Meet the New Chair: Dr. David J. McGee

By Michael Jokubaitis (*10)

This year, a subtle and smooth transfer of authority and responsibility has taken place in the Drew Physics Department. Dr. Robert L. Fenstermacher, after a tenure of thirty-five years, has handed over the position of Department Chair to Dr. David J. McGee. We were fortunate enough to speak with Dr. McGee and ask him about his new responsibilities and his plans for the department.

How do you feel about your new position?

Well it’s certainly a nice title.

But it does carry more responsibility.

There are more things that you have to do. But in some senses it is more of an organizational position, making sure that certain things happen at certain times with admissions and budgets and hiring and interacting with the administration, so that clearly is more responsibility – someone has to do that. But in this department, we tend to share the load. Jim Supplee does a lot of work in intro lab, Rob Murawski takes on the obser-

Welcome, Dr. Minjoon Kouh!

The Drew Physics Department is pleased to announce the tenure-track appointment of Dr. Minjoon Kouh as assistant professor of physics beginning Fall 2009. Dr. Kouh has his Ph.D. in Physics from Massachusetts Institute of Technology. He comes to Drew following a postdoctoral research experience at The Salk Institute for Biological Studies. His research focuses on understanding the information-processing mechanism of a neural system, using ideas and techniques from neuroscience, physics, and mathematics. He has also developed a computational model for analyzing and understanding the visual object recognition process.

Dr. Kouh's hiring is part of an effort to bridge the worlds of physics, neuroscience, and computational science at Drew, and is initially funded by a Howard Hughes Medical Institute (HHMI) grant. Dr. Kouh will develop new courses in biophysics and computational science, as well as teach in the current physics curriculum.

Aside from his work in physics, Dr. Kouh is an avid musician and participates in the preservation and performance of pungmul—an ancient Korean folk music tradition. His chosen instrument is the janggu (hourglass drum).

(Reprinted with permission from the Drew University Physics Department homepage)

Dr. Minjoon Kouh playing the janggu.
Photo courtesy of http://cnl.salk.edu/~kouh/
vatory, and Bob Fenstermacher runs SPS, so all of us do something. Everybody has a role.

I was going to ask, what is it like taking over from Dr. Fenstermacher?

He’s built a tremendously firm foundation upon which to build. Of course, it is going to be hard to be the second act to someone like Bob. That’s going to be tough. At the same time, though, Bob’s success in building a well-rounded physics department gives me a sense of comfort in taking over the chair. The number of majors has always been at or above the national average for schools our size and we’ve always done well with graduate school and REU acceptances. All of that is a testament to the work that he has done. That makes my job a lot easier.

Coming back to my responsibilities, I really think that what the chair does is to educate people outside of the sciences on what the physics major is about; to help them see that despite being a small major, physics is a vitally important component of a liberal arts education. You need someone to put it in perspective for them, so that is part of what I think the chair does. I’m sure I’ll figure this out as I go along.

That leads into my next question of how you are adjusting to your new responsibilities. Obviously the work load is somewhat heavier.

It is, a little bit. Things are changing around here with the new Gen Ed program and with routine procedures, including constantly upgrading computers and equipment and the like. It is not clear what the big picture is yet. But again, we are going to try to figure this out as we go along.

There has been some talk that professors in the sciences at Drew are being encouraged to focus more on individual research, much like professors at larger universities. Do you see the department heading more in that direction?

In the physics department there has always been a good balance between teaching and research. Most important, in this department the role of research has always been (and will continue to be) a form of hands-on teaching. The new biophysics faculty member, Dr. Minjoon Kouh certainly will bring a very active research program with him. Dr. Murawski and I have overlapping experimental research programs in photonics, and Jim Supplee’s work is in theoretical physics. Bob Fenstermacher’s work centers on astronomy and instructional lab development, so I think there’s a very nice balance here.

As long as we have the students, we will try to keep each one of them busy with some sort of research project, one way or the other. It is not clear how this is going to be distributed over the next couple of years, but it looks to me that we will continue to have a very active faculty here, each with their own projects, which I think is a good thing. Any student who comes through this department and wants to participate in research has the opportunity to do so, whether it is an independent study or a summer research project. I don’t think, however, that it’s useful to say everybody must do it. I think it is more useful to say that everyone has the chance to do it. And that formula has worked very well in the past. We’ve always managed to give everybody the experience they’ve wanted, so I think that will continue.

Is there any one project or course that you want to see conducted or established in the department?

Well, I guess there are a lot of things we have discussed as a department. I have to say that our stated goal would be to double the number of majors over the next five years. We would love to see that. We’ve all sat down and said that is our number one goal—unequivocally. How we go about doing that is another story.

We’ve got several plans on the table. One is more visible engineering options for a student, which actually translates into applied physics options. At the moment, we are not sure what this might mean in practice. It might mean having at the ready an independent study course that is more focused, like a course in applied photonics or a course in applied materials. In general, we need some way to provide that extra amount of classroom material necessary to make a student better prepared to pursue a master’s degree in engineering or a Ph.D. program in materials science. In other words, we would have something to complement what we already do to prepare students for a Ph.D.-level in a graduate school in physics.

Again, how we do this is not yet clear. It might be as simple as having three or four research options for students, as opposed to just one or two, particularly as other faculty members come on board. The fact that we are now going to have a biophysics aspect to the department could alone be the other piece we need to bump up the number of majors. Of course, there are a lot of other things that would help: the laboratory space to develop new A-Lab experiments and better research spaces for all of us. For now, I’d like to focus on those things that I know we can accomplish in the near future, such as a rotation of upper-level, advanced courses that meet a need in certain areas, such as solid-state physics, materials physics, or applied photonics. We’ve talked about what courses we might institute as part of the goal of attracting more majors, but it is not clear yet which ones of those we’re going to put on the books or how we might do that.

So, we are discussing what we might do in that regard right now. As I said, the number one wish would be to continue what we’ve been doing but to open it up to a wider audience: not to have five or so majors graduating in a good year, but to have eight or nine. That would be phenomenal. APS and AIP have done many studies about how to make that happen and our department has been doing all the right things under the guidance of Bob Fenstermacher. Research opportunities for

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those that want them are important, but having all students gain hands-on experience in intro and advanced labs, as well as having a strong SPS chapter, are all important.

Again, biophysics could be one good answer to our needs, providing a timely complement to our existing strengths. Biophysics leads right into medical physics and it would be great to have more A-lab experiments that deal with aspects of those fields including radiation, dosimetry, X-rays, and all the projects that could build off our Compton experiment. The other avenue could be applied optics and photonics. Dr. Murawski and I have research programs in these fields and some of what our new biophysics faculty member studies has applications to imaging. This is another area where we might have room for an upper-level course.

Lastly, what do you see as your greatest challenge as the new chair.

It is a privilege and honor to carry on the tradition of Drew physics following the work of Bob Fenstermacher. Looking at our graduates over the past 40-some years, the scale of what they have done with a Drew physics degree is inspiring. My job will be to keep that success story thriving, and all I can say is “thank you” to Bob and my colleagues for building such a firm foundation upon which to grow. We face several challenges. The number of students in the physical sciences is down at Drew, at the same time that economic conditions are placing small-enrollment classes under the microscope. We have also fallen behind our peer schools in facilities for teaching and doing physics. Fortunately, our faculty has continued to innovate around these difficulties with courses such as How Things Work, a vibrant externally-funded student research program, and a continued presence in admissions efforts. Continued success will rest on a more aggressive effort to bring physical science students to Drew, and to teach them in facilities that reflect the importance of science in a liberal arts education.

I Saw So Many Stars in CA, But Not in Hollywood

By Melissa “Missy” Louie (‘10)

My research experience for undergraduates (REU) with the Southeastern Association for Research in Astronomy (SARA) last summer was a great experience. I was able to do many amazing things over those ten weeks. But when the summer ended the experience that I got from my REU was not finished. The SARA REU program was able to send all of the nine interns from the summer program to the 213th American Astronomical Society (AAS) Meeting in Long Beach, CA. The conference brought together thousands of scientists and students from around the world for one reason: astronomy.

At the first night of the meeting the AAS had a reception for all of the undergraduates that were in attendance. This was the first chance that I got to really see the magnitude of this meeting. The reception was amazing. Hundreds of undergraduate students, most of whom were there to present work that they have been doing, gathered in a banquet room. At the reception, many universities with graduate programs had set up tables to talk to the students and I was able to talk with many of them about their different graduate programs and other post-graduation options. There also were different REU programs for which undergraduate students could apply. This was quite useful because REU applications were due only a few weeks after the conference.

While at the undergraduate reception, I was able to catch up with two of the students that I worked with at Valparaiso University; I had not seen them since the end of the summer. I got to talk to many other undergrads from all over the country about their research and different research experiences, whether it was with an REU or through on-campus research. I talked to some of them about different graduate schools and major requirements. Since I am one of only a few students at Drew who know what astrophysics is, this reception was a great way to feel more connected to the field that I want to pursue and to those who study it.

Not only did I get to go to the meeting but I also was able to present my research from the summer during one of the poster sessions. The research that I did on planetary nebulae possessing binary central stars with Professor Todd Hillwig from Valparaiso University was chosen for one of the posters in the Wednesday poster session. There were hundreds of posters presented each day. Just being able to put my poster up alongside posters from some of the lead researchers in astronomy and astrophysics and to know that I am also contributing to the expansion of the field was an amazing feeling. I was able to stand by my poster for most of the day and talk to those passing by about my work and even talk to many of them about theirs.

An option for the student presenters was to participate in The Chambliss Astronomy Achievement Student Award contest, where students’ posters would be judged against each other by researchers in the field. Hundreds of students participated and were judged by two different researchers on the day of their poster session. After the meeting, each student got to see their own personal score cards to see what they should work on to improve future presentations. I really enjoyed being able to see the comments that were made because it will help me in presentations in the future.
During the day, we had the opportunity to walk up and down the aisles, talk to different researchers, and read many of the different posters that were displayed. I looked at poster topics like cataclysmic variable stars, blazers, and exoplanets. The amazing thing was that these posters were being shown by so many different presenters: from other undergrad students to researchers from national labs.

Each day of the conference there was a huge exhibit hall set up with different merchandise stations. Some were for book publishers while others promoted observatories or different telescopes. Everyday the other SARA interns and I wandered around looking for which booths had the best posters for us to bring back and hang up in our dorm rooms. There are even a few new posters on the walls in the observatory, so make sure you that head up there and check them out. I also got some Lockheed Martin Luggage tags and a free laser pointer, along with mugs, pens and stickers from Arecibo, NRAO, and NASA.

I thought that one of the best exhibits at the conference was the virtual planetarium. In the back of the exhibit hall there was an inflatable dome. When one ventured inside of this dome he or she found the coolest planetarium set up ever. It was completely digital. Not only could everything be controlled remotely, it also let people zoom in on objects in the sky. You could see where the Ring Nebula is in the sky and then actually zoom in and show people what the Ring Nebula looks like through powerful telescopes like Hubble. Needless to say, I was a huge fan and would love to see this used in the Introductory Astronomy Classes for days when the weather is bad. (Hint, hint, www.digitaliseducation.com/index.html)

During the day, they also held smaller ten minute presentations on different topics all over the conference center. I was able to attend many of these, including talks about star formation, telescope technology, black holes, and planetary nebulae. These allowed me to learn about some other fields of astronomy and to get a better sense of the people in the field through their discussions and Q&A sessions following each presentation.

One of the short presentations that I attended was by none other than Drew’s Professor Kurczynski, who taught the fall 2008 Thermodynamics course. His presentation was on work that he has been doing on Galaxy Formations. Although his work was far above my current understanding of astrophysics, it was still awesome to see him outside of class talking so passionately about his work. After his presentation, I was able to talk to him more about this work and he asked about mine and stopped by my poster the next day to look at what I did.

I think that one of the best parts of the conference was the people. I was able to meet people from all across the country doing work in every different field of astronomy. Some of them were undergrads and some were seasoned researchers working for NASA or KPNO. I spent an hour one day talking to a man who worked at JPL about the research that he is doing and he talked to me as an equal, not some undergrad about whom he could care less. I also was able to see people who I met through my internship and who I may not see again. I hope that I have an opportunity to go again next year if for no other reason than to stay in touch with other members of the field.

Despite almost being booted from my flight to Long Beach because the plane was overbooked, my luggage getting lost on the first day; and having to lug back about five pounds of posters, pens, luggage tags, and other awesome star merchandise, the conference was absolutely amazing. It was a great experience and has continued to spark my interest in astrophysics and show me many more possible opportunities in the field. I hope to have the chance to go back to the AAS meeting next year.
It’s been five years since I graduated from Drew with my B.A. in physics—how about an update?

I am living in Charlottesville, Virginia and attending the University of Virginia, working on my Ph. D. in nuclear/medical physics. My thesis project is to develop and test new MRI (Magnetic Resonance Imaging) sequences that will allow me to measure the surface to volume ratios inside rabbit lungs. Some of the rabbits will be normal, and some of them will have emphysema. We are hoping that getting quantitative numbers out of MRI will result in a better ability to characterize different stages of the disease, and track its treatment. You may be wondering how I lucked into such a diverse field of physics…and the answer is Drew University Advanced Physics Lab!

Allow me to explain. When I was selecting graduate schools in my senior year at Drew, I didn’t really have a preference for a particular field in physics. I had done some atomic work in Dr. McGee’s lab, and some programming and materials work in my REU at William and Mary. I was open to anything. Until I walked into Dr. Gordon Cates’ lab at UVa. They are a nuclear physics lab, so the primary focus is using something called Hyperpolarized Helium-3 as a neutron target at the Jefferson Lab Accelerator Facility in Newport News, Va. However, they also use the Hyperpolarized 3He to produce MRI images in the lung. This is because normal MRI images water in your body, but there is not enough tissue in your lungs to image. So you can inhale a helium-oxygen mixture, and image the airspaces in your lungs instead of the tissue. I thought it was so cool that the same physics used at an accelerator could also be used in a hospital. I wanted to join Dr. Cates’ lab, but so did a lot of other people.

The secret to my getting in was how the 3He gets polarized- Spin Exchange Optical Pumping with Rubidium. In Advanced Lab back at Drew, Tom Zielinski and I got to try out a new experimental setup Dr. F had just bought called (drum roll, please) Optical Pumping!

Optical Pumping involves heating Rubidium (or another alkali metal) in an oven surrounded by a magnetic field. The field separates the two spin states of the electron so that when you shine circularly polarized light on it, only one state can get excited. Wait a little while, excitations and decays happen, and the only place a Rubidium electron can settle is in the state that doesn’t absorb the light. Voilà, polarized rubidium!

The only difference between the experiment we did at Drew and what the group at UVa was doing is the addition of 3He into the oven. Because I had some experience with the polarization mechanism, I had a leg up on everyone else who wanted to work in the lab- thanks to Drew Physics!

I’ve been working with Dr. Cates since I finished my classes. I started out helping the older grad students with their work, but in the last two years I’ve helped build a new Helium Polarizer at the Medical School for MRI research and started my thesis project. I plan to defend and graduate in the spring of 2010, then start looking for a job. Right now I’m open to a lot of job possibilities, so we’ll see what opportunities come up.

Thanks again, Drew Physics!

If you have any questions or thoughts, my email is: kem2q@virginia.edu
Senior Goodbyes

A Humble Thank You

Brian Kelly (‘09)

My time at Drew started, like so many potential physics majors, on Science day. However, always a glutton for punishment, I didn’t just sit in on an intro physics class. I also visited a session of Dr. Carter’s Math Phys class. Naturally, I didn’t understand a word of it, but I did notice how involved and excited the 3 students attending were. I also noticed how nice and welcoming both Dr. Carter and the physics majors were. I left that class intimidated, as one would expect, but I also felt a jolt of confidence. The students I had met a mere hour before weren’t so different from me. They were laughing and joking, both with each other and with Dr. Carter, and they each had words of encouragement for me. They raved about the department’s small size, the level of interaction and familiarity they had with the faculty, and life on campus. When I left them, I was still a scared potential student, but they had planted the seeds of confidence.

In my four years here, I have come to realize something about that visit to Drew. That feeling wasn’t a campus-wide one, as I had thought, but something much more special. It was the result of a department that took care of its students, not just in class work, but in questions about grad school, dealing with other professors, and general life questions. The professors here have been more than teachers to me. They have helped me gain work experience, decide what I want to do after graduation, and made me stay focused. The only group that influenced me more than my professors was my peers. From late nights in the library to late nights in the RISE Reading Room (when we made too much noise!), from marathon study sessions for big exams to building up our shattered confidence after them, having them to share it with made it all bearable. I have spent more midnights in the Hall of Sciences with them than I ever expected, and I wouldn’t have it any other way. Now I know why those three students I met so long ago were so enthusiastic about the department, and I feel the same. In the fall, when I go to the University of Delaware to pursue a Ph.D., I will look back to my time at Drew and I will never doubt that it is thanks to the people of this department that I have the opportunity and drive to continue studying physics.

A Wild Ride

By Todd Navarre (‘09)

Four years ago, I entered Drew University after a very disorienting relocation due to hurricane Katrina. At that time I was entering college to study political science. After a year and a little influence from the executive branch, I felt that politics might not be the best place for me. I wanted something concrete, real, and honest. Physics was exactly what I needed. While sitting in Professor Morgus’ physics class, I realized that what was being taught was tested fact. I was hooked.

As the years went on I learned so much not only about physics but about myself as well. I learned how to play nice with my partners and how not to destroy expensive lab equipment in advanced lab. My fortitude was tested in the depths of the Hall of Sciences during Electromagnetism with Professor Murawski. My spirit was lifted by the fantastic motivational speeches of Professor Kurczynski in Thermodynamics. I was taken aback at Professor Supplee’s knowledge of the structural integrity of tables as he pounced upon them to drive home a point. I was grateful for Professor Fenstermacher’s patience as I would stumble over my answers in Advanced Lab. Hey, at least I got the point across. If I ever had a question that didn’t pertain to physics, I could always count on Stephen Takacs to have an insightful and well-thought-out answer.

The biggest influence at Drew came from my fellow physics students. The countless hours in the RISE Reading Room can really bring people closer, especially when one problem can stump a group for over three hours. Overall the Physics Department at Drew felt more like a family than part of a cold institution bent on churning out physics majors. It felt like an episode of Cheers when I could walk into a class and everybody knew everybody’s name. I really liked that. In retrospect the last four years were a very wild ride.

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Senior Goodbyes

Farewell
By Kyle Nugent (’09)

For four years now, I’ve thought of Drew University as more then just a school; Drew has been my home. Drew is a nursery for free thought, imagination, and expression. How many institutions — how many houses of higher learning - offer so many freedoms? Not only does Drew allow you the freedom to succeed, which is always important, but also the freedom to fail. The last four years have undoubtedly changed me; this isn’t uncommon as I’ve also noticed changes in my friends as well. The changes seem necessary in hindsight, but how many of us knew from the start during that first disorienting day of orientation how different we would be?

For whatever reason we came here, we all found out slowly that it didn’t actually matter. The only thing that mattered was what you were able to take away from it, and it’s more then just a diploma. As Dr. Fenstermacher taught us in Advanced Lab, it truly isn’t the destination that matters, but the journey. So I’ve memorized some equations and learned some new math, gained a new respect for computers by grinding through countless hours of homework, but more importantly I’ve learned how to think.

I will miss both friends and faculty greatly; classes where I leave wondering what just happened, and the time I’ll never get back wondering why the signal on the oscilloscope looks the way it does only to find that AC coupling was on, again. For those I leave behind, looking forward to their commencement day I say only, good luck. For the faculty, my sincerest thanks.

Summer Plans

Summer at NRAO
By Melissa “Missy” Louie (’10)

I am thrilled to let everyone know that this summer I will be in Charlottesville, VA at the National Radio Astronomy Observatory (NRAO) participating in their Summer Student Research Assistantship program. I will be working with Dr. James Miller-Jones doing research on Jet-ISM Interactions around X-ray Binary Systems. I will be working with eight other student summer researchers from across the country in Charlottesville, and other student researchers in Green Bank, WV and Socorro, NM. Over the summer I will get a chance to travel to Green Bank, WV and work on an observing project with the Robert C. Byrd Green Bank Telescope (GBT) — the world’s largest steerable telescope. I also will be attending weekly lectures from lead astronomers in different fields of radio astronomy at the NRAO headquarters in Charlottesville. At the end of the summer, I will be able to present my findings to the other student researchers and the NRAO staff. I am super excited and can’t wait to come back and share my experience with everyone.
Summer at PPPL

By Michael Jokubaitis ('10)

This summer, I will be traveling to Princeton, New Jersey to work at the Princeton Plasma Physics Laboratory (PPPL) under the auspices of the National Undergraduate Fellowship (NUF) Program. My mentor, Dr. Douglass Darrow, and I will be studying the loss of superthermal ions from the beam plasma at the National Spherical Torus Experiment (NSTX) by simulating the signals in the neutron detector and the Neutral Particle Analyzer (NPA) using a simple model of the beam ion spatial deposition patterns and orbit shapes. By doing so, we hope to determine what portion of the neutron and NPA signals are due simply to fast ion orbit geometry effects and what is due to actual unstable plasma waves present in the torus. This will allow us to calculate the inherent stability of the plasma being generated. I also hopefully will work on resurrecting a currently nonfunctioning neutron detector and expanding the existing photomultiplier system for the edge fast ion loss detection system.

I am very excited about this work and am looking forward to it immensely. It should be challenging but extremely rewarding. I can hardly wait!

The National Spherical Torus Experiment (NSTX) - Photo Courtesy of www.toodlepip.com

The Drew Physics Department proudly announces the 2009 inductees into ΣΠΣ, the National Physics Honors Society:

Melissa “Missy” Louie ('10)
Todd Navarre ('09)
David Thorpe ('11)
The department asks that alums remember us and our continuing need for laboratory instrumentation and equipment. If you have a particular item that is no longer useful to you and could find a new home at Drew, we would be very happy to hear from you at any time. While not limited to these, some current needs include:

**General:**

**General Lab Instrumentation**
- Digital scopes
- Function/pulse generators
- Meters

**Gas handling** – regulators

**Microscopes** – general purpose stereo microscopes (for inspection of optoelectronic and solid state devices)

**Optomechanics** – translating stages with micrometer movement for optical experiments (e.g. Newport, Thorlabs, etc)

**Power Supplies**
- High voltage power supplies – 5 to 10 kV (e.g. Bertan)
- Low voltage, general-purpose

**Vacuum pumps** – general purpose roughing pumps and diaphragm/oil free pumps (for use with small vacuum ovens)

**More specific research equipment:**

**Electronics** – Stanford Research SR280 NIM bin, SR250 Integrator, SR645/535 digital delay

**Fiber optic equipment** – fiber cleaver, fiber optic switches

**LASERS** – NdYAG, Argon Ion, Diode-pumped solid state, fiber-coupled, HeNe

**Microscope hot stage**

**Nonlinear crystals** – e.g. BaTiO₃, LiNbO₃, BBO, etc

**Thin film surface profiler** – e.g. Dektak

If you have equipment you would like to donate, please contact:
Dr. Robert Fenstermacher
Drew University
Department of Physics
Madison, NJ 07940
E-mail: rfenster@drew.edu
Awards and Prizes

Many plaudits have been bestowed on students of the Drew University Physics department over the past year. Special congratulations for 2009 go to the following for work well done:

The Novartis Awards in the Sciences – Brian G. Kelly (’09) (recipient in Physics and Mathematics)

Marshall C. Harrington Prize in Physics and Astronomy – Melissa “Missy” Louie (’10)

Arnold S. Boxer Memorial Prize in Physics – Michael L. Jokubaitis (’10)

Society of Physics Students Outstanding Leadership Scholarship 2009-2010 – Michael L. Jokubaitis (’10)

2009 Barry M. Goldwater Scholarship (Honorable Mention) – Michael L. Jokubaitis (’10)