

PHYSICS AT WABASH



WELCOME!

Welcome to the 11th issue of the Physics Department Newsletter, the annual effort to keep our former students and friends informed of the accomplishments of our students and faculty over the past year. We want to include more alumni news so please don't hesitate to send us a note about what you are doing, particularly if you have something you wish to brag about. As always, if you ever return to campus, please stop by Goodrich Hall for a visit. If you cannot make it to Crawfordsville, you can always keep in touch through our website.

Faculty and Staff Update



Jim Brown became Department Chair this year. He also continued his work with the MoNA collaboration at the National Superconducting Cyclotron Laboratory. Two students from the class of 2013 assisted him in that work. Logan Rice and Jonathan Wong travelled with Jim to the NSCL to participate in the weeklong commissioning run to

provide more precise results on the decay of neutron rich oxygen isotopes. These students also made a poster presentation on the attenuation lengths of MoNA and LISA detector modules at the American Physical Society's Division of Nuclear Physics annual meeting during the fall.

In addition to the introductory course, Jim team-taught a course on the astronomy of the Maya with Prof. Warner from History. Several physics majors (Yijun Tang '12, Zach Rohrbach '12, Tyler Buresh '12, Evan Groninger '13, and Willy Costakis '13) were in the course and travelled throughout the Chiapas state of Mexico visiting Mayan sites.

Jim was pleased to travel back to Ann Arbor to give a talk on careers in liberal arts colleges to the physics graduate students at the University of Michigan.

Jim was honored to be recognized with the 2012-2013 McLain-McTurnan-Arnold Excellence in Teaching Award.

Jim had four publications since the last newsletter:

- "Near-Barrier Fusion of the $^8\text{B}+^{58}\text{Ni}$ Proton-Halo System," E.F.Aguilera, P.Amador-Valenzuela, E.Martinez-Quiroz, D.Lizcano, P.Rosales, H.Garcia-Martinez, A.Gomez-Camacho, J.J.Kolata, A.Roberts, L.O.Lamm, G.Rogachev, V.Guimaraes, F.D.Becchetti, A.Villano, M.Ojaruega, M.Febbraro, Y.Chen, H.Jiang, P.A.DeYoung, G.F.Peaslee, C.Guess, U.Khadka, J.Brown, J.D.Hinnefeld, L.Acosta, E.S.Rossi, Jr., J.F.P.Huiza, and T.L.Belyaeva, *Physical Review Letters*, 107, 092701 (2011)
- "Neutron-unbound states in $^{25,26}\text{F}$," N.Frank, D.Albertson, J.Bailey, T.Baumann, D.Bazin, B.A.Brown, J.Brown, P.A.DeYoung, J.E.Finck, A.Gade, J.Hinnefeld, R.Howes, M.Kasperczyk, B.Luther, W.A.Peters, A.Schiller, A.Smith, M.Thoennessen, and J.A.Tostevin, *Physical Review C* 84, 037302 (2011)
- "Search for the ^{15}Be ground state," A.Spyrou, J.K.Smith, T.Baumann, B.A.Brown, J.Brown, G.Christian, P.A.DeYoung, N.Frank, S.Mosby, W.A.Peters, A.Schiller, M.J.Strongman, M.Thoennessen, and J.A.Tostevin, *Physical Review C* 84, 044309 (2011)
- "Exploring the Low-Z Shore of the Island of Inversion at $N=19$ " G. Christian, N. Frank, S. Ash, T. Baumann, D. Bazin, J. Brown, P. A. DeYoung, J. E. Finck, A. Gade, G. F.

Grinyer, A. Grovom, J. D. Hinnefeld, E. M. Lunderberg, B. Luther, M. Mosby, S. Mosby T. Nagi, G. F. Peaslee, W. F. Rogers, J. K. Smith, J. Snyder, A. Spyrou, M. J. Strongman, M. Thoennessen, M. Warren, D. Weisshaar, and A. Wersal, Physical Review Letters, 108, 032501 (2012)



Brian Brueggert, who joined our department January 2011 as our instructional support technician, resigned March 30th due to family obligations. Brian did a wonderful job developing our instructional technology database, assisting in lab and demo setups, repairing equipment, and helping us develop new experiments. He

had all the skills we hoped for when we conducted our search and we are sorry to see him leave.



Rochella Endicott, our administrative assistant for over a year, handed off her duties to Kristi Mangold in November. However, Rochella, who also serves the Biology and Chemistry Departments, still watches over us during the summer months when Kristi is off.



Laura Kinnaman joined the faculty in the fall and successfully defended her dissertation to receive her Ph.D. from the University of Notre Dame. She gave the annual Monon Bell Physics Lecture on her graduate research at DePauw University over Bell Week, and started down a new track of research this summer with Jacob

Scherb '14, investigating computational simulations of correlated random walks to model individual and coupled blindfolded walkers. She enjoyed teaching upperclassmen in quantum mechanics, thermodynamics, and a special topics course on computational physics, as well as the astronomy course.



Dennis Krause was on sabbatical this past year, but he still could usually be found in his office in Goodrich Hall. During the fall he spent much of his time working with colleagues at Purdue and Cal Tech's Jet Propulsion Laboratory analyzing the power production of the radioisotope thermal electric generators (RTGs) aboard the Cassini spacecraft. The

goal was to see if there were any radioactive decay anomalies similar to those that have been seen in a significant number of terrestrial experiments. The fact that none were observed sets constraints on violations of the exponential decay law for ^{239}Pu . During this work, Dennis developed a phenomenological approach that can be used for all terrestrial experiments.

The bulk of Dennis's time this spring was spent working with colleagues at Purdue and the Universidad Nacional Autónoma de México (UNAM) in Mexico City on studying the gravitational interaction with unstable particles. The focus was investigating the new features that a particle's instability produces in a matter-wave interferometry experiment done in a gravitational field. Dennis spent a week at UNAM in March, just in time to experience the earthquake that struck Mexico City.

In addition to a Wabash College physics colloquium on his work on the Cassini RTG analysis, Dennis gave two external talks during this past year. At the annual meeting of the Indiana American Association of Physics Teachers at IUPUI in April, Dennis spoke on how clocks appear to relativistically moving observers. He also took along Wabash seniors Zach Rohrbach and Tyler Buresh so they could speak on their adlab project modeling the exit velocity of an air cannon. Then in May, he spoke on the Quantum Twin Paradox at the meeting of the Anacapa Society (an organization of theoretical physicists teaching at undergraduate institutions) at Hamline University.

Dennis had four publications since the last newsletter:

- "Searches for solar-influenced radioactive decay anomalies using spacecraft RTGs," D. E. Krause, B. A. Rogers, E. Fischbach, J. B. Buncher, A. Ging, J. H. Jenkins, J. M. Longuski, N. Strange, P. A. Sturrock, *Astroparticle Physics* **36**, 42–46 (2012).
- "Casimir force between a microfabricated elliptical cylinder and plate," R. S. Decca, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, D. Lopez, and V. M. Mostepanenko, *Physical Review A* **84**, 042502 (2011).
- "Capacitance Measurements and Electrostatic Calibration in Experiments Measuring the Casimir

Force," R. S. Decca, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, D. Lopez, U. Mohideen, and V. M. Mostepanenko, *International Journal of Modern Physics A* 26, 3930–3943 (2011).

- "Observation of the Thermal Casimir Force is Open to Question," G. L. Klimchitskaya, M. Bordag, E. Fischbach, D. E. Krause and V. M. Mostepanenko, *International Journal of Modern Physics A* 26, 3918– 3929 (2011).



Martin Madsen had a particularly outstanding year. First, he successfully passed his tenure review to become Associate Professor of Physics. As a result, he will be taking a well-deserved sabbatical for the entire 2012-2013 academic year. He was also the recipient of the 2012-2013

McLain-McTurnan-Arnold Research Scholar Award which will partially fund his sabbatical year. Finally, he received a Great Lakes College Association New Directions Grant to support his research this summer studying surface noise on graphene at Purdue. Finally, in addition to his usual teaching, he sponsored four student posters at the 2012 Celebration of Student Research in January. One of these describes work by adlab students modeling the exit velocity of an air cannon that was published in the *American Journal of Physics*.

Martin engaged alumni at two events during the past year. At the 2012 Wally at the Wheel symposium this spring, he spoke on the physics of automobile collisions, while at the 2012 Big Bash he gave a talk on his "Mythbusters" physics class.

Martin had two publications since the last newsletter (* denote undergraduate co-authors):

- Rohrbach, Z.J.*, Buresh, T.R.*, Madsen, M.J. "Modeling the exit velocity of a compressed air cannon", *American Journal of Physics*, v 80, pp 24-27 (2012)
- Madsen, M.J. "Physics Myth Busting: A Lab-Centered Course for Non-Science Students", *The Physics Teacher*, v 49, pp 448-451 (2011)



Kristi Mangold joined the Wabash Staff in November as the Administrative Assistant for the Mathematics/CS and Physics Departments. Her previous experience working as an administrative assistant for a Mega Church prepared her for this position as well as to have a passion to invest in the lives of the young men of Wabash.

The Mangold family is originally from Southern Indiana and moved to the Crawfordsville area in June 2011 when Kristi's husband, Tony, was transferred. A mother of two boys, Dylan and Luke, Kristi enjoys watching her kids play in sports and getting involved in their academic endeavors.



Matt Roark is joining the Department August 1st to replace Brian Brueggert as our instructional support technician. Some readers may remember that Matt was a physics major who graduated from Wabash in 2007. He has remained on campus as a systems administrator and researcher in Scott Feller's computational chemistry lab. Matt will continue

working with Scott, but will now be devoting three-quarters of his time supporting the Physics Department. We're happy to have Matt back in Goodrich!



Chris Gorman ('13) receives the Fuller Prize from Jim Brown at the Awards Chapel.

Transit of Venus

Approximately 60 people gathered west of the Knowling Fieldhouse to watch the transit of Venus in June. Jim Brown and Chemistry Professor Wally Novak setup telescopes and a pinhole camera to aid the observations. Hopefully you were able to see it. If not, you'll have to wait until 2117 for the next occurrence.

Here Jim Brown aims the telescope after the sun emerges from the clouds.



The James and Susan Smith Family Scholarship

Last year's newsletter described the new 3-2 pre-engineering program that was established with Purdue. In February the College announced that Jim and Susan Smith of Crawfordsville established *The James and Susan Smith Family Scholarship* to support Wabash students participating in the Purdue 3-2 program. Any Wabash student who enrolls in the Purdue 3-2 program is eligible, and the scholarship can be renewed annually.

Physics Faculty Win MMA Awards

Each year the College presents two awards to exceptional faculty members, and this year they were given to two physicists. At the end of the year's Awards Chapel, Jim Brown received the McLain-McTurnan-Arnold Excellence in Teaching Award for his extraordinary work in the classroom. Earlier in the year, Martin Madsen was announced as the McLain-McTurnan-Arnold Research Scholar for 2012-13, which provides a semester free of teaching to pursue scholarly research. He will be using the award to study grapheme as an electrode material for ion traps with Prof. Yong Chen at Purdue. Congratulations to both for their outstanding achievements!



Jim Brown receiving the McLain-McTurnan-Arnold Excellence in Teaching Award from David Polley, Division I chair, at Honors Chapel.

Student News

Graduating Seniors

The class of 2012 included five physics majors: Tyler Buresh, Ben Foster, Zachary Rohrbach, Jeff Soller, and Yijun Tang. A physics minor, Bihui (Will) Liu, finished his course requirements last year, but was back for graduation. He is presently studying engineering at Washington University as part of the 3-2 Dual Degree Program. Jonathan Barlow was also back for graduation—he's finishing the 3-2 engineering program at Columbia University.

What are our seniors doing after graduation? Zach Rohrbach will be back on campus in the fall participating in the 4+1 teacher education program, and Ben Foster will be studying engineering at Purdue. Yijun Tang will be in the Physics PhD program at Stanford University, while Jeff Soller will be serving Teach for America as a high school math teacher in Houston, TX. Tyler Buresh accepted a position with Axiom Resource Management in Falls Church, VA where he will be supporting the Department of Defense's Computer/Electronic Accommodations Program.

We wish everyone well and hope they'll keep in touch.

Awards Chapel Winners

This year's winner of Harold Q Fuller Prize given to the most outstanding junior physics major is Chris Gorman ('13), while Zachary Rohrbach ('12) won the Physics Department writing prize for the *American Journal of Physics* paper that he co-authored with fellow ad lab student Tyler Buresh ('12) and Martin Madsen. Physics minor Bihui (Will) Liu received the George E. Carscallen Prize in Mathematics.

Three physics students received Distinction on their Comprehensive Exams: Yijun Tang ('12) and Zach Rohrbach ('12) for physics, while physics minor Bihui (Will) Liu got Distinction in math.

A number of physics students won other awards at this year's Awards Chapel. Yijun Tang ('12) received a Mackintosh fellowship for graduate study at Stanford University, while Jacob Scherb ('14) received the Community Service Award for Outstanding Work. Finally, three of seniors were inducted into Phi Beta Kappa: Bihui (Will) Liu, Jeff Soller, and Yijun Tang, joining Zach Rohrbach who was inducted last year as a junior.



Graduating seniors and faculty on the steps of Goodrich Hall after graduation. Front row (left to right): Jeff Soller, Yijun Tang, Zach Rohrbach, Tyler Buresh, and Laura Kinnaman. Back row: Martin Madsen, Jim Brown, and Ben Foster.

Summer Internships

Our students were busy this summer. Here's a partial list of what they were doing:

- Evan Groninger ('13) interned at IUPUI with Dr. James Marrs in a position funded by the Lilly Business Internship Fund.
- James Gorman ('13) participated in an NSF REU program in Metallurgical and Materials Engineering at the Colorado School of Mines..
- Chris Gorman ('13) interned in physics at Bucknell University as part of their REU program.
- Logan Rice ('13) is interning with the Majorana Collaboration at the Sanford Underground Research Laboratory at the Homestake Mine in South Dakota.
- Yifei Sun ('13) received a Molecular Dynamics Research Internship at New York University.
- Nicholas Reese ('14) interned at Wabash with Dennis Krause studying the coupling of center of mass and internal dynamics of systems in non-uniform fields.
- Jacob Sherb ('14) worked with Laura Kinnaman on campus modeling random walks of real people.

- Jonathon Wong ('13) and Likai Yan ('15) worked with Jim Brown on campus setting up software to analyze data.

Off Campus Presentations

A number of students gave off-campus presentations this past year.

- Yijun Tang ('12) presented the results of the research he did last summer on levitating water droplets with lasers at the Midstates Consortium for Math and Science Undergraduate Research Symposium at the University of Chicago.
- Jonathan Wong ('13) & Logan Rice ('13) presented their work with Jim Brown at the 2011 Division of Nuclear Physics of the American Physical Society Conference at Michigan State University.
- Zach Rohrbach ('12) and Tyler Buresh ('12) spoke on their air cannon adlab project at the annual meeting of the Indiana American Association of Physics Teachers meeting at IUPUI.



Students in Jim Brown's Mayan archaeoastronomy immersion course at the top of the Temple of the Cross in Palenque, Mexico.

Society of Physics Students (SPS)

Pi (π) Day

Again this year SPS represented the Physics Department at the 4th annual Crawfordsville Carnegie Museum Pi Day (Einstein's Birthday 3/14) which attracted 255 visitors. With Jim Brown and Martin Madsen, students James Gorman ('13), Chris Gorman ('13), Nazir Tokhi ('14), Derek Fritz ('13), Zach Rohrbach ('12), and Drew Songer ('14) showed off physics demonstrations to the community. This year had a green theme since it was held on St. Patrick's Day.

For more photos, check out:

http://cmmc-collage.blogspot.com/2012_03_01_archive.html



Zach Rohrbach ('12) and Martin Madsen demonstrating the mysterious properties of non-Newtonian fluids at Pi Day.



Terrence Pignes ('14) racing a Segway at the Physics Heptathlon.

Physics Heptathlon

SPS took over the Allen Center fieldhouse one evening in October for the second annual Physics Heptathlon, where students competed in seven physics-related sports activities for prizes. This year's activities included: Segway Races, Bounce House Jousting, Hover Puck Bowling, Monster Corn Hole, 3-way Tug-of-War, Vortex Cannon Challenge, and Fastball Batting Cage Challenge.

SPS Physics Demo Show

The SPS demo show was a big hit again this year as the SPS students along with Martin Madsen, Jim Brown, and Laura Kinnaman showed off our more spectacular demonstrations in Ball Theater to the Crawfordsville community. Demos included the Fire Extinguisher Rocket, Vacuum Marshmallow Man, Laser Balloon Popping, Bed of Nails, Electric Guitar and the Fire Tube, Ferrofluid, Fun with Liquid Nitrogen, the Hunter and the Bear, Jacob's Ladder, Smoke Ring Launcher, and the Fruit Ninja. You can check out a video of the performance at:

<http://www.youtube.com/watch?v=WtytZeoStis>



Jim Brown takes out his frustrations with the Bed of Nails demo. Martin Madsen is his "victim."



Drew Songer ('14) readies the air cannon for the Hunter and the Bear Demo.



James Gorman ('13) and Laura Kinnaman demonstrate the effect of liquid nitrogen on a flower.

Celebration of Student Research

The Physics Department was well represented at the 12th Annual Celebration of Student Research in January. Here's a list of talk and poster titles which illustrates the breadth of work our students have done over the past year:

- William Costakis ('13) and Jonathan Wong ('13): "Attenuation Lengths of MoNA and LISA Detectors"
- William Costakis ('13) and Logan Rice ('13): "Characterizing a Spatial Light Modulator"
- Christopher Gorman ('13) and Derek Fritz ('13): "A Measurement of Cosmic Ray Muon Flux through Scintillator Bars"
- Evan Groninger ('13), Yijun Tang ('12), and Ben Foster ('12): "Chaotic Double Pendulum"
- Yijun Tang ('12): "Levitating Water Droplets with Lasers"
- Zachary Rohrbach ('12) and Tyler Buresh ('12): "Modeling the Exit Velocity of a Compressed Air Cannon"



Derek Fritz ('13) explains his work to Prof. Karen Gunther at this year's Celebration.

Advanced Lab (Adlab)

The students in our 2-semester junior/senior advanced lab course have done a lot of good work this year. Here are brief descriptions of some of their projects:

Yijun Tang ('12), Evan Groninger ('13) and Ben Foster ('12) made significant progress on the chaotic pendulum project. They successfully mapped out a phase space plot of the bottom arm of the pendulum, started work on the Poincare sections, and developed a procedure for collecting and processing large amounts of data. Their work, "Chaos of the Double Pendulum" moved us closer to finishing this project. They found that their measurements of the small angle oscillations were close to agreement with our Lagrangian model.

We finally made measurements of our superconducting wire! Ben Foster ('12), Derek Fritz ('13) and Logan Rice ('13) built a 1-meter-long cryostat and measured the superconducting transition of the wire. Their work, "Precision Measurement of Resistance of Superconducting YBCO Wire" made great progress and showed we can make a measurement of the superconducting transition.

As part of the engineering beam monitoring project, William Costakis ('13) and Evan Groninger ('13) cast several steel reinforced concrete beams and measured an acoustic fracture signal as the beams approached breaking. Their work: "Predicting a Steel-Reinforced Concrete Beam Failure Using Acoustic Emissions Monitoring" moved this project forward. We synchronized data collection between a camera and the piezoelectric transducers.

William Costakis ('13) and Logan Rice ('13) added a spatial light modulator (SLM) to the HeNe dynamic holography experiment. Their work focused on understanding how the SLM works, "Characterizing a Spatial Light Modulator". They made diffraction gratings with the SLM and looked at the interference pattern in the far-field.

All their papers are available on the Ad Lab web page:

<http://www.iontrap.wabash.edu/adlab.html>

We are looking to build new research lines and are looking for ideas and support from alumni!

Alumni News

Updates

Since our last newsletter, we've heard from...

- **Len Loker ('59)** has been trying to understand the dark matter problem and to see if there is a relation between it and the deficit of antimatter in the universe.
- **David Bohlin ('61)**, was impressed with our last newsletter and with the quality of our students.
- **Roger Alig ('63)**, enjoyed meeting Suniti Karunatlillake ('01) who joined the faculty at Rider University. Roger is an adjunct physics professor at Rider.
- **Gary Wollenweber ('74)** was pleased with our new 3-2 engineering program with Purdue. He notes that he was a 4-1-2 (1974 BA Physics, 1975 BSME, and 1977 MSME). Gary is putting his engineering education to good use at GE Aviation in Cincinnati.
- **Patrick Conroy ('78)** has relocated close to home after traveling for 23 years since Crawfordsville. In year 2000 he moved back from Washington state to be near home in Grand Rapids, MI. After Wabash, Patrick was a H.S. physics teacher for 6 years before going back to school at Montana State to get a bachelors degree civil engineering. From there he went to Texas and then to Washington for the next 20 years having fun working mostly on structural inspections on bridges, piers, water tanks, lighthouses and anything on the waterfront. As a SCUBA diving engineer, he was able to travel the world, as well as 37 states. In the meantime he also picked up a pilot's license, owned an airplane, and taught flying for 6 years.
- **Rolland Strasser ('81)** went on to study Mechanical Engineering at M.I.T. (MSMA 1984) with an emphasis on Polymer Processing. After 11 years as V. P. of Engineering at Captive Plastics in Piscataway, New Jersey in 2008 they sold the company to Berry Plastics in Evansville. He's come full circle, returning to Indiana every month or so working on new product initiatives. He often tells prospective employees that it is the liberal arts skills he learned as a Physics Major at Wabash (especially how to write, speak, and think logically) that have really helped him in his career.
- **Ian Kowalski ('02)** has started medical school at

Nova Southeastern University in Fort Lauderdale, FL. His wife has established a practice, Center For Advanced Neuropsychology (www.CFAN.co) in Tamarac, FL and they hope business will keep coming in. Ian has three children who all look forward to daddy teaching them what he learned in school. He's not sure how many math/physics majors have become medical doctors or have an MBA (Florida State '04). Is he the first?

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

In the future, if you give us permission, we would be happy to include your news and comments in an Alumni News section of the newsletter. 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

We are always looking for alumni speakers who can show our students what one can do with a Wabash physics degree. If you are interested and are in the area (we don't have a lot of money to pay travel) please let us know!

Wabash Fermi Problem

Enrico Fermi was famous for making numerical estimates with a limited amount of information. If you wish to dust off your physics brain cells, we'd like you to play with the following problem:

Estimate the total amount of energy (in Joules) expended by the Wabash football team during the Bell Game.

Send your solutions (listing your assumptions, etc.) to Dennis Krause. We'll include the "best" (i.e., most creative, accurate, fun...) in our next newsletter.

Big Bash Open House

This year the Physics Department held an open house during Big Bash weekend. We didn't know what to expect so we were thrilled by the response. Over a dozen alumni and family members stopped by Goodrich to chat in the lounge and be taken on tours of our facilities. Due to the success of this year's event, we plan to hold another open house next year. **We invite all alumni who attend Big Bash next year to stop by.** Just check the schedule of events for the time and location.



Physics Fund

The number of students participating in summer research internships and in the PHY 381/382 advanced lab course has grown steadily in recent years. Our faculty are engaging students in a wide variety of projects, but we are still largely dependent on college funding for most of our summer student interns and equipment. Presently, the College can support only 3 summer interns for the Math/CS and Physics Departments. We hope to improve this situation with the *Physics Fund for Student-Faculty Research*, an endowed fund that we established in 2009. Dedicated to supporting student-faculty research within the Department, we envision that this fund would

eventually support three to four research interns during the summer and advanced lab projects during the school year, and provide travel funds for students to present their work at conferences. The goal of our Physics Fund, to foster closer interaction between our faculty and students, aligns perfectly with the College's Challenge of Excellence campaign. If you are interested in more information about how you can contribute to the campaign and support the Department's efforts to engage more students, please contact the Advancement Office: Alison Kothe, 765-361-6027 or kothea@wabash.edu

Contact Info

Jim Brown (Dept. Chair)
Phone: (765) 361-6282
Office: Goodrich 308
Email: brownj@wabash.edu

Laura Kinnaman
Phone: (765) 361-6141
Office: Goodrich 312
Email: kinnamal@wabash.edu

Dennis Krause
Phone: (765) 361-6181
Office: Goodrich 313
Email: kraused@wabash.edu

Martin Madsen
Phone: (765) 361-6071
Office: Goodrich 309
Email: madsenm@wabash.edu

Kristi Mangold
Phone: (765) 361-6292
Office: Goodrich 106
Email: mangoldk@wabash.edu

Matt Roark
Phone: (765) 361-6431
Office: Goodrich 001
Email: roarkema@wabash.edu