Welcome!

What a year this has been. As we welcome alumni and friends to our annual newsletter, we hope you and your loved ones are (and remain) healthy and safe. Here we describe a normal year until March, when Wabash became vWabash, completing the spring semester online. Yet, Physics kept going in the new environment. We completed a robust virtual summer intern research program and are preparing for the fall semester. Follow our progress on Facebook, and please let us know how you are doing so that we can include it in next year’s newsletter.

Faculty Update

Jim Brown remains the department chair. Last year, Jim expected lots of Midwest driving for GLCA Academic Council and MoNA/LISA work at Michigan State. While a trip to beautiful downtown Toledo did occur, travel brought him to other spots. He was able to attend the APS Division of Nuclear Physics meeting in Alexandria, Virginia, where his students, Spencer Shank (’20) and Will Lillis (’22), presented a poster on automating calibrations for the MoNA/LISA detectors using both statistical and AI methods. He was happy to be able to visit with his daughter while in the D.C. area. Spring Break brought his first trip to Florida for Spring Break where he visited his brother who has recently retired.

Jim was lucky to teach a number of upper-division courses this year. He was particularly excited about the Classical Mechanics course which saw a substantial inclusion of the dynamics of solid elastic materials for the first time, which with some effort dovetailed into a special topics course on the physics of the Manhattan Project taught in the Spring. The quick pivot to teaching via Zoom after Spring Break due to the pandemic worked surprising well, and this is no small part due to the “WAF” attitude of the juniors and seniors in that course. The willingness of our students and faculty to adapt and persevere never fails to amaze, and real kudos should go to Profs. Krause, Tompkins, and Ross who were responsible for successfully handling this transition for our much larger introductory courses and service courses.

Jim was sad to miss the in-person graduation ceremony in the Spring, and the annual photo with our graduates on the steps of Goodrich Hall, and to be unable to say a proper good-bye to the students who have treated our classrooms and laboratories as their second homes for the last four years. He was pleased to see the third cohort of students in our National Science Foundation funded S-STEM Scholars program that Jim co-leads with President Scott Feller head off to graduate study and prestigious fellowships.

Since the last newsletter, Jim co-authored one publication:


Jill Keller continues to be our Academic Administrative Coordinator for the Physics Department. Jill knows the ropes now, so it was an easier year. She is still getting to know all the faculty and staff and loves working at Wabash. Jill experienced her first Physics cookout and couldn’t believe how much Wabash men could eat. She enjoyed talking to them, getting to know who they are and what their plans are.
for the future.
This summer Jill enjoyed the summer weather with her husband and two teenage boys by going on trails and swimming in their pool.

Dennis Krause was back in the classroom after his 2018-19 sabbatical. In the fall he taught introductory calculus-based physics (now called PHY 111 Physics I-Calculus) and second semester quantum mechanics. In the spring, he taught the second semester of calculus-based physics (now called PHY 112 Physics II–Calculus) and, for the first time in a long time, electrodynamics (PHY 314). He also taught Physics GRE prep sessions in the fall, and participated in Prof. Mukubaya’s MUS 202 in the spring.

Of course, like everyone else, he had to move his spring semester courses online after Spring Break. At the beginning of March, Dennis didn’t know what Zoom was, but by the end of the month, he was using it to teaching PHY 112 and 314. For the most part, the transition went relatively smoothly. He was able to run the classes virtually in a manner similar to face-to-face meetings, using Zoom’s polling feature for iClicker questions. However, labs were a different story. He carried out the experiments, making videos of the procedure. He then gave his data to the lab students to analyze using Zoom’s Breakout Rooms so lab groups could work together. However, students were unhappy that they couldn’t actually perform the experiments, which is the fun part of lab.

When Dennis had time to do research, he was focused on ultralight dark matter wind forces. During this summer, he and Chad Wunderlich (’21) examined how such wind forces could be observed in laboratory experiments using optically-levitated microspheres which can measure forces $\sim 10^{-21}$ N. One advantage of the current COVID-19 world is that they were able to attend the APS DAMOP conference where they learned the state-of-art of these experiments.

Since the last newsletter, Dennis had three publications, including two co-authored with Quan Le Thien (’18):


Matt Roark lent his hand to the Physics department for another year, and the coming year surely holds many new things. After what looked like a routine year, health and safety concerns disrupted classrooms and labs this spring. His portion of MUS 202 was reimagined from hands-on tools training to virtual lectures on woodworking. “In woodworking, experience is the best teacher. Thus, I felt like the virtual classroom was much more work.”

Labs will have new technical challenges to implement this coming fall, and Matt will provide an extra set of hands to keep students healthy and labs running smoothly. The Department has a number of challenges related to physical lab spaces. Matt has been busy in the Roark family woodshop making Plexiglas dividers for lab tables. This will allow for more efficient and safe use of our rooms. While “staying at home” with the rest of our nation, Matt has kept busy with running, photography, and woodworking. Matt encourages readers to not neglect emotional and mental health in these stressful times.

Gaylon Ross is beginning his third year at Wabash, continuing his joint appointment as Visiting Associate Professor in the departments of Physics and Chemistry. After a first year that involved him teaching upper-level physics major and pre-professional service courses, his second year was filled with distribution courses for students taking PHY-101 Astronomy and CHE-101 Survey of Chemistry. His 14 years away from academia brought a renewed enthusiasm for teaching non-science majors, and although he still has significant interaction with physics students, he enjoys the opportunity of working with liberal arts students throughout the college who have often avoided, or even dreaded, science classes in the past.

With the opportunity to teach these same courses in the upcoming academic year, and given the ongoing COVID-19 concerns, he will continue to focus his efforts on developing pedagogical tools that provide a comparable educational experience through distance learning as that afforded to students who are able to
attend in-person classroom and lab meetings. In addition, with the purchase of a new color CCD camera for video astronomy which couples to our department telescopes, he plans to host remote viewing sessions of solar system and deep sky objects while still allowing social distancing.

Nathan Tompkins finished his third year as a member of the Physics Department and will be continuing as the tenure-track Byron K. Trippet Assistant Professor of Physics this fall. This past year he taught the sophomore physics sequence, continuing oral examinations and introducing mock internship applications. He also taught the (newly renamed) Physics I/II – Algebra sequence (PHY 109/110) for the second time. During the pandemic lockdown both classes continued online via Zoom.

Within the past year Nate has published two papers:


Nate intends to continue working on pattern formation in the laboratory and hopefully upgrade the fabrication facilities within the Physics Department to work with microfluidics. This is in addition to continuing the ongoing work in the Pattern Lab: the constant-pressure pump created by Theodore Lupinski (’20), the 3D fluidics of Tyler Richmond (’21), the hydrodynamically-controlled precipitate of Zachary Ostrowski (’20), and the Python tutorials by Hamza Moudden (’21). The Pattern Lab itself includes two 3D printers, rate controlled fluid injectors, pressure-controlled fluid injectors, a planetary mixer for PDMS casting, and a plasma bonder for surface treatment & device bonding. Several publications from the lab are in preparation, including the work of Theodore Lupinski (’20) and Tyler Richmond (’21).

This upcoming year Nate is looking forward to teaching a freshman tutorial that investigates the process of scientific discovery entitled: “Why trust science? – What do we know, and how do we know it?” Nate will also be teaching the life sciences focused algebra-based introductory physics sequence again, this time adapted to be entirely online for socially distanced learning.

Matt Roark’s summer project combined woodworking, electronics, and programming. Matt created an infinity mirror clock featuring a Lichtenberg figure in acrylic. The branching tree-like structure is a naturally occurring example of a self-similar pattern described by fractal geometry.

Vern Easterling (1934–2019)

We’re sad to report the passing of Vern Easterling, who taught in our department from 1962 until retiring in 2000. He came to Wabash from Wayne State University where he received his Ph.D. in low temperature solid state physics, but in his later years, he took particular interest in astronomy. Even in retirement he remained active, teaching acoustics and the physics of music in Prof. Makubuya’s MUS 202 Instruments & Culture course for several more years, and attending physics colloquia.

A complete obituary can be found in the Journal Review.
Opening Cookout

We began the fall semester 2019 with our annual opening picnic, where we introduced new students to the Department and the activities of the coming year. We were blissfully unaware of what was going to happen….

Dennis Krause and Matt Roark tending the grill on a perfect day for the cookout.

Everyone enjoying their food as they listened to the presentations.

Nate Tompkins discusses the work he has been doing with his students.

Gaylon Ross describes his research interests in nuclear astrophysics.

Did you know…

Did you know that College Factual ranks Wabash 11th among 818 colleges most focused on physics? https://www.collegefactual.com/ranks/sciences/physics/rankings/most-focused/
Student News

Graduating Seniors
This year five physics majors (Quan Chau, Teddy Lupinski, Zach Ostrowski, Michael Reising, and Spencer Shank) and one minor (Manzil Mudbari) were rung out at this year’s virtual graduation ceremony. Quan is going to be starting his second year at Washington University Saint Louis as part of their 3 + 2 + 1 program. When he is finished, he’ll have a Bachelor’s degree in Physics from Wabash, and a Bachelor’s degree (Mechanical Engineering) and a Master’s degree (Aerospace Engineering) from WUSL. After spring break, Michael found an internship at RQAW, an engineering and architecture services company in Fishers, IN, where he is transitioning to a full time position as a staff engineer in their bridge department. Finally, Spencer accepted a position as an Air Warfare Simulation Associate Software Engineer with FAAC in Ann Arbor, MI. We wish everyone our best wishes and hope they will keep in touch.

(Virtual) Awards Chapel
The Awards Chapel was held online this year. The 2020 winner of the Fuller Prize, which goes to the most outstanding junior physics major, is Chad Wunderlich ('21):

The winner of the Physics Department Writing Prize, for his forthcoming paper on developing a low-cost constant pressure pump with Prof. Tompkins, is Teddy Lupinski ('20):

This year’s senior class. Top row (left to right): Quan Chau, Teddy Lupinski, and Michael Reising. Bottom row: Zach Ostrowski, Spencer Shank, and Manzil Mudbari. Sadly, we were unable to take the usual group photo on the steps of Goodrich after graduation.
January Celebration of Student Research Poster Session

Teddy Lupinski (’20) shows off the Arduino-based constant pressure pump (on the chair) he designed and built.

Zach Ostrowski (’20) explains how he designed and fabricated devices to create chemobrionic membranes with Nate Tompkins.

Tyler Richmond (’21) discusses his poster describing devices he designed and fabricated out of PDMS in Nate Tompkins’ Pattern Lab.

Michael Reising (’20) describes the autonomous underwater vehicle (lower right) he designed and constructed as his advanced lab project.

Teddy Lupinski (’20) and Spencer Shank (’20) discuss the poster describing their work with Jim Brown.
Early in the fall, the summer 2019 interns presented their work at a physics colloquium. They are (from farthest left, clockwise) Spencer Shank ('20), Teddy Lupinski ('20), Tyler Richmond ('21), Will Lillis ('22), and Zach Ostrowski ('20).

In October, Jim Brown took Spencer Shank ('20, left) and Will Lillis ('22, right) to the Fall Meeting of the Division of Nuclear Physics of the American Physical Society in Crystal City, VA where they presented a poster of their summer research.

Despite the pandemic, the Physics Department held an 8-week summer research program this summer which involved all four faculty and five student interns:

- Chad Wunderlich ('21) worked with Dennis Krause on determining how to set limits on ultralight dark matter wind forces using optically-levitated sphere force experiments.
- Will Lillis ('22) and Andrew Rippy ('22) modeled the bending of a particle beam by a magnetic field for the MoNA/LISA experiments with Jim Brown.
- Hamza Moudden ('21) and Tyler Richmond ('21) investigated simulation methods for microfluidic experiments and developed Python tutorials with Nate Tompkins.

Everyone met daily via Zoom according to the following schedule created by Nate Tompkins:

- Monday (9 a.m.): Group meeting to discuss any work done Friday and over the weekend, and develop the plan for the week.
- Tuesday (12 noon): Journal club meeting to discuss a paper related to the summer research, and learn how to read a scientific paper.
- Wednesday (9 a.m.): A more formal group meeting where students present slides on their progress over the past week and their plan for the coming week.
- Thursday (4 p.m.): Cookies and socializing.
- Friday (9 a.m.): Weekly wrap up chat to discuss how the week went and how they are doing.
Updates

Since our last newsletter, we’ve heard from…

- **Ken Loker (’59)** is posting his thoughts on astrophysics.
- **Jim Nichols (’61)** sent us his contribution to a book of memoirs of graduates of Winchester (Ind.) High School. It describes how his interest in physics was kindled in high school where he built a Tesla coil that lit up all the florescent lights in the neighborhood and knocked out AM radio in the vicinity. After Wabash, he went to California where he fell in love with the mountains and worked for the Navy at China Lake. There he answered questions like: What can the Navy do with a computer on a ship? On an aircraft? On a missile? “I was lucky to be able to make a career out of solving Navy problems with the developing number crunching power of computers.” He worked for the Navy at China Lake for 35 years, retiring in 1994 with a Certificate of Recognition from William Perry, then Secretary of Defense. Since then he’s kept active with the Sierra Club and is serving on the board of the Ridgecrest Area Visitor and Convention Bureau, which sponsors the annual Flower and Petroglyph Festival and promoting filmmaking in the area. Jeff specializes in showing filming locations to movie scouts.
- **Tom Bauer (’77)** now has an asteroid named after him! You can check out its orbital parameters at: [https://ssd.jpl.nasa.gov/sbdb.cgi? sstr=tombauer;old=0;orb=1;cov=0; log=0;cad=0#orb](https://ssd.jpl.nasa.gov/sbdb.cgi? sstr=tombauer;old=0;orb=1;cov=0; log=0;cad=0#orb)
  A photo of Poisson’s spot taken by Tom, [http://academics.wellesley.edu/Physics/ Tbauer/Poisson/](http://academics.wellesley.edu/Physics/Tbauer/Poisson/) has been requested to appear in a new illustrated edition of Thomas Kuhn’s book *The Structure of Scientific Revolutions*. Tom taught physics labs at Wellesley College for 30 years before retiring five years ago.
- **Gary Wollenweber (’77)** was awarded the RADM Robert H. Gormley Combat Survivability Award for Leadership by the National Defense Industrial Association “for his sustained leadership in aircraft engine thermal design, exhaust nozzle cooling design, and IR signature control technologies. Throughout his 42-year career at General Electric, he has contributed to the combat survivability and effectiveness of numerous rotary, fixed wing, and commercial derivative aircraft across the services.”
- **Jeff Gunter (’91)**, who is at the Aging and Dementia Imaging Lab at the Mayo Clinic, alerted us to internship opportunities at the Clinic.
- **Bart Waclawik (’98)** tells us that his company, Innovative Neurological Devices ([https://cervella.us/](https://cervella.us/)), won the Innovation of the Year Award at the 2019 MIRA awards ceremony for the Cervella Cranial Electrotherapy Stimulator device, which is an FDA-cleared medical device which treats patients suffering from anxiety, depression, and insomnia. The device sends micro-currents of electricity through a patient’s brain, and the innovation here is that they incorporated the device into a bluetooth-enabled noise-cancelling headset so patients can use the device anywhere as the device is inconspicuous. Since anxiety attacks often occur outside of the home, this device allows patients to use the device without the curious looks from onlookers. Bart is a great example of what a Wabash physics major can do in the world of medical devices.
- **Chris Gorman (’13)** accepted a Cryptographic Researcher and Programmer position in Columbus, Ohio, with MadHive. They are a startup based in Manhattan but just opened a second location in Ohio. He will be learning Elliptic Curve Cryptography in the near future. They also like having him around for his general technical ability, of which no small part is due to his Wabash physics classes.
- **Jia (Alex) Qi (’15)** is working on his Ph.D. research at the University of Florida. He’s developing a new physical model which will be applied to a large simulation project on galaxy evolution.

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

In the future, we would be happy to include your news and comments in our newsletter. Not only is it wonderful to hear from you, it is also very useful for us to learn 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.

Internships Wanted

Do you have internship opportunities in engineering or technical fields that would be of interest to a Wabash physics major? Please let us know so we can forward that information to our students and the Career Center.
Alumni Colloquia

We were fortunate to have two of our alumni return to Wabash in the fall to give colloquia. First up was Chris Gorman (‘13, below left) who gave a Math/CS colloquium in September. He recently received his Ph.D. in Mathematics from the University of California, Santa Barbara, and spoke on his research, "Fast Algorithms for Solving Linear Systems." Chris is now a cryptographic researcher and programmer at MadHive in Columbus, OH.

Then, in November, Chris’s brother James Gorman (‘13, below right) gave a physics colloquium on his Ph.D. research: "Quantitative Prediction of Adhesive Deformation Along an Interface." He received his doctorate in Mechanical Engineering at the University of Michigan and is now working as a mechanical engineer at the US Army CCDC Ground Vehicle Systems Center, Detroit, MI.

We don’t know when we will be able to hold in-person physics colloquia this coming year, but we would like to attempt holding virtual colloquia via Zoom. It is important for our students to see what our alumni are doing with their Wabash physics degrees. If you are interested, please let us know!

COVID-19 couldn’t stop our weekly social hour with students, Thursday Cookies at 4 pm. Jim Brown created an appropriate Zoom background.

A photo of the comet NEOWISE taken by Jim Brown July 12th from the Crawfordsville High School parking lot with an inexpensive zoom camera. He used a 15 sec exposure which led to some streaking of the sky as the earth rotated.
What can you do with a physics degree from Wabash?

Some Graduate Schools and Companies Accepting/Hiring Recent Majors

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Thank you for your support!!!

The Physics Fund is a special fund established specifically to support physics student-faculty research at Wabash. In the past, we have used this fund to purchase laboratory equipment and provide summer internships—we never want to turn away an eager student!

We thank all donors, with special mention to Roger Alig ('63), C. D. Decker ('67), Rebecca Henry, David Nisius ('87), Harrison Smith, and the Verizon Foundation Matching Gift Program for their support of the Department over the past year. The Physics Fund and other 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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