, and were highly motivated to increase participation from North American colleges. I would encourage any current Drew undergraduates to contact me for information on these outstanding international opportunities.

Dr. McGee (2nd from left) and colleagues hard at work.
Although the low representation of women in physics is an issue of international concern, this problem of untapped talent is particularly prevalent in the United States. In the 2005 AIP report “Women in Physics and Astronomy,” the US ranked 12th out of 19 countries for percentage of PhDs, and 11th out of 20 countries for percentage of Bachelor’s degrees awarded to women. The representation of women in physics is progressively lower for each rung that is higher in the academic ladder. The key transition is from undergraduate to graduate school. Currently, only 13% of US citizens receiving PhDs are women.

Recognizing the need for increased efforts focused on the undergraduate to graduate transition, two grad students at the University of Southern California organized their first Conference for Undergraduate Women in Physics, in January 2006. The conference was repeated the next year, with the addition of two seed groups—students at the University of Michigan and Yale University. This year’s conference was held from January 18-20th, with the aim of giving women the confidence, motivation, and resources they need to apply to graduate school, complete successful doctoral theses, and pursue careers in physics. The Conference for Undergraduate Women in Physics at Yale (CUWPY) sought to foster an undergraduate culture in the Northeast in which women are encouraged and supported to pursue and succeed in higher education in physics.

The conference began on Friday night, January 18th, with a welcome reception followed by a talk from Yale’s Dr. Meg Urry on black holes, galaxies, and the evolution of the universe. The next morning, Dr. Elizabeth Rhoades from Yale gave a talk about the use of single molecule fluorescence to study protein folding, followed by a talk about the frustration of women at Harvard given by Dr. Howard Georgi, and lunch with Yale faculty members. The next talk actually took place at U. Mich. and was broadcast to Yale and USC through videoconference. Dr. Mildred Dresselhaus from MIT discussed the expanding opportunities for women in physics. Afterwards, Dr. Elsa Garmire from Thayer School of Engineering at Dartmouth discussed options for careers in physics. Yale also hosted a career panel as well as a graduate student panel. On Sunday, the morning began with a talk from Dr. Wendy Zhang from the University of Chicago about liquid impact and liquid drop break-up. She demonstrated how they can be analyzed in terms of singularity formation in the continuum mathematical description. Next was a series of student research talks, one of which was given by me, and a student poster session. Tours of the labs at Yale were given, and a final talk by Dr. Janet Conrad from Yale about her new experiment of neutrino scattering on glass, rounded out the day.

My talk was on my paper “Einstein and His Son Hans Albert: A Fresh Look at Their Relationship,” which I completed this past fall with the help of my advisor, Dr. Ashley Carter. Dr. Carter and I reviewed an interview conducted by Hungarian journalist Bela Kornitzer, which was donated along with his collected papers to the Drew University Library. This interview was possibly the first interview conducted with Einstein’s son, Hans Al-
Senior Goodbyes

Goodbye, Drew Physics!

By Laura Barclay

My first introduction to physics at Drew was my first day of class, freshman year. Dr. Supplee climbed onto the professional-looking desk at the front of the room and loudly declared, “Just say no to significant figures!” This should have been my first clue that perhaps this is a different kind of department. Over the course of that year, I second-guessed my decision to be a physics major, as I completed one boring intro problem set after another, watching my friends go out and party while I sat doing physics homework. By sophomore year, I was only taking classes in the department to finish a minor in physics, as I pursued medieval studies as my major. Then I began to think about life without the late-night hilarity that is completing problem sets with Evan, Dave, Mac, and at that time, Ethan. I began to think how I would only be taking classes without explanations that cover 3 out of 4 walls of the classroom, and classes that aim to complicate the assigned reading, rather than clarify them. I began to think of how little time I would spend with the department, and how I would never get to take quantum mechanics. Needless to say, I changed my mind and decided to stick with the major. “But I am still going to grad school for medieval studies!” I insisted. Hah! Wrong again! After hours upon hours of after-class help in mathematical physics (and along the way, self-esteem) from Dr. Carter, and after noticing that I was squirreling away formulas and copies of MathCAD and Graphical Analysis for future use, I realized that I could never actually give up physics.

At the Conference for Women in Physics I went to this semester, a main topic of discussion was that women often feel they are not smart enough in physics and so they pursue something else. I have to admit that my own insecurity in my abilities was a main factor in my temporary lapse. At the conference, I was proud to tell everyone all about our friendly, helpful, and above all, caring department. I meant every word of praise, because if it were not for the support of this physics department, I would not be a physics major today, much less going to the University of Delaware to earn a PhD. Thanks for everything, Drew Physics Department!

A Chimp’s Final Thoughts

By Evan Kimberly

So, I have read a lot of these, but I’ve never really thought about what I myself would have to say as I graduated. I guess I’m going to miss this place. Drew has been a great school for me. Sometimes I look back on myself as an entering freshmen, and just realize how much I’ve learned and changed since then. The department has become like a second family for me. Some of my best memories of Drew take place at Doctor F’s house, or working on Quantum problem sets in the library for hours with people in various mental states (Dave and Mac, mostly).

Dave, Mac and Laura, as well as Ethan, have been great friends throughout my time in the Drew physics department. It’s a wonder none of us killed each other, but I’m thankful for them throughout my time here. It would have been a much more difficult four years without them, as it would have been without all of the faculty and staff. The department has always been kind, friendly, and helpful to me, to the point that I consider some to be more friend than professor.

Next year I will be attending the University of Delaware for my Ph.D. in Physics, hoping to concentrate in astrophysics. Coincidentally, Laura Barclay will also be attending the school. I guess you could say 50% of the graduating class of the physics department will be in Delaware.

The department has given me so much, and I will never forget the people who have helped shape my future in science, especially our recently departed Dr. Carter, who has given us all a nearly unattainable goal to live up to. I will definitely miss Drew, and hope to see you all again in the future.
Much Love,

Varun “Mac” Makhija

During my time at Drew, I have come to realize that physics students here are especially fortunate. This did not occur to me when I first arrived, being surrounded by “people who look strange and talk funny.” With my first physics class however, I noticed the staggering difference in the quality of discourse at Drew and my school in India. I would exclaim, “These people are actually attempting to EXPLAIN concepts. That’s a novel idea.” But, everybody still “looked strange and talked funny” for a while, though this eventually passed. I was also able to address the faculty openly without fear of being reprimanded for my insolence. In fact, we are fortunate in that we are able to interact a great deal with the faculty, and essentially befriend them. We at Drew physics are extremely spoiled, though in the best possible way. In interacting with our faculty I have learned exactly what it means to do physics, as a consequence of which I have realized that I want to keep doing it.

I also learned a lot from interactions with fellow physics students, particularly those in my year, in which I am spuriously including Ethan Marsh. When we started here as infants in the world of physics, I was under the impression that everything would be like introductory physics. This illusion dissolved the second or third time I sat doing the mathematical physics homework in the library with the other physics majors. We unabashedly abused one another both physically and verbally. This continued as we battled through further upper level courses. Through this torrent of abuse, physics infants became physics men/women.

I owe each student involved in these homework sessions a great debt of gratitude, particularly; Dave, for falling to the ground in his chair, Laura, for punching Dave in the arm, Evan, for his immaculate script, and Ethan, for telling me rather curtly to shut up. I am also grateful to Brian and Michael, who patiently bore my company all summer.

An even deeper debt of gratitude is owed to each faculty member: Dr. McGee, for allowing me work in his lab and essentially teaching me how to conduct experimental research; Dr. F., for advising me about graduate school and two very enjoyable lab courses; Dr. Supplee, for his insight on physics, which is usually twisted but very helpful, and for making fun of me when I’m blatantly wrong; Dr. Murawski, for wonderful conversations on intense field physics; and Dr. Carter, for being an inspiring lecturer and effectively forging me into a physics man from the infant I once was. I will miss everybody dearly.

My time at Drew began with a visit to Science Day. I have always been interested in science, and I got a generally good feeling from Drew, so I figured an Open House for the sciences would be a good thing to attend.

At science day I was taken by the overall friendliness of the department. Touring other schools had been like visiting a hospital. Walking around the physics department at Drew felt like going home. Talking to the faculty reinforced this feeling. I was amazed that these physicists (Real physicists! The first ones I ever met!) would sit down and chat with prospective students. Dr. Carter regaled me with tales of his days working with sonar on the high seas, Dr. McGee gave tours of his lab, and Dr. F gave his ever-convincing “why you should be a physics major at Drew” pitch. I was sold on the department from that day on, and I have never regretted this decision.

My experience at Drew has been the most enriching of my life. The professors here have taught me more in and out of the classroom that I thought I could learn. I’ll consider myself a success if I become 1/10th the scientist that anyone in the Drew physics faculty is.

Perhaps nearly as enriching have been the adventures with my fellow students. Some highlights: Problem sets past midnight, studying for the physics GRE and driving to that GRE in Newark, replacing the shutter motor in the observatory, countless nights in the observatory, electronics class (“WHY IS THE COMPARATOR GUSHING SMOKE?!”) and A-lab, and those rare bits of leisure time that we grabbed in between.

As I move on in my education, I feel like I’m taking a bit of Drew Physics with me. No matter how far I go, I’ll always remember this department as feeling like a second home.

“NO, CHEWIE, NOT THE RED ONE! THE OTHER ONE!”

By Dave Newby

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My experience at Drew has been the most enriching of my life. The professors here have taught me more in and out of the classroom that I thought I could learn. I’ll consider myself a success if I become 1/10th the scientist that anyone in the Drew physics faculty is.

Perhaps nearly as enriching have been the adventures with my fellow students. Some highlights: Problem sets past midnight, studying for the physics GRE and driving to that GRE in Newark, replacing the shutter motor in the observatory, countless nights in the observatory, electronics class (“WHY IS THE COMPARATOR GUSHING SMOKE?!”) and A-lab, and those rare bits of leisure time that we grabbed in between.

As I move on in my education, I feel like I’m taking a bit of Drew Physics with me. No matter how far I go, I’ll always remember this department as feeling like a second home.
On Sunday, February 24, nine adventurous students ventured forth on an epic journey to the Liberty Science Center. Seeking the promises of good times and educational experiences, they braved the treacherous highways of North Jersey, finally to arrive at the gleaming entrance. After combining forces with their fearless leaders, Dr. Murawski and his wife, the students entered the shining hall. They began their exploration by climbing to the top floor, where physics lessons awaited. There was joyful mirth as hydraulic engineering, thermal physics, new energy sources, and electrodynamics were explored. They smiled as they looked upon the world’s ruthless nature in the animal exhibit “Eat and Be Eaten.” After studying the construction of skyscrapers, Missy and Dave braved the towering beams of a building, walking along the ceiling with only a small harness to protect them from imminent death. Learning about the jobs of immunologists in the exhibit “Infection Connection,” and a pause to consider human interactions in the exhibit “Race: Are We So Different?” rounded out the day. As the young physicists prepared for their journey home, Dr. Murawski kindly provided them with sustenance—pouches of freeze-dried “astronaut” ice cream. It was a glorious day indeed!

On February 20th, the Earth, Moon and Sun became syzygial (which is an excellent hangman word). A total lunar eclipse was visible from our part of the world for a period of several hours, and in celebration we opened the observatory to the campus and public.

What followed was absolute mayhem. Well, not really. We (Dave and Evan, along with our apprentice Missy (who has since been promoted to journeyman)) were very nearly overwhelmed by the crowd that gathered on the roof. The area around the observatory was filled to capacity for about three hours, with approximately 60 people on the roof at any one given time. We set up three Questars out on the deck, pointing at the Moon, Orion’s Nebula, and Saturn. Evan manned the big telescope and was pointing it at the same three objects on a rotating schedule.

The response to the event was very positive. Many students seemed surprised that the observatory existed, and said they’d be back on public viewing nights. People from the public showed up as well and gave equally enthusiastic responses.

The next total eclipse visible from the observatory will be in December 2010. Unless Evan has his way, that is.
I am ecstatic to inform you all that this summer I will be at Valparaiso University in Indiana interning under the Southeastern Association for Research in Astronomy, SARA, REU program. I will be working under Professor Todd Hillwig, Assistant Professor of Physics and Astronomy at Valparaiso, on detecting close binary stars in planetary nebulae. I will also get a chance to travel to Kitt Peak in Arizona and do some on-site observation with the SARA telescope. I’m so excited for this summer and can’t wait to come back in the fall and tell everyone about my experience.

Second-Harmonic Generation

By Brian Kelly ‘09

This summer, I have been given the opportunity to research in conjunction with Dr. McGee and Varun “Mac” Makhija on the Drew campus. This research is the continuation of a DSSI session last summer, and two independent studies. I will be testing the second harmonic generation of samples produced by Dr. McGee and the University of Wisconsin (Madison) and using my results to help direct the changes they will make to new samples. I’ll be using a technique developed by alum Ethan Marsh and fine-tuned by Mac. We hope to see promising results in the two months we have to work on this project.

Twinkle, Twinkle

By Missy Louie ‘10

I am ecstatic to inform you all that this summer I will be at Valparaiso University in Indiana interning under the Southeastern Association for Research in Astronomy, SARA, REU program. I will be working under Professor Todd Hillwig, Assistant Professor of Physics and Astronomy at Valparaiso, on detecting close binary stars in planetary nebulae. I will also get a chance to travel to Kitt Peak in Arizona and do some on-site observation with the SARA telescope. I’m so excited for this summer and can’t wait to come back in the fall and tell everyone about my experience.
Upcoming Events:

May 4th, 2008:
Memorial service for Dr. Ashley H. Carter at 2:00 P.M. in the Craig Chapel, Seminary Hall, Drew University, Madison, New Jersey 07940.

May 5th, 2008:
Annual end-of-year picnic to be held at Dr. Fenstermacher’s house: food, fun, and physics - who could ask for anything more?

May 17th, 2008:
Commencement. Join us at the physics department table for fond farewells and a champagne toast following the ceremonies.

Don’t forget to visit the physics department website at:
http://depts.drew.edu/phys/