



September 26, 2018

Dear Physics Alumni:

Welcome to the department's 2018 newsletter! I hope you will take a few minutes to catch up on what has been happening in the department.

I especially want to call your attention to our departmental Homecoming reception on November 3. We would love to see you again. Details are below.

If you did not get a copy of this newsletter by e-mail, that means that we do not have an up-to-date address for you. Would you please send me your preferred e-mail contact address at shapiro@wfu.edu?

We would love to hear from you.

Best regards,

A handwritten signature in black ink that reads 'Daniel Kim-Shapiro'.

Daniel Kim-Shapiro, Ph. D
Professor and Chair of Physics
Harbert Family Distinguished Chair
Director, Translational Science Center: Fostering Independence in Aging

Homecoming Reception



The Physics Department faculty and staff invite you to our **Homecoming reception on Saturday, November 3**. As in the past few years, we are having a joint reception with Chemistry and Biology and a lecture demonstration show.

The show is designed to be of interest to everyone including children. **The lecture demonstrations will begin at 10 am on Saturday morning in room 126 of Winston Hall. This will be followed at 10:45 am by a reception in the lobby of Winston Hall.** Tours of the newly renovated Salem Hall will also be available.

Alumni Award 2018



Daniel Kim-Shapiro presents Alumni Award to Richard Williams.

Last year we implemented a new alumni award. The award is given out to a Physics Department alumnus for exceptional achievements and/or service. The award is not limited to physics but covers all areas that our alumni excel in. If you can think of someone to nominate, please send a letter to the Department Chair, Daniel Kim-Shapiro or email (shapiro@wfu.edu) describing why that person is a good candidate for this award. Note that the award will have a modest monetary component.

We are pleased to announce that Reynolds Professor Emeritus Richard Williams is the inaugural winner of the annual Physics Department Outstanding Alumni Award. Dr. Williams accepted the award at a special physics colloquium on September 5, 2018. Dr. Williams retired earlier this year after 31 years of service as a Reynolds professor. It is fitting that Dr. Williams will be our first winner of the Alumni award; he was the first Speas Award recipient for distinguished work in physics (our highest undergraduate award), he mentored the first Physics Ph.D. graduate, and was the first endowed professor within the Department. Dr. Williams, an international expert in scintillators and ultrafast laser spectroscopy, has helped to significantly increase the reputation and visibility of the Physics Department.

Significant changes over the past year

Melissa Mitchell has been our administrative assistant for the past year. Melissa comes to us after working at Wake Forest Baptist Medical Center as an administrative secretary. Prior to this, she worked remotely for 15 years as a medical transcriptionist – 5 of those years for Adventist Health/Florida Hospital and 10 years for Novant Health. After both of these positions were outsourced,

Melissa felt it might be time to “reinvent her wheel”, and this led her to the Wake Forest University family.

Melissa has many joys and interests in her life. She loves spending time with family (including her dogs) and friends. She enjoys gardening and yard work, antiques, interior decorating, and planning social events, not only for those close to



her personally but for the Physics Department as well. The following quote sums up her feelings about coming to work with us: “I am thrilled to be a part of the Physics Department! I feel at home in this amazing group of people, including faculty, staff, and students. I look forward to a wonderful future here.”

In last year’s newsletter it was mentioned that Richard Williams has retired, but is keeping his laboratory space for two years. We hired an instructor named Bin He to temporarily replace him. Dr. He received his Ph.D. from the University of Delaware. His dissertation was on Higgs phenomenology and new physics beyond the Standard Model. After that he taught as a visiting professor at Central Washington University and then at Central Michigan University.

Our part time administrative Assistant, Lesley Whitener has moved on. She is now working full time for the Computer Science Department. Lesley joined the Department in 2015 and we have really enjoyed working with her. She has been incredibly helpful. We wish her well in her new job.

When Lesley joined us she replaced Heather Chapman who had worked in that position for a few years. Now they’ve switched and Heather is Lesley’s replacement. We are very happy to have Heather back.

On Tuesday, June 19, 2018 rising junior and biophysics major Bingrui (Zach) Zhang passed away. We mourn the loss of a wonderful person, friend, student, colleague and researcher. Our deepest sympathy goes out to his family.

Zach joined the Physics department in the fall of 2017. He had taken several classes in the Physics department and he worked as a researcher in the Guthold/Bonin lab. He was an excellent student, and an enthusiastic, deeply involved student-researcher. He had also won a \$4000 URECA fellowship to be a full-time researcher in the Guthold/Bonin lab for the summer of 2018. Zach is remembered as cheerful, hard-working, helpful to everybody, and also as very inquisitive and interested in his research project. He was working on the characterization of electrospun nanofibers that might be used in tissue

engineering and biomedical research. His goal was to go to graduate school in biomedical engineering.

Awards received by faculty and students

Associate Professor Timo Thonhauser has been elected a 2017 Fellow of the American Physical Society (APS) by the APS Council of Representatives upon the recommendation of the Division of Computational Physics. This honor is in recognition of Dr. Thonhauser's contributions to include van der Waals interactions in density functional theory.

Associate Professor Oana Jurchescu was awarded the Wake Forest University Undergraduate Research and Creative Activities Center's (URECA) Faculty Award for Excellence in Mentorship in Research and Creative Work. The award was presented at the 2018 WFU Founders' Day Convocation held in Wait Chapel on Feb. 15, 2018. The award recognizes faculty members who engage Wake Forest undergraduates outside the classroom and inspire, guide and support the students' intellectual and creative endeavors.

Jed Macosko and Fred Salsbury were promoted to the rank of Full Professor during the spring semester.

WFU Physics alumna Angela Harper (B.S. '17) was awarded the 2017 LeRoy Apker Award, in recognition for outstanding achievements in Physics. This award is given by the American Physical Society and two awards are presented each year, one to a student from a Ph.D. granting institution, and one to a student from a non-Ph.D. granting institution. Angela was selected for her contributions to printed electronics research and outstanding leadership of the Society of Physics Students and Society of Women in STEM fields. Angela worked in Prof. Jurchescu's group and together with postdoctoral researcher Peter Diemer developed the first ever laser printed transistor. While an undergraduate at WFU she also won a Goldwater fellowship, the Churchill fellowship and the NSF graduate research fellowship. She is now a graduate student at Cambridge University in the UK.



Jed Macosko and Fred Salsbury



Katrina Barth and Zach Lamport
made 2,000 award offers.

Undergraduate student Katrina Barth ('18) won a 2018 NSF Graduate Research Fellowship. The NSF Graduate Research Fellowship Program recognizes and supports outstanding graduate students in science, technology, engineering, and mathematics disciplines who are pursuing doctoral degrees at US institutions. This fellowship will cover her graduate school tuition and stipend. For the 2018 competition, NSF received over 12,000 applications, and

WFU Physics alum, Chaochao Dun (Ph.D. '17), has been awarded the Chinese Government National Outstanding Self-funded Scholarship Award for 2017. This award was founded by Chinese government in 2003 with the purpose of rewarding the academic excellence of self-financed Chinese students studying overseas. This award is considered as the highest award given by Chinese government to graduate students who study outside of China and do not receive financial support from Chinese government. An award ceremony will be held at the Chinese Embassy in Washington, D.C. in April. Dr. Dun completed his thesis under the direction of Professor David Carroll at the Center for Nanotechnology and Molecular Materials.

At our annual Physics Department awards ceremony in May, Oana Jurchescu received the Physics Department Excellence in Teaching Award. Eric Chapman received the Physics Department Outstanding Service Award. Graduate Student Richard Dudley won the Outstanding Teaching Assistant Award. Graduate students Hyunsu Lee, Stephanie Jensen, and Zach Lamport (who graduated last spring) were co-recipients of the Peer Mentor Award. Sajant Anand and David Ostrowski were co-recipients of the Speas award.

Ledford Scholars



We have a new Ledford Scholar this year, Hannah Duke from Charlotte, NC.

Hannah took classes in middle school and high school in physics to see if an interest in space, which she has had since she was very young, would correlate with an interest in and passion for physics. She found that it does and says that she is “beyond excited to explore physics more deeply at Wake alongside great faculty and fellow students.” Hannah also loves to dance and play the piano. This played a part in her decision to come to Wake Forest which she says is “an institution that allows me to pursue challenging academics alongside high level arts classes”. The Ledford scholarship also played a significant role in her decision. Along with

Hannah Duke

the significant financial help it provides she says that “it made me feel like Wake really cared about me as a student and was willing to invest in my potential”.

Several years ago one of our alumni, Randall Ledford (72), funded a scholarship for gifted physics students. It is a merit based four-year half-tuition scholarship which is awarded to a promising incoming physics major attending Wake Forest.

Anyone is eligible to apply during the year it is available. Later he funded a second scholarship for which anyone attending high school in North Carolina during the time it is available is eligible to apply. The second scholarship is currently worth a minimum of \$39,200.

Dr. Ledford says the following about the reasons he set up these two scholarships: “There are many reasons that motivates someone to contribute to education and universities. For me, my major reason is a way of ‘giving back’. I would not have been able to attend WFU without financial aid. Before I funded the scholarship, I donated to the yearly WFU fund raising campaign, but I wanted to do something more than simply writing a check each year. I chose to fund an endowed scholarship for young men and women who loved science and would like to major in physics. I wanted to help others who might not otherwise be able to attend WFU and have the opportunity I had. There was another important factor. I’ve always had a special affinity and loyalty to the WFU physics department. My physics professors shaped my life and taught me to think logically and analytically. Faculty members like Shields, Kerr, Williams and

Turner will forever be more than just educators to me. They were true teachers that molded the boy who first walked into Salem Hall into the person I became. The scholarship was a way for me to do something for the department.”



Dr. Randall Ledford

Dr. Randall D. Ledford, Ph.D., is retired from Emerson Electric Company where he served as Senior Vice President and the Chief Technology Officer. During this time he also created R&D centers around the world including India, China and Eastern Europe. He was also President of Emerson Ventures since 1997. Prior to joining Emerson, he served as President and General Manager of several different divisions at Texas Instruments Inc., including the divisions of Digital Imaging, Software, Enterprise

Solutions and Process Automation. He began his career with Bell Telephone Laboratories in New Jersey where he worked on UNIX development, fiber optic communication and microwave transmissions. He has served as a director of several companies including [Akermin](#), Inc., Gerber Scientific, Inc., Stereotaxis Inc., Amphenol Corporation and Interphase. Dr. Ledford was a director for the Oak Ridge National Laboratory strategic transition board. He has served on several university advisory boards including Cornell, Missouri, Carnegie Mellon and WFU. Dr. [Ledford](#) received a Ph.D. and M.S. in Physics from Duke University and a B.S. in Physics from Wake Forest University.



Jacquelyn Sharpe

The current recipient of the first Ledford Scholarship is Jacquelyn Sharpe who is a senior this year. She is on track to receive a BA in Physics and plans to graduate next spring.

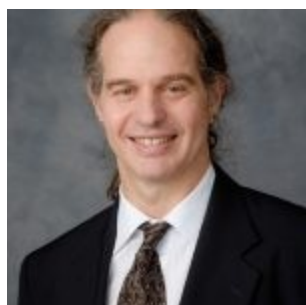
Jacquelyn is from Marietta, GA, just outside of Atlanta. She is a physics major with Mathematics and Spanish minors. She plays Ultimate Frisbee and participates in the school orchestra, where she plays the viola. She is also involved with the Wesley Foundation on campus and attends a local Methodist Church. Jacquelyn has had a love for science since she was very young. She became interested in physics during her third year of high school and also enjoyed studying calculus while in high school.

She says that she “was attracted to physics because of its real world applications of math and science”.

There were several reasons she chose to come to Wake Forest including its location in a small city in what is essentially a suburban campus, her desire to be at a small school where she says that she “could really get to know my professors and other students”, and the attractiveness of the Wake Forest campus including its trees and flowers. However, she says that “The Ledford scholarship is one of the biggest reasons I am at Wake Forest. It would not have been feasible for my family to afford Wake Forest without the Ledford Scholarship.” After being informed that she had received the scholarship Jacquelyn says “I was delighted and immediately chose Wake Forest, which has been one of the best decisions of my life”.

Personal updates from faculty

Daniel Kim-Shapiro



My first year as Chair has gone well thanks very much to the great faculty and staff here and having a great Associate Chair, Oana Jurchescu. This will be a big year with our search for two new tenure-track faculty. The department continues to grow and do well.

I enjoyed teaching Biophysics last year with Martin Guthold. We had a great bunch of students and it was fun incorporating some group problem solving in that class.

My lab is doing well. A few undergraduate students graduated last year: Caroline Vath and David Ostrowski who completed an honors thesis and won the Speas award. This past summer I had four undergrads working in the lab: Fernando Rigal, Chloe Harty, Aryatara Shakyra (from Salem College), and Lauren Hobson (from UNC). They are all still working in the Lab this fall except Lauren. They did a great job working with Swati Basu, Nadeem Wajih, Andreas Perlegas, and Howard Shields along with grad student Ellie Alipour. We are presenting results at the NO meeting in England in September, the Carolina Biophysics Symposium in October, and a Gordon Conference in Ventura CA in February.

My oldest son Soleil decided to major in computer science at the Engineering school at NC State as he starts his second year there. My other two boys are in high school. My wife Lisa is still working hard as a Pathologist at Wake Forest. The highlight of our summer was probably the trip to NYC where we stayed downtown and played tourist.

I bumped into alum Michael Font at a talk I gave at the medical school here; he is a resident there now. I love when that happens.

Stay in Touch

Dany Kim-Shapiro

Paul Anderson



Last year was a good year. A paper with a former student, Dillon Sanders (B.S. 14), and an external collaborator, Emil Mottola, was published in Physical Review D. The topic was particle production in the presence of a strong electric field and also in models in which the universe expands exponentially for a period of time. A paper on work with graduate student Richard Dudley and two external collaborators, Roberto Balbinot and Alessandro Fabbri, was very recently submitted for publication in Physical Review D. The subject is Bose-Einstein, BEC, analog black holes. The idea is that under certain conditions a BEC can mimic mathematically some of the properties that a black hole has. The advantage is that, unlike black holes, BEC's can be studied in the laboratory. This work involves using a simple model to predict what types of structure experimenters might find under certain conditions in a quantity they can measure called the density-density correlation function.

Last winter undergraduate Robert Link joined our small research group. Both Robert and Ray Clark worked with me during the spring semester on different projects and both applied for and received WFU Undergraduate Research and Creative Activities grants which allowed them to spend most of the summer doing research. Robert worked mostly on a project that involves studying the effects of particle production which occurs due to a strong electric field. It is known from previous work that the created particles accelerate and in the process create a counter electric field which then damp the original field. The goal in this project is to determine whether one of the important approximations used to determine the effect on the background electric field is valid. Ray worked on a project that involves computing the details of the particle production which occurs when a spherical shell of photons collapses to form a black hole. Although this is not how black holes actually form, it serves as a simple model of the collapse process and is providing us with insight as to how the particle production might work in the more complicated cases of collapse of a star to form a black hole.

Ritchie Dudley and I gave talks and Ray Clark presented a poster at the American Physical Society Meeting in Columbus last April. I also attended two weeks of a three week workshop on cosmology in Stockholm, Sweden in late July and August. There I gave a talk on the paper mentioned above with Dillon Sanders and Emil Mottola.

Keith Bonin



Keith Bonin completed his last year (of 10) as Chair of the Department on June 30, 2017, and so the past year was spent on sabbatical to conduct research. Over the past year he wrote two papers as the corresponding author that were accepted in peer-reviewed journals. One paper concerned structured illumination to measure chromatin mobility in cancer cell nuclei. The other paper was on the development of an optical trap created using a standing wave Bessel beam. Both papers had student co-authors who worked on the related projects. In addition, he gave two oral talks at international conferences – one in San Diego and the other in St. Petersburg (Russia). In addition, Prof. Bonin submitted 3 grant proposals last year as co-PI with other scientists, and one was awarded from the NIH, beginning Sept. 2018, to study chromatin dynamics in 3D using some novel optical methods. Finally, on July 1st, 2018, Prof. Bonin started working in Reynolda Hall as the Associate Provost for Research and Scholarly Inquiry. This past year Prof. Bonin mentored or co-mentored 9 undergraduate, and 2 graduate, students in research.

Oana D. Jurchescu



The Jurchescu research group welcomed one new graduate student this fall (Ryan Sullivan). Five undergraduate students and one graduate student graduated in May 2018. Dr. Zach Lamport is now a postdoctoral researcher at Wake Forest University, four undergraduates continued with graduate school (Sajant Anand at Cambridge University, Shengcheng Chen at UC Berkeley, Katrina Barth at Duke University and Ben Scharmann at Georgia tech) and one works in industry (Laura Jennings, Dow Corning). Katrina won a graduate research fellowship from the National Science Foundation that will support her PhD studies at Duke, Sajant won the best presentation award at the American Physical Society (APS) March Meeting and the WFU Archie Student Award. Angela Harper was awarded the 2017 LeRoy Apker Award, in recognition for outstanding achievements in Physics. This award is the most prestigious award given by the APS to an undergraduate student. Angela was selected for her contributions to printed electronics research and outstanding leadership of the Society of Physics Students and Society of Women in STEM fields.

Natalie Holzwarth



Jason Howard completed his thesis on “First-Principles Simulations of Solid State Battery Materials” and received his Ph. D. in May 2018. In September 2018 he began a postdoctoral position at Argonne National Laboratory. Ahmad Al-Qawasmeh completed his thesis on “Ab Initio Simulations of Idealized Solid Electrolytes in Lithium Ion Batteries” and received his Ph. D. in August 2018. He has returned to his home in Jordan where he is continuing some research projects and applying for various employment opportunities. Yan Li is continuing her second year of materials modeling research.

Rick Matthews



Hello, alumni!

I spent the 2017-18 academic year on research leave, only the second of my career. After spending seven years in administration and (over)due for a leave, I faced a decision: should I use this leave to get back up to speed in my old research areas or go in a new direction?

First a little context. Computational condensed matter has moved a long way while I was in administration full time. Catching would easily take the entire year, with little to show at the end. Also, though I am no longer Chief Information Officer, I still have a half-time appointment as Director of Academic and Instructional Technology for the College; in this role I lead a team of instructional technologists to help faculty enhance their teaching through effective use of technology-enhanced pedagogy. Finally, upon returning to teaching in 2014, I experimented with a radically different approach to teaching: flipping my class. This approach has worked remarkably, with my students enjoying it more and learning much more. With my colleague Jack Dostal, we have been able to document huge improvements in learning with this approach to teaching and learning.

With all that in mind, I chose to make my research leave topic physics education, exploring what about this approach to flipped classes results in such remarkable improvements in learning. I also wanted to discover ways to make it better still. Sharing these findings will make it easier for other faculty to adopt this approach. This choice of topic means the three aspects of my work reinforce each other. My scholarship on this topic helps my teaching, and both position me to better support other faculty in my academic technology role.

The leave was exciting, but I am delighted to be back in the classroom this fall. The department chose to spin off our flipped sections of General Physics as honors sections!

Hope to see you all at Homecoming.

Timo Thonhauser



The Thonhauser lab got another grant funded from NSF, focusing on fundamental work to improve the description on van der Waals interactions in density functional theory. The grant sponsors a postdoctoral research associate, who joined our group in November 2017 such that our group now consists of 2 postdoctoral research associates, two graduate students, and three undergraduate students. However, the majority of work over the past couple of years has gone into establishing the WFU Center for Functionals Materials. Prof. Thonhauser has shepherded this center application through the “Center Planning Year” and on July 1, 2018 the center was officially established at WFU with Prof. Thonhauser as the founding director. The goal of this center is to provide a common platform for all researchers at WFU who have an interest in materials, bringing together several departments, also joining the various campuses, and even including the medical school.

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