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UNIVERSITY
Department of Physics
Office of the Chair

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Dear Physics Alumni,

The Physics Department faculty and staff invite you to our **Homecoming reception on Saturday, September 22**. We are excited about a new format for the Homecoming reception this year as we are joining with the Chemistry Department to have both a reception and a lecture demonstrations show. The show is designed to be of interest to everyone including children. The lecture demonstrations will begin at10 am on Saturday morning in room 101 Olin. The demonstrations will be followed at 10:30 by a reception in room 210 of Salem Hall. There will also be tours of Olin and Salem Halls for anyone who is interested.

This past year has been an excellent one for the Physics Department. Our students and faculty have received a number of awards including a Rhodes Scholarship for graduating senior Brandon Turner, National Science Foundation Graduate Research Fellowships for graduating senior Claire McLellan and WFU graduate student Jeremy Ward, and a Fulbright Research Scholarship (in Germany) for graduating senior Soham Banerjee. In late April a public talk by Nobel Laureate William Phillips was sponsored by the Society of Physics Students in conjunction with the Physics Department, and two physics conferences, were held on the WFU campus. Some details on these and other activities and awards are given below.

Our graduation rates continue to be relatively high. This past year we had 17 graduating seniors, one student who graduated with an MS in Physics, and 8 Ph.D. recipients. Our tradition of undergraduate research continues. Last year over 30 undergraduate students engaged in research with our faculty. If you look around Olin, you will see posters and publications in our halls bearing the names of both our undergraduate and graduate students. You can also read about some of the students and their research projects at http://www.wfu.edu/physics/profiles/profiles.html

We are very happy to have a new scholarship for students applying to the U~~u~~niversity who intend to major in Physics. Its purpose is to help recruit students from the state of North Carolina. It has been generously endowed by alumnus Dr. Randall D. Ledford '72 and is the second scholarship for prospective physics majors that he has endowed. The new scholarship has also been partially supported through the generosity of a number of other Physics alumni. We thank them for their support. See **http://www.wfu.edu/academics/physics/news/20/11f-12s/ledford/announcement.html** for more information.

After many years of turnover of the faculty due to retirements and promotions, and a slight expansion in the staff (addition of a Business Manager in 2009), we have had a quiet year with only one change. Our Staff Assistant Gale Burns retired in March after serving the Physics Department for ten years. She has been a valuable member of our Department, who will be remembered for her dedication and hard work, and for taking excellent care of the weekly seminar teas, and other social events in the Department. We thank her for making the Department a pleasant place to work. She has been

replaced (in July) by Heather Chapman, the wife of Eric Chapman our Instructional Resources Manager. We are very happy to have Heather working with us.

Professor Oana Jurchescu was awarded a Wake Forest University Faculty Endowment Fund Fellowship. This award is for a two-year period, from July 1, 2012-June 30, 2014, and is in recognition of the outstanding work that she does in the classroom, in research, and in service. She also received the Physics Department Excellence in Teaching Award at the Department's May awards ceremony.

As I mentioned above, senior Brandon Turner was awarded a Rhodes Scholarship in November 2011. Just 32 Americans are selected as Rhodes Scholars each year. They study for two years at the graduate level at the University of Oxford in the U.K. Brandon was also one of three WFU students chosen to give a senior oration at the WFU Founders' Day Convocation on Feb. 16. His talk was titled "Easy as Pi". He also gave the only talk at the Uuniversity's Graduation Awards Ceremony the day before graduation in May.

Soham Banerjee was awarded a Fulbright Research Scholarship to support graduate studies in Germany. The Fulbright award allows Soham to study for one year at the University of Duisberg-Essen Center for Medical Biotechnology under the guidance of Dr. Matthias Epple. Their work will focus on the development of new nanostructured biomaterials for orthopedic implants and their subsequent use in a clinical setting.

Claire McLellan and Jeremy Ward were both awarded National Science Foundation Graduate Research Fellowships. These Fellowships are for 3 years and provide each student with a $30,000 annual stipend and each student's institution with a $10,500 annual cost-of-education allowance. Jeremy is a WFU graduate student working at the Nanotech Center under the guidance of Professor Oana Jurchescu. Claire also worked there as an undergraduate and was also under the guidance of Professor Jurchescu. Claire started graduate school at the University of California, Santa Barbara in July this year.

Katelyn Goetz received an NSF summer travel fellowship to work with Christian Kloc at Nanyang Technological University in Singapore. Her work there this summer has been focused on the growth of crystals. She has worked with Professor Oana Jurchescu as both an undergraduate and a graduate student. Their relationship was the focus of an article in last February's edition of Wake Forest Magazine – see http://magazine.wfu.edu/2012/02/01/katelyn-goetz-%E2%80%9911-and-professor-oana-jurchescu/.

At the 2012 International Conference on Defects in Insulating Materials the Young Researcher prize was awarded to Wake Forest graduate student Qi Li for his presentation on "First Principles Calculations of Iodine Vacancy Centers in Strontium Iodide". Co-authors with Qi on the research are professor Richard Williams of Wake Forest, and Daniel Aberg and Babak Sadigh of Lawrence Livermore National Laboratory. The research is important for improving the energy resolution and sensitivity of radiation detectors used in homeland security, medical molecular imaging, and high-energy physics.

Kristen Binz, (an undergraduate Physics senior) won an award for being one of the best oral presenters from SPS oral and poster sessions held on February 27th and 28th, 2012 at the annual March Meeting of the American Physical Society in Boston, MA. Kristen won for her oral presentation entitled: "Depth of focus in digital holography using semi-coherent light". The research was carried out during

the summer of 2011 by Kristen at the University of South Florida in Tampa, where she was funded by a National Science Foundation Research Experience for Undergraduates summer fellowship.

Claire McLellan, Soham Banerjee, and Danny Gallagher (all undergraduate Physics seniors last academic year) won a Bronze Medal in the 2011 University Physics Competition. The competition consists of students solving an open-ended problem during a 48 hour period. The competition is international. They chose to solve the problem entitled "Shooting a Basketball for Three Points." Of the 77 teams in the 2011 University Physics Competition, 2 teams (3%) were ranked as Gold Medal Winners, 14 teams (18%) were ranked as Silver Medal Winners, 21 teams (27%) were ranked as Bronze Medal Winners, and 40 teams (52%) were ranked as Accomplished Competitors. The 2011 University Physics Competition received official sponsorship from the American Physical Society and American Astronomical Society, which provided prizes for the gold medal winning teams.

Graham Lopez was selected for the XSEDE (Extreme Science and Engineering Discovery Environment) Student Engagement Program which is a 10-week program where students selected from around the country participate in projects at various high-performance computing facilities. As a result, Graham worked this summer at Oak Ridge National Laboratory with the National Institute for Computational Sciences (NICS) on tasks related to performance comparisons for a new full-scale system with other existing NICS systems. Graham Lopez is a graduate student in the Materials Simulation Group of Professor Timo Thonhauser where he does research on computer simulations of magnetic properties of molecules and materials.

Nicholas Lepley and Greg Smith, both graduate students in Physics, and Lee Bailey, a graduate student in the Computer Science Department, received an award from The Office of Innovation, Creativity, and Entrepreneurship at WFU. They are being funded to develop software to do 3D printing, a type of rapid custom manufacturing process, to create additional visualization and display tools for their research. In addition, they hope to allow others to upload things to their website so as to provide a centralized, feature-rich, method of exchange for other designers, printers, and users of this 3D printing technology. Nicholas Lepley's research is conducted under the guidance of Professor Natalie Holzwarth and Greg Smith's research is conducted under the guidance of Professor David Carroll.

Two Physics graduate students, Joel Grim and Peter Diemer, won awards in the Analytical Poster category of the Twelfth Annual Graduate Student and Postdoctoral Fellow Research Day presented by the Wake Forest University Graduate School of Arts and Sciences. Joel Grim placed first with his poster "Scintillator proportionality: your life might depend on it!". Joel's work was completed under the direction of Professor Richard Williams. Peter Diemer was first runner-up with "Improving the Performance of Organic Devices by Tuning Film Morphology". Peter's research was conducted under the guidance of Professor Oana Jurchescu.

Three Physics Department awards were given out to students during our last colloquium of the academic year in May. Claire McLellan and Brandon Turner both received the Speas award and graduate student Corey Hewitt received the Outstanding Teaching Assistant award.

I mentioned above that two physics conferences have been held at WFU in the past year. One of them, the WFU 2012 Zone 5 SPS Conference, was organized by the Society of Physics Students under the guidance of Professor Eric Carlson. It was held on the WFU campus on April 20-21. We were very impressed that they were able to bring in as a speaker Nobel Laureate William Phillips from the National Institute of Standards in Gaithersburg, MD and the University of Maryland, College Park. He

gave an excellent public talk entitled “Time, Einstein, and the Coolest Stuff in the Universe”. Other participants at the conference came from North Carolina, Virginia and Tennessee.

The second conference was the 24th Annual Workshop on Recent Developments in Electronic Structure Theory held at Wake Forest on June 5-8, 2012. Physics professors Timo Thonhauser and Natalie Holzwarth, along with Chemistry professor Akbar Salam worked together to organize and make the local arrangements for it. They also worked with the international steering committee to choose a list of topics representing recent major developments in the field and invited speakers. The program consisted of 24 oral presentations, 70 posters, and 2 panel discussions, with a total of about 150 participants. Participants came from all over the world and included undergraduate students, graduate students, postdoctoral researchers, and senior scientists. During the closing remarks, Professor David Ceperley (University of Illinois at Urbana-Champaign), one of the founding fathers of this workshop series, said “This is without doubt the best organized workshop in the 24-year history of this workshop series and one of the strongest programs.”

Some members of the Department have also been involved in outreach programs to the local public schools. Professors Samuel Cho (Department of Physics and Department of Computer Science) and Paúl Pauca (Department of Computer Science) organized a computational thinking workshop for teachers at Hanes Magnet School. The workshop was generously supported by Google, Wake Forest University Departments of Physics and Computer Science, The Center of Excellence for Research, Teaching, and Learning at Wake Forest School of Medicine, and Cengage Learning. Their focus was to incorporate computational thinking problem solving skills into the teachers' existing curriculum. Represented were Engineering, English/Language Arts, Science, and Social Studies teachers who decided to spend their summer learning ~~to~~ about how computational thinking can help their students. They are an inspiration.

The Society of Physics Students, under the guidance of Professor Eric Carlson, visited Hanes Middle School weekly over a period of 3 months to teach sixth through eighth grade students about robotics, science, technology, engineering and mathematics (STEM). The students designed and constructed underwater Remotely Operated Vehicles (ROVs), through their participation in SeaPerch, a national program sponsored by the U.S. Office of Naval Research.

Some of the research efforts of our faculty have received extra recognition in the past year. An article written by Professor Fred Salsbury and post-doc Lacramioara Negureanu was selected for the cover of the February issue of the Journal of Biomolecular Structure and Dynamics. The paper titled "Insights into Protein - DNA Interactions, Stability and Allosteric Communications: A Computational Study of Mutsα-DNA Recognition Complexes" studies the conformational changes that occur in this recognition complex due to the binding of DNA damage from the chemotherapeutic cis-platin, in order to better understand the molecular origin of intra- and inter-protein communication mediated by this complex, to predict the effects of cancer-associated mutations on the molecular level, and to assist in further developing this complex as a target for therapeutic design.

Professor David Carroll’s group at the Center for Nanotechnology and Molecular Materials has developed an exciting nanoengineered thermoelectric/piezoelectric technology called PowerFelt. This fascinating material generates electricity from the heat and vibration of large extended objects, like the human body, but feels and acts like a fabric. Professor Carroll's work in power generating fabrics has been featured in the national news recently (CNN, Discovery, Time, and more) and in June 2012 the NY Times featured PowerFelt at the top of a list of 32 Innovations "That Will Change Your Tomorrow".

The research of Professor Sam Cho and his students was recently profiled in a number of international and local news media outlets. Professor Cho and his team tackle biomolecular molecular dynamics simulations by implementing their algorithms on a video gaming technology called graphics processing units (GPUs). These GPUs were originally designed for rendering images on a computer screen, but they hijacked this technology for high performance computing with impressive results.

Wake Forest University has been named a CUDA Teaching Center by NVIDIA Corporation. Professor Sam Cho will coordinate the Teaching Center activities, which include teaching, research, and training. CUDA is NVIDIA's parallel computing architecture that enables dramatic increases in computing performance by harnessing the power of the graphics processing unit (GPU). CUDA Teaching Centers have integrated GPU computing techniques into their mainstream computer programming curriculum, and are dedicated to training the next wave of parallel programmers to address today's most challenging computing issues and drive the next wave of scientific discovery. As part of the Teaching Center program, Dr. Sam Cho taught a new course: Special Topics: GPU Programming (CSC 391/691, cross-listed as PHY 391/691) based on the CUDA architecture in Fall 2011.

Two of our faculty members have also been interviewed by the press in the past year. Professor David Carroll was interviewed on the importance of nanotechnology by Denise Franklin on the Voices and Viewpoints Program on our local National Public Radio Station WFDD. Professor Eric Carlson was interviewed for several stories concerning numbers and the fascination of many with the date of 11/11/11. He was featured or quoted by WFMY 2 News, USA Today, CNN, Huffington Post, BBC Radio, and NBC Nightly News.

I want to give special thanks to all of you who designated the Physics Endowment Fund as part of your alumni giving. As well as helping to send students doing research to national and international conferences, the Physics Endowment Fund is used to support other aspects of student research and scholarship. It also supports the annual faculty and student awards and allows us to provide lunches at the career advising events for our undergraduate and graduate students. The Fund is also used to support the students who are members of our local chapter of the Society of Physics Students in their activities and events throughout the academic year. The members of the Physics Department and the university community greatly appreciate the support of our alumni.

Please come by Olin Physical Laboratory and join the fun if you can. We are looking forward to seeing you. If you can't make it to Homecoming, please drop me a note or give me a call and tell me what you're up to. If this letter was forwarded to you, please let us know your current address.

Best Regards,

Keith Bonin
Professor of Physics & Chair