Welcome!

The new class of freshmen has been rung in so it is time to review what has happened over the past year in the Physics Department. Among other things, you’ll notice some new faces along with the absence of some with whom you’ve grown familiar. We invite you to follow us on Facebook to keep up to date on what is going on. Finally, please let us know what you are doing so that we can include it in next year’s newsletter.

Faculty and Staff Update

Eileen Bowen is starting this fall as the academic administrative coordinator for physics, mathematics, and computer science. No stranger to the College, she was the administrative assistant for the Fine Arts Center from 2001–2015 when she retired. Eileen has enjoyed working for a number of departments since then when staff members were on maternity leave. She was honored to work in the Dean of the College’s Office this past year following the passing of Chris Duff.

Eileen graduated from Lebanon Valley College (Annville PA) with a B.S. in Music Education, taught public school music (elementary strings and vocal music), and was a stay-at-home mom for a few years. Prior to coming to Wabash, she was the administrative assistant for a University of Cincinnati Medical Center pulmonologist in his academic office, focusing mainly on clinical trials and investigator-initiated research. Eileen is looking forward to working with her first Division I faculty and getting to know, however briefly, some of the students who have classes in Goodrich.

Jim Brown saw the first cohort of students in the S-STEM scholars program graduate this spring, and most were physics majors! Two will go on to teach in Indiana high schools, one is pursuing graduate study in physics, and two more are working in industry in California and Arizona. We wish them good fortune in these endeavors and take joy in their time at the College. The greatest part of being a professor at Wabash College is watching and helping students grow throughout their four years here.

Jim is happy to be working with freshmen again. After teaching PHY 112 in the spring, he will be teaching PHY 111 in the fall. Jim is again teaching the advanced laboratory course this year, and is always on the lookout for new student projects. If you have a fun idea or think there is something current students “must know,” send him an email. We love to hear from our alumni.

Jim’s research continues to be centered in the nuclear structure of the most neutron-rich nuclei that can be made. This year marks two transitions for the MoNA collaboration: Michael Thoenessen, the long-standing leader of the group at Michigan State and the NSCL has departed to take on new duties as the Editor in Chief for APS, and the detector systems themselves have begun a
two-year process of changing beamlines within the laboratory. While it is sad to see the detectors boxed and stored, it has been an amazing run for fifteen years and over forty publications. While these events will present challenges in the next two years, Jim is looking forward to the opportunities provided by the new location and new more intense beams of rare isotopes to be provided by the Facility for Rare Isotope Beam in the coming years.

Jim was recognized at the annual Faculty and Staff Retirement and Recognition Lunch for his 15 years of service to the College.

Dennis Krause completed his 20th year at Wabash, teaching PHY 111 (first semester introductory physics) again this past fall along with quantum mechanics. To prepare students taking the physics GRE (and seniors preparing for comps), Dennis gave weekly sessions covering material covered on the exam. Since the sessions were done in the early evening, he brought Chinese takeout food for everyone. During the spring semester, he taught a special topics course on cosmology, which was perfect preparation for a lecture “Physics and Big History” he gave in Prof. Rick Warner’s Big History course in February.

Dennis continued working on two major research projects this past year. With Quan Le Thien (‘18), he investigated the effect of neutrino oscillations on the potential energy between two fermions exchanging virtual neutrino-antineutrino pairs. In the process, he developed a new, more straightforward, approach to deriving this potential. This summer, he also continued working with Joseph Bertaux (‘19) on the drag force on celestial bodies moving through dark matter.

Since the last newsletter, Dennis had one publication:


Dennis will be on sabbatical 2018-19, but he’ll still be around, doing research, helping with the department review, and firing up the grill for the annual beginning-of-the-year physics cookout.

Martin Madsen took a leave of absence 2017-18 to explore the application of machine learning in the business environment. This turned out to be a good fit, so he decided to leave Wabash to work full-time, becoming a data scientist at Allegion in Carmel, IN.

It would take the full length of this newsletter to list all the contributions Martin made to the Department over his 10-year tenure: Cookies at 4:00, experiments with an element of danger and destroying indestructible tabletops, Mythbusters Physics, Physics 105, Physics 109/110, and creating a model for teaching Adlab that works. We’re going to miss his presence, and wish him well in his new career and hope he will return to give a colloquium on his experiences.

Rebekah Mason served as our academic administrative coordinator this past year. Graduating from Crawfordsville High School, she received a BS degree in biology from IU, and then held a number of positions with Clarian Health, Kelly Scientific Services, and Eli Lilly before taking a break from work to raise her family.

Matt Roark has now accumulated ten years at the college, serving campus needs with the IT, Chemistry, and Physics departments. Matt added collaborations with the Music and Art departments, supervising the physical construction of musical instruments in an Art lab space with Dr. Makubuya’s MUS 202 class.

Matt also assisted with Nate Tompkins’ redesign of PHY109/110 labs, including the fabrication of giant, adjustable resonance tubes. He also created a laminar flow apparatus which made an appearance at PI Day at the Crawfordsville Carnegie Museum. Matt also modified several lab components, including adding more robust resistors in the Faraday lab to better manage high currents.
Gaylon Ross joins the department as Visiting Associate Professor for 2018-2019 to serve as Dennis’s sabbatical replacement. Gaylon took a quite circuitous route to Wabash. He received his B.S. from the University of Central Arkansas, earned M.S. and Ph.D. degrees from the University of Notre Dame, and then was a faculty member (Instructor, Assistant Professor, and Associate Professor) in the Department of Physics and Astronomy at his undergraduate alma mater from 1993-2004. While at UCA, he taught a dozen different courses from general education service classes to senior level major classes, served as Interim Department chair from 2000-2002, and was elected Faculty Senate President.

In 2004, he left academia to become plant manager of Sommer Metalcraft Corporation here in Crawfordsville, a business owned by his wife Kristie’s family since the 1930s. After 13 years, he chose to leave the business and return to what he had always felt was his “true-calling” in higher education. His primary research has been focused in the field of nuclear astrophysics, studying thermonuclear reactions that occur in hot, dense environments such as novae and supernovae, but he is also interested in industrial physics and its applications.

Kristie and Gaylon have one son, Sam, who is a junior majoring in Biology at Butler University. They are members of First United Methodist Church in Crawfordsville where they have been active in numerous roles and Gaylon sings in the Chancel Choir and Men’s Quartet. They are also strongly rooted in the community, having served on the boards of the Montgomery United Fund and the Montgomery County Community Foundation, and Gaylon is currently an appointed member of the Crawfordsville Redevelopment Commission.

Nathan Tompkins took over the new life sciences focused introductory physics sequence this year. He focused the laboratory portion on video tracking labs using the high-speed video camera functionality of iPads and free object tracking software. Students also built their own miniature Tesla coils in lab. A teaching paper about the Tesla coils should be coming out in the fall. In the classroom portion he added a unit on types of fluids, types of fluid flow, and fluid contact angle. He also enjoyed teaching the upper level Classical Mechanics and Electromagnetic Theory courses.

During this year his most recent publication on pattern formation came out:


At Wabash he established the Pattern Lab to study hydrodynamically controlled precipitate formation. To this end the physics department has a new 3D printer, PDMS casting facility, and fluid injection workstation. Over the summer he worked with students Theodore Lupinski ('20) and Zachary Ostrowski ('20), and presented their work at an academic conference in Les Diablerets, Switzerland.

This upcoming year he is looking forward to teaching the sophomore physics sequence and repeating the upper level courses from last year. In the lab he intends to keep working on precipitate formation, develop an Arduino controlled constant pressure pump, and create a demonstration railgun.

Keep up-to-date on what’s happening in the Physics Department through our Facebook page: https://www.facebook.com/WabashCollegePhysics

There you will also find additional photos and articles we weren’t able to include in this newsletter.

Photo by Matt Roark: Flowers caught off guard by a surprise spring snow.
Graduating Seniors
We had another large group finishing this year, including 9 majors (Devin Atkins, Oscar Chavez, Cody Cochran, David Johnson, Patrick Kenney, Quan Le Thien, Tyler Mix, Tim Riley, and Carlos Rios) and one minor (Kirill Ivanishchenko). Devin and Tim will be teaching in the Indianapolis area next year in the Indianapolis Teaching Fellows program, while David will be at Purdue studying electrical engineering as part of the dual degree engineering program. Tyler is entering the physics Master’s program at Ball State, while Quan is taking a gap year before entering the Ph.D. physics program at Stony Brook. Finally, Cody will be starting the aerospace and mechanical engineering Ph.D. program at Notre Dame, and Patrick will be a project estimator with F. A. Wilhelm Construction. We wish everyone our best!

Awards Chapel Winners
This year’s winner of Harold Q Fuller Prize for the most outstanding junior physics major was Joseph Bertaux (’19) who was studying in Budapest during the spring semester and so wasn’t able to attend the Awards Chapel. Quan Le Thien (’18) won the Physics Department Writing Prize (our first 2-time winner) for his paper (co-authored with Prof. McDermott) “Enhanced pinning for vortices in hyperuniform pinning arrays and emergent hyperuniform vortex configurations with quenched disorder” published in Physical Review B. Quan also received the Carscallen Prize in Mathematics and a Mackintosh fellowship for graduate studies.

Quan Le Thien (’18), received distinction on his physics and mathematics comprehensive exams, and joined Cody Cochran (’18) and Patrick Kenney (’18) in being inducted into Phi Beta Kappa. David Johnson (’18) received the Treves Science Award for the DIV I major who made the greatest academic progress during his junior year.

In non-science wards, Cody Cochran (’18) received the Indianapolis Association of Wabash Men Scholar-Athlete Award, and Tim Riley (’18) was a co-winner of the Mitchum Glee Club Leadership Award.

Cody Cochran Receives Sparks Award
At the Senior Breakfast, it was announced that Cody Cochran (’18) was the recipient of the Frank Hugh Sparks Award for the senior “who has done the most to promote the true spirit and purpose of Wabash College.” He was unable to attend the breakfast since he is on the road pitching for the baseball team which won the NCAC championship.
Celebration of Student Research

In January, advanced lab students presented their work at the annual celebration of student research:

- Tyler Mix (’18): “Modeling Halo Nuclei with a Spherical Potential Well”
- Quan Le Thien (’18): “Neutrino Flavor Mixing with Dirac Equation”
- Patrick Kenney (’18): “Evaluating Crack Behavior in Reinforced Concrete”

Summer Research

This summer five students worked with our faculty on various research projects:

- Koty Hall (’19) and Spencer Shank (’20) developed software for analyzing MoNA experiments with Jim Brown.
- Teddy Lupinski (’20) and Zach Ostrowski (’20) worked with Nate Tompkins. While Zach designed and fabricated devices to study precipitate formation, Teddy created computer simulations of the processes occurring in these devices.
- Joseph Bertaux (’19) calculated drag forces acting on moving celestial bodies due to dark matter with Dennis Krause.

Joint Wabash-DePauw Physics Research Group Meeting

Midsummer, we invited Professor Jacob Hale from DePauw University to bring his three research interns up to Wabash for a joint Wabash-DePauw physics group meeting. The students presented their ongoing research projects, and then we had a cookout afterwards. At the right, we see them enjoying ice cream dessert.
Wabash Eclipse Expedition of 2017

On August 22, 2017, two College vans loaded with students and faculty drove to Hopkinsville, KY for the total eclipse. There they found perfect weather conditions to observe a spectacular eclipse.
Society of Physics Students (SPS) Activities

Pi Day

Sporting their new t-shirts designed by Nate Tompkins (below left), SPS was back at the Carnegie Museum for the annual Pi Day demonstration show in March. Along with some old favorites, they brought new demonstrations and hands-on activities which the kids thoroughly enjoyed. Below right, David Johnson ('18) and Robert Reed ('19) create patterns in sand with the Chladni plates.

Science Club at Hoover Elementary School

Led by Devin Atkins ('18), Society of Physics students Patrick Kenney ('18), Tyler Mix ('18), Cody Cochran ('18), and Alex Pittsford (‘20) went on the road to the Mollie B. Hoover Elementary School in Crawfordsville to investigate density physics with their science club students.
Alumni News

Updates
Since our last newsletter, we’ve heard from...

- **Ken Loker (’59)** is still active posting his ideas to [https://www.facebook.com/Spacetimemodels1/](https://www.facebook.com/Spacetimemodels1/).

- **Dave Bohlin (’61)** was cleaning out his shop and put together a box of old optical components left over from his early career in research before moving to NASA HQ. After checking with the Department, he mailed it to us for use in the advanced lab. Thank you!

- **Mike Swift (’77)** has recently moved to southwest Colorado to spend his days hiking, fishing and biking under clear mountain skies. “A career driven by numbers and airports is now history, happily replaced by a quiet contemplative life at the edge of the wilderness.”

- **Brock Berta (’88)** obtained an MBA and has used his physics degree “in the noble pursuit of healthcare paper shuffling, but still loves to hear about the Department.” He reminds us that his class year produced the most physics majors since the Kennedy administration.

- **Darius Galinis (’95)** went to grad school at Purdue and then worked for Intel for over 17 years designing microprocessors. “You give me a person that’s used any Intel processor and chances are I was on the design team.” He is now moving from hardware into the realm of software and databases.

- **Sam Krutz (’09)** followed his passion and obtained a degree in audio engineering from Middle Tennessee State University. He is currently working a day job in Nashville while also running his own music production and mixing services with the goal of pursuing it full time. “I really enjoy recording and mixing a raw idea into a polished track. I like to build or modify my own equipment using the knowledge gained from Wabash. It's wild what you can create with sound. It's become my passion/obsession lol.”

- **Zach Rohrbach (’12)** has started his fifth year of teaching at Avon High School. Aside from teaching Honors Physics, Physics I, and Integrated Chem/Phys, he’s starting his fourth year as coach of Avon’s Science Olympiad team, which recently made it to the State competition at IU-Bloomington for the first time. While many high school teachers are being driven crazy by their students’ “fidget spinners,” Zach likes the heavier models because they can provide a great demonstration of the concept of moment of inertia.

- **Yijun Tang (’12)** completed his Ph.D. in physics at Stanford University. His thesis project involved measurements of fundamental properties of the dysprosium atom, and studying thermalization near integrability in one-dimensional quantum gases of dysprosium atoms. He is getting married and joining ArgoAI's Princeton, NJ office to work on lidar sensors for self-driving cars.

- **Logan Rice (’13)** is finishing his master’s degree at Northern Illinois University and will be heading off to the Ph.D. physics program at the University of Pittsburgh to continue his study of neutrinos.

- **Drew Songer (’14)** returned to school to complete remaining prerequisite biology and chemistry coursework for medical school, got a solid score on the MCATs, and is applying to medical school.

- **Jia (Alex) Qi (’15)** has decided to return to graduate school after spending a year in the IT industry in Seattle. This fall he’s entering the Ph.D. astronomy program at the University of Florida where they have groups studying gravitational wave physics and galaxy evolution.

- **Braden Badger (’17)** completed the 3-2 engineering program at Purdue, a member of the first cohort from Wabash to do so. He gave us valuable feedback to advise future students. He is now working at Rolls-Royce and is planning to pursue a Master’s degree in mechanical engineering.

- **Trevor Fitzpatrick (’17)** is joining Teach for America.

We apologize to anyone we missed, and for misspellings or other mistakes made while editing the material sent to us.

In future newsletters we will be happy to include your news and comments in the Alumni News section. Not only is it wonderful to hear from you, it is also very useful for us to know what our alumni are doing and how they got to where they are. Our students wonder what one can do with a physics degree and it is great to have alumni stories to share with them.
Alumni Colloquia

Two alumni returned to campus this past year to present talks to our students. In the fall, Zach Rohrbach ('12, below left) described how he was intellectually invigorated teaching physics at Avon High School in his talk “Conservation of Intellectual Momentum.” Then at the end of the spring semester, Tuan Le ('16, below right) described his Master’s thesis research at Ball State on the “Thermal Properties of Single Wall Carbon Nanotubes: Molecular Dynamics.”

While our speakers budget is limited, we would love to have alumni come back to campus to talk to our students about what they’ve done. If you’re interested, please let us know!

Wabash Physics Students Work Even on Thanksgiving

While most of us were relaxing on Thanksgiving, Seniors Cody Cochran and Tyler Mix were up at the National Superconducting Cyclotron Laboratory at Michigan State with Jim Brown. Here’s a photo of faculty and students of the MoNA group preparing to measure the first excited state of $^{31}\text{Ne}$. 
Big Bash Physics Department
Open House
Alumni from the classes of 1963, 1968, and 1998 dropped by the Physics Department Big Bash reception on Saturday afternoon. They described what they did with their Wabash physics degree, including starting several technology companies, getting a Master’s degree in geophysics to search for oil, and becoming a professor in the history of science.

We invite all physics alumni to attend our Big Bash open house next year. Please come share your stories of Wabash and experiences since you graduated. Check the schedule of events for the time and location.

Thank you for your support!!!

This past summer, Nate Tompkins was able to purchase a 3-D printer for research with his two summer interns using the Physics Fund established to support student-faculty research. In the past, we have also used this fund to support internships—we never want to turn an eager student away!

We thank all donors, with special mention to Roger Alig ('63), David Nisius ('87), and Harrison Smith for their support of the Department over the past year. Funds set up by our alumni and friends have supported internships, student travel, departmental prizes, library book purchases, and senior dinners.

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