

# WOOSTER PHYSICS



*Abigail Ambrose, Michelle Bae, and Mili Barai attended the 2019 APS Conference for Undergraduate Women in Physics (CUWiP) at Michigan State University. This conference aims to help undergraduate women continue in physics by providing them with the opportunity to experience a professional conference, information about graduate school and professions in physics, and access to other women in physics of all ages with whom they can share experiences, advice, and ideas.*

**2018-2019 Annual Report**  
**[physics.wooster.edu](http://physics.wooster.edu)**

# CLASS OF 2019



front: Michelle Bae, Asaki Takahashi, Benji Jenkins

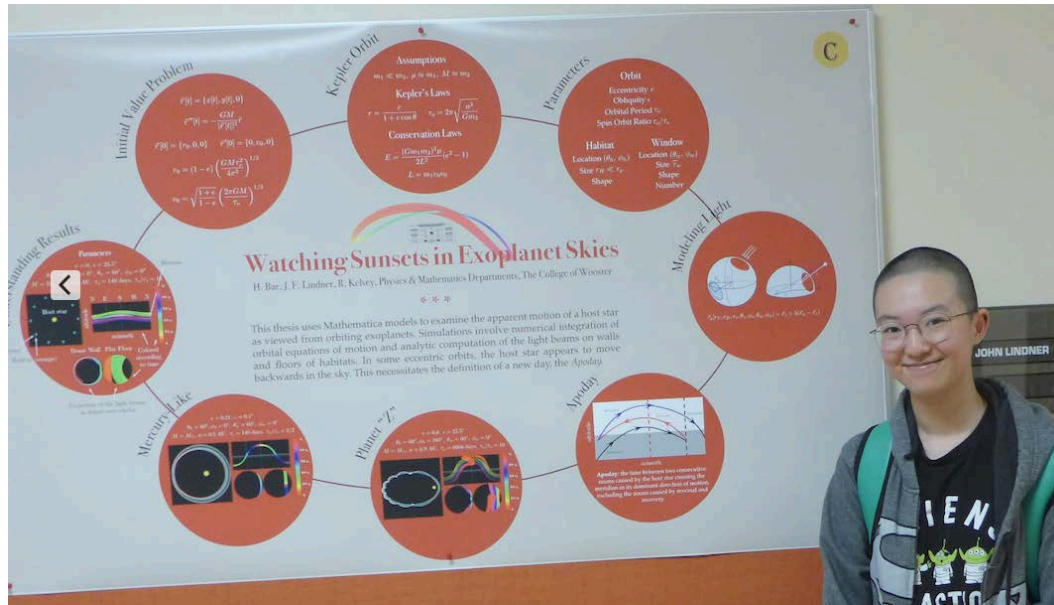
rear: Carson Bullock, Kenny Huang (3/2 engineering Wash U), Daniel Blaikie, Sam Nash, Haidar Esseilli, Chase Fuller, Vincent Hui, Joe Theiss, Danny Renbaum-Koss (3/2 engineering Wash U), David Morrow, James McElroy (3/2 engineering Akron U)

*Benji, a practitioner of Parkour, flipped onto the stage to receive his diploma.*





# SENIOR INDEPENDENT STUDY



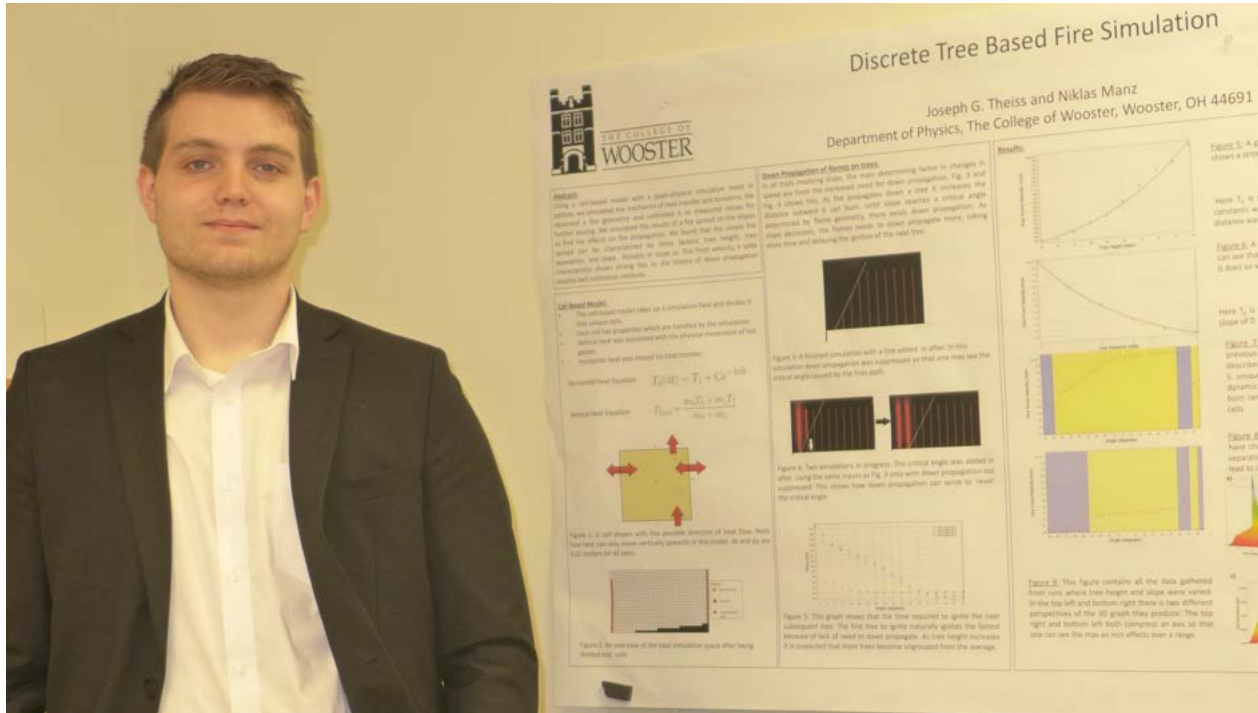
***Hwan (Michelle) Bae (Physics and Math Major from Seoul, South Korea)***

***Watching Sunsets in Exoplanet Skies***

***Advised by John Lindner (Physics) and Robert Kelvey (Math)***

Using novel visualizations, this thesis uses Mathematica models to examine the apparent motion of the host star as viewed from exoplanets. Simulations involve numerical integration of orbital equations of motion and analytic computation of the light beams on the walls and floors of the habitats. In some eccentric orbits, the host star appears to move backwards in the sky. Let the dominant direction be the direction of the apparent motion of the host star when the planet is at the apoapsis. Let the reversal motion be the motion in the direction opposite to the dominant direction. Let the recovery motion be the motion of the host star in its dominant direction from the end of reversal to the azimuth where reversal began. Then, the apoddy is defined as the time between two consecutive noons in the dominant direction of motion, excluding the noons caused by reversal and recovery.

# SENIOR INDEPENDENT STUDY



***Joseph Theiss (Physics Major from Concord, NC)***

***Slope's Effect on Discrete Tree Fire Simulations***

***Advised by Niklas Manz (Physics)***

A quasi-physical flame simulation was built. It featured the physics for heat propagation based off of buoyancy and Newton's law of cooling, variable slope, variable tree height, and variable tree distance, and custom environmental factors such as ambient pressure. All these factors were controlled to examine their effect on fire propagation and to examine why fire spreads faster uphill. It was found that slope, tree distance, and tree height play major roles in determining simulation outcomes, and that these outcomes could be matched to real world values. Notably in slope vs. fire front velocity, a spike characteristic shows strong ties to the theory of down propagation despite bad calibration methods.

# SENIOR INDEPENDENT STUDY

***Carson Bullock***

***(Physics & Political Science  
Major from Toledo, OH)***

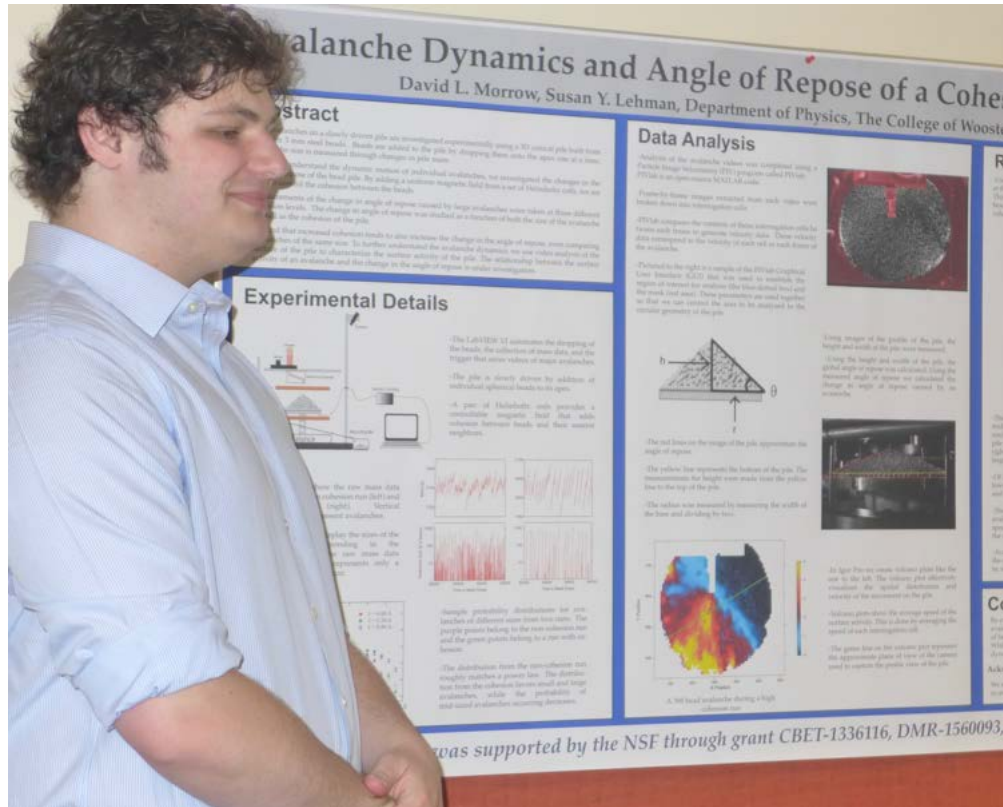
***Orbital Debris Proliferation and  
the Evolution of the Space  
Sustainability Norm***

***Advised by John Lindner (Physics)  
and Jeff Lantis (Political Science)***

This study investigates the relationship between political and physical outcomes in the outer space domain. International norms become translated into national policy, and those policies have concrete manifestations on the debris environment of low-Earth orbit. We treat this process as one vertically integrated model in examination of the effects of norm antipreneurship, the resistance to changes in the norm status quo, on the rate of orbital debris proliferation. We find that entrepreneur and antipreneur designations accurately predict the stances held by state delegations in an international forum. The presence of antipreneurship by the United States delegation to COPUOS is linked with unsustainable space policies by all three major spacefaring powers. Simulating the low-Earth orbital environment, we found that the number of particles of debris and the collision fertility are both positively correlated with the proliferation rate, but that ASAT usage frequency is associated with even greater increases on debris proliferation.



# SENIOR INDEPENDENT STUDY



***David Morrow (Physics Major from Ann Arbor, MI)***

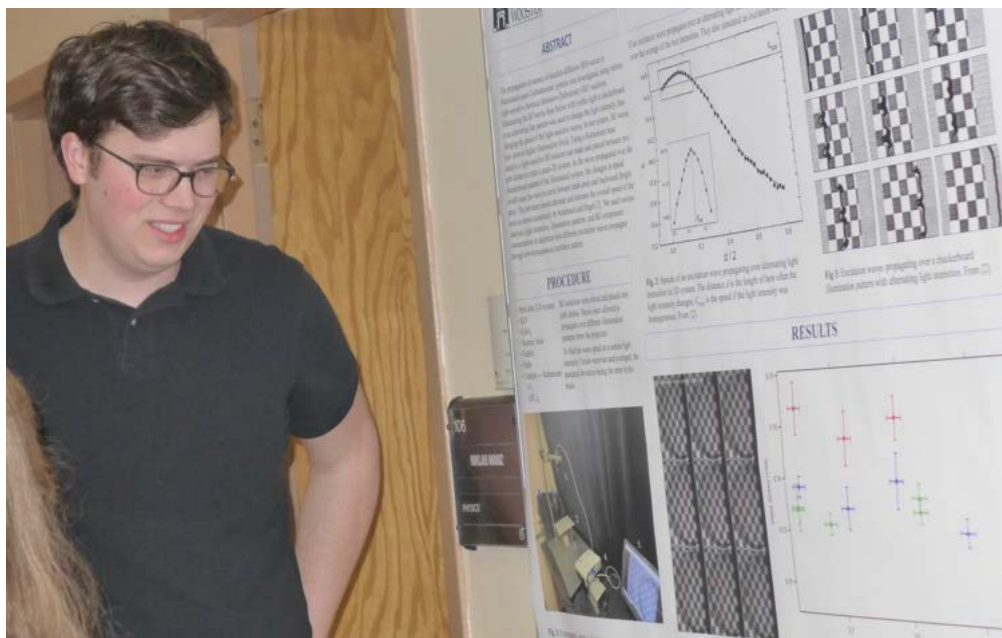
***An Investigation of Angle of Repose and Surface Activity of a Conical Bead Pile***

***Advised by Susan Lehman (Physics)***

Slip avalanches are investigated on a conical pile built from uniform steel beads. The pile is driven by the addition of steel beads to the top of the pile one at a time. To better understand the dynamic motion of avalanches, we investigated the change in angle of repose of the bead pile. The change in angle of repose was studied as a function of avalanche size as well as cohesion levels. It was found that increased cohesion tends to increase the change in angle of repose regardless of size of the avalanche. To further understand avalanche dynamics, we used video analysis of the surface of the pile. The relationship between surface activity and the change in angle of repose is under investigation. Avalanche depth has been proposed as a possible factor that affects angle of repose.



# SENIOR INDEPENDENT STUDY



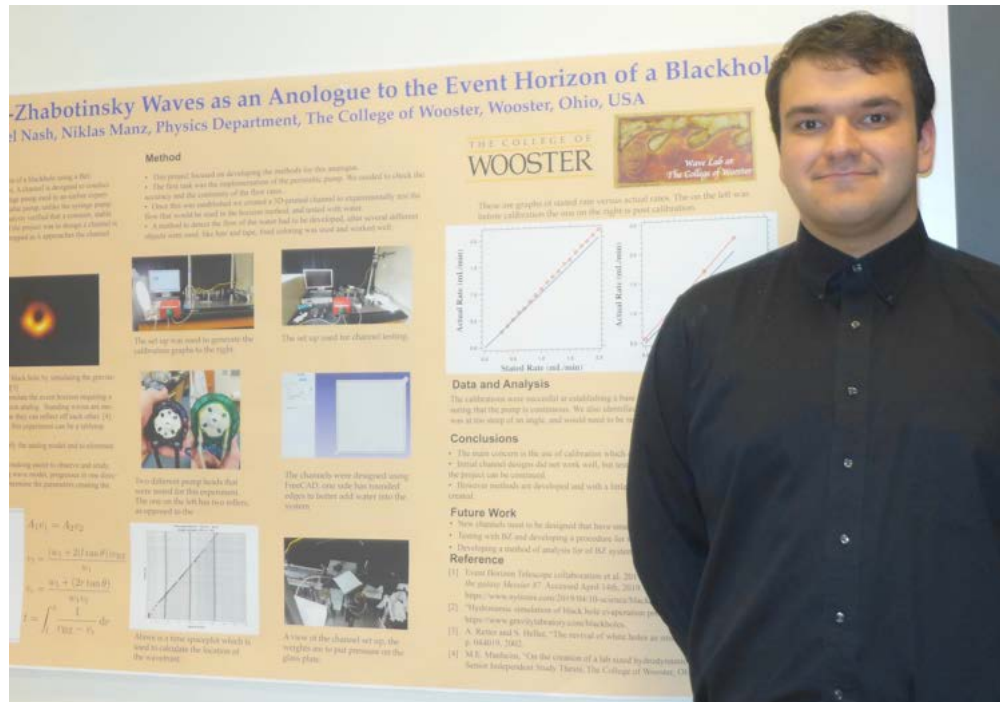
***Daniel Blaikie (Physics Major from York SC)***

## ***Propagation of Light-Sensitive Reaction-Diffusion Waves in Inhomogeneously Illuminated Systems***

***Advised by Niklas Manz (Physics)***

The propagation dynamics of reaction-diffusion (RD) waves in illuminated quasi-2-dimensional systems was investigated, using various light-sensitive chemical Belousov-Zhabotinsky (BZ) reactions. Illuminating the BZ waves from below with visible light a checkerboard or an alternating line pattern was used to change the light intensity, thus changing the speed of the light-sensitive waves. Using a Ruthenium base catalyst, a light-sensitive BZ solution was made and placed between two petri dishes to create a quasi-2D system. As the wave propagated over the checkerboard pattern of the illuminated system, the changes in speed would cause the wave to curve forward (dark area) and backward (bright area). The curvature should alternate and increase the overall speed of the wave as shown numerically by Schebesch and Engel [Schebesch and Engel, 1998]. We used various catalysts, light intensities, illumination patterns, and BZ-component concentrations to determine how different excitation waves propagate through non-homogeneous excitation pattern.

# SENIOR INDEPENDENT STUDY



***Samuel Nash (Physics Major from Cincinnati, OH)***

***Using Belousov-Zhabotinsky Waves as an Analogue to the Event Horizon of a Black Hole***

***Advised by Niklas Manz (Physics)***

This project creates an analogue to the event horizon of a blackhole using a Belousov-Zhabotinsky wave to simulate a gravity wave. A channel is designed to conduct the experiment, and the utility of replacing the syringe pump used in an earlier experiments with a peristaltic pump was tested. The peristaltic pump, unlike the syringe pump can be run indefinitely fed by a reservoir. Analysis verified that a constant, stable flow rate was maintained by the pump. The goal of the project was to design a channel is to get a distinct wavefront so that the BZ wave is stopped as it approaches the channel opening, across the width of the channel.



# SENIOR INDEPENDENT STUDY



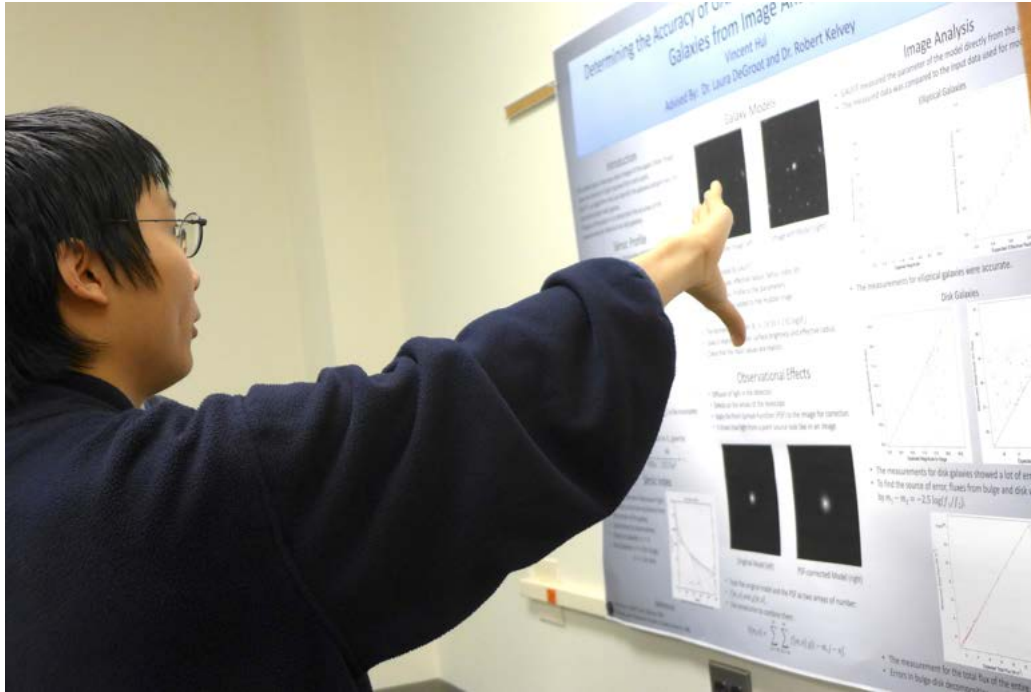
***Chase Fuller (Physics Major from Parma, OH)***

***Spiraling into Control: Spiral Density Wave Structure of GAIA DR2 Galactic Radial Velocities***

***Advised by Laura DeGroot (Physics)***

The goals of this study, awaiting future work, are to (1) determine the sturdiness of the galactic models and (2) learn about the spiral density wave parameters unique to the Milky Way. The second data release from the *Gaia* Mission contains approximately 7.2 million stars with measured line-of-sight velocities. After requiring statistically robust data, we transformed the surviving sources from International Celestial Reference Frame coordinates ( $p, \alpha, \delta$ ) to galactocentric coordinates ( $R, \theta, z$ ) and binned as a function of galactic radius. The mean galactic radial velocities of each bin  $\langle V_R \rangle_{obs}$  and associated errors  $\sigma_{obs}$  were calculated. We then presented a method for fitting spiral density wave theory predictions of mean radial velocities  $\langle V_R \rangle_{mod}$  to the observed values using models of the Milky Way.

# SENIOR INDEPENDENT STUDY



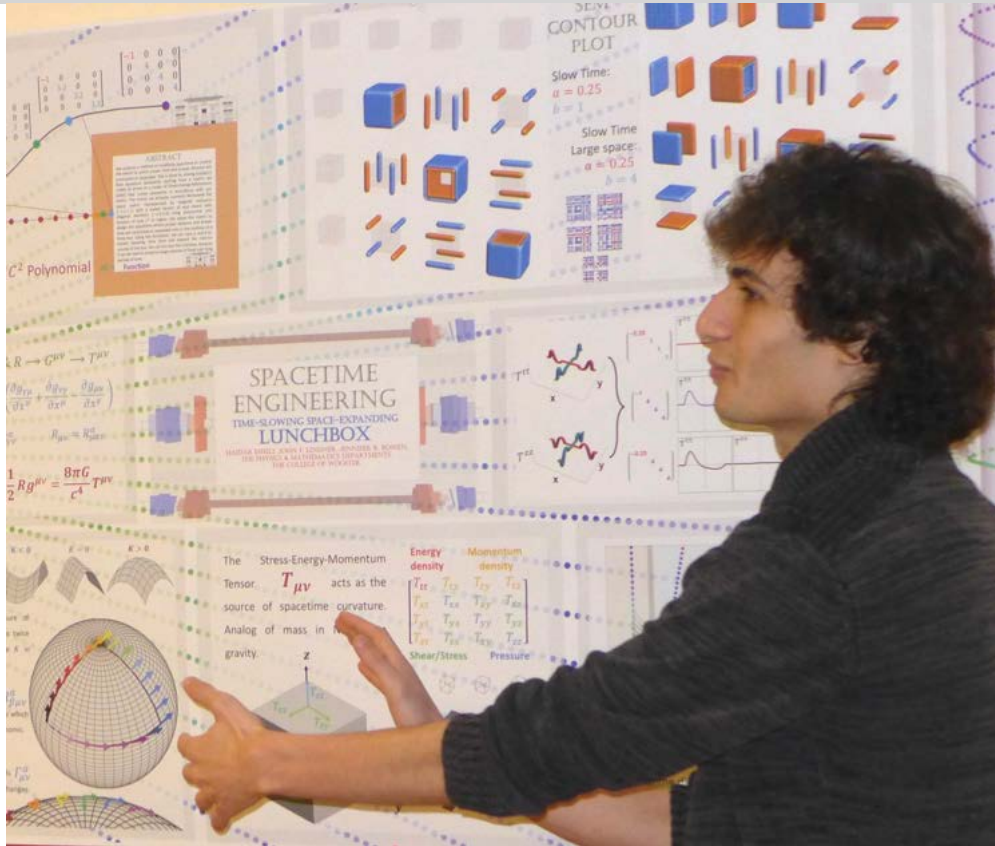
***Wan Hang (Vincent) Hui (Physics & Math Major from Jordan, Hong Kong)***

***Determining the Accuracy of GALFIT in Morphology Measurement of Galaxies from Image Analysis***

***Advised by Laura DeGroot (Physics) and Robert Kelvey (Math)***

In this experiment, a program called GALFIT was used to generate realistic models of galaxies. By inputting parameters such as magnitude, effective radius and the Sérsic index, it used the Sérsic profile to generate a light profile for the galaxies. Then each model was stacked onto an image from the Hubble Space Telescope. Then GALFIT was used to extract information of those models from the image, and the information was compared to the original input data. We have accurate measurements for the magnitude and the effective radius of the elliptical galaxies, and the measurement for the Sérsic index had more errors in comparison. Then, we had difficulties in using GALFIT for bulge-disk decomposition of the disk galaxies. We found that although it identified those disk galaxies as a whole, it failed to separate the two components and the measurements had large errors.

# SENIOR INDEPENDENT STUDY



***Haidar Esseili (Physics & Math Major from Beirut, Lebanon)***

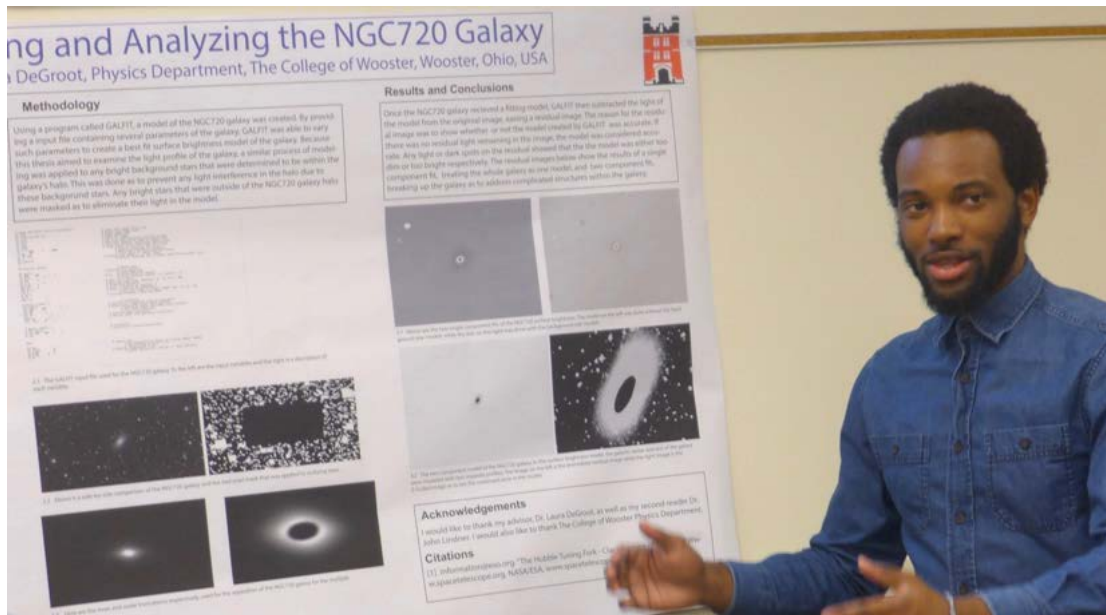
***Spacetime Engineering: Time-Slowing Space-Expanding Lunchbox***

***Advised by John Lindner (Physics) and Robert Kelvey (Math)***

We propose a method of modifying spacetime to control the extent to which proper time and proper distance are contracted or expanded. This is done by solving Einstein's field equations backwards starting from a metric we create to arrive at a recipe of Stress-Energy-Momentum (SEM) that curves spacetime in accordance with our metric. The metric we propose connects Minkowski flat space metric characterized by diagonal elements  $[\hat{a} \sim 1 \ 1 \ 1 \ 1]$  with a scaled version of said metric with diagonal elements  $[\hat{a} \sim a \ b \ b \ b]$  using polynomial join function of rank  $C^2$  or higher. We adopt this metric to design the spacetime where proper distance and proper time are contracted or expanded only in the confines of a finite box. Using this formalism, we can vary 'a' and 'b' to, loosely speaking, slow time and expand the interior volume of the box. We call this box the lunchbox.



# SENIOR INDEPENDENT STUDY



***Benjamin Jenkins (Physics & Chinese Major from Ann Arbor, MI)***

***The Decomposition and Analysis of the NGC720 Galaxy***

***Advised by Laura DeGroot (Physics)***

In this thesis the relationship between galaxy morphology and the surrounding halo shape is examined. This analysis focused on the nearby elliptical galaxy, NGC720, whose images were acquired through the HERON survey study. By examining the photometry of the galaxy and creating surface brightness profiles of the galaxy and nearby objects, the light model's accuracy was examined. Using the program GALFIT, the light of the developed model was subtracted from the light of the original image, leaving a residual image to be studied. A good fitting model left only the background sky, whereas any model too bright or too dim left dark and light spots/areas. The NGC720 galaxy received a single and multiple component modeling of the surface brightness profile. The single component model treated the galaxy as a single object whereas the multiple component model allowed for different areas and sections of the galaxy to be modeled separately. While the resulting residual images showed that the multiple component modeling provided a superior fit of the galaxy, neither was effective in establishing any trend or correlation between the NGC720 galaxy and its halo. Further research should skip the single component model and focus on creating a multiple component model where the halo of the galaxy can be isolated. Several other galaxies should also be examined to see if any correlations can be seen.

# 2018-2019 COLLOQUIUM SERIES

Physics Juniors, Junior I.S. Self-Designed Experiments, 30 April

Timothy Dolch, Hillsdale College (NANOGrav, CANDELS, and IPTA), 18 April

Josh Bozeday '99 (Physics-CS double major), My Professional Life After Wooster: From Software Engineering to Teaching High School Physics, 28 March

Martin Weinhaus, Cleveland State University (Director of Graduate Programs in Medical Physics), 7 March

Zachary P. Sefcovic, NOAA Cleveland Weather Forecast Office, TBD, 21 February

Jessica Bickel, Cleveland State University, Imaging Atoms: Examining How Molecules and Atoms Self-assemble on Surfaces, 7 February

Research opportunities with CoW Physics faculty (Cody Leary, Susan Lehman, John Lindner, Laura DeGroot), 17 January

Senior I.S. progress reports by Michelle Bae, Carson Bullock, Chase Fuller, Vincent Hui, David Morrow,, 4 December

Senior I.S. progress reports by Daniel Blaikie, Haidar Esseili, Benji Jenkins, Sam Nash, Joe Theiss, 27 November

Pearl Sandick, University of Utah, Supersymmetry, WIMPS, and the Search for Dark Matter, November 6

Physics Club, Preparing your REU and other applications, 1 November

Andrew DeGroot, Goodyear Tire & Rubber Company, Data Scientists, or: How I Machine Learned to Stop Worrying and Love the Big Data, 30 October

Stephen Fitzgerald, Oberlin College, The Quantum Mechanics of Hydrogen Storage and Isotope Separation, 23 October

Stephane Coutu, Penn State University, Extreme Particle Astrophysics, 2 October

CoW Physics majors share summer research experiences I (Katie Shideler, Megan Fisher, Abigail Ambrose, Carson Bullock), 4 September

Sheila Bailey, Space Environment and Experiments Branch at NASA Glenn Research Center, Space Photovoltaics, 28 August

# HONORS & AWARDS

## FOR PHYSICS MAJORS

### ***Latin Honors***

#### ***Summa cum laude***

Carson Bullock

Haidar Esseili

#### ***Magna cum laude***

Hwan (Michelle) Bae

#### ***Cum laude***

Wan Hang (Vincent) Hui

Samuel Nash

### ***Phi Beta Kappa***

Hwan (Michelle) Bae

Haidar Esseili

### ***The Arthur H. Compton Prize in Physics***

Haidar Esseili

### ***The Joseph Albertus Culler Prize in Physics***

Ariel Xie

### ***The Mahesh K. Garg Prize in Physics***

Chase Fuller

### ***The Cummings Rumbaugh Government Prize***

Carson Bullock

### ***Ninth Annual University Physics Competition***

*(an international physics competition)*

Silver Medalist

Team of Abigail Ambrose and Mili Barai

Problem A – Sending a Light Sail Propelled Nanocraft to Alpha Centaur





# JUNIOR INDEPENDENT STUDY SELF-DESIGNED EXPERIMENTS

***Abigail Ambrose***

The Rotation Curve of the Milky Way Galaxy

***Adam Deeley***

Exploring Efficiency of 3-D Printed Propellers

***Ben Hessman***

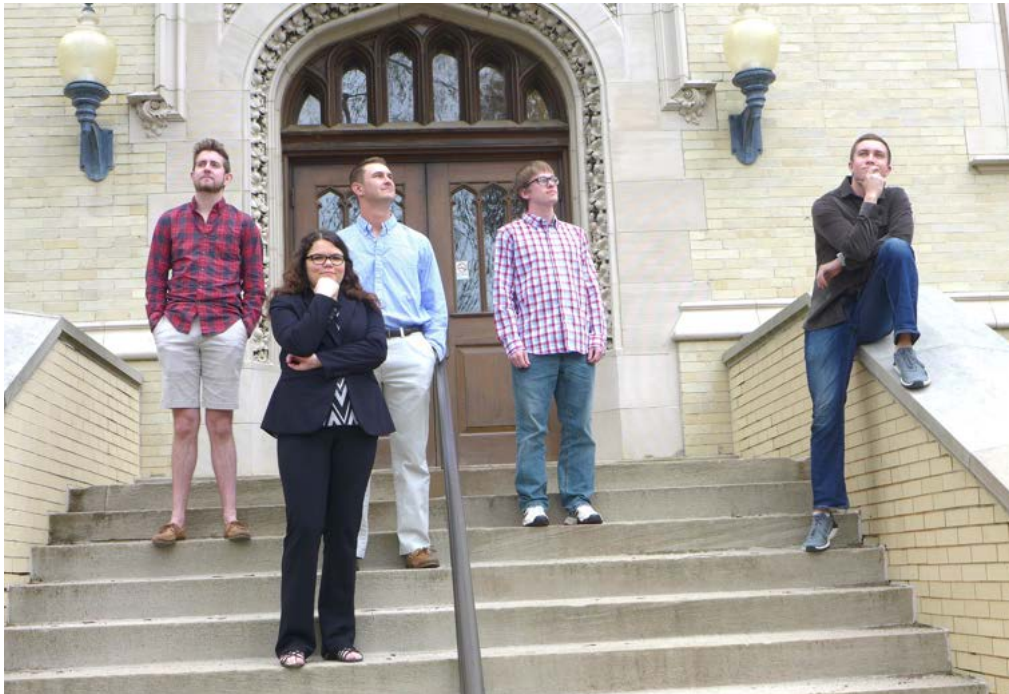
Falling into Chaos

***Christian Julius***

The Unpredictability of a Knuckleball

***Nicholas Rosner***

Experimental and Simulated Explorations of the Feynman Disk Paradox



Wooster Physics juniors: Ben, Abigail, Christian, Nicholas, and Adam

# ALUMNI SPEAKER



***"My Professional Life After Wooster: From Software Engineering to Teaching High School Physics"***

***Joshua Bozeday '99***

***Physics & Computer Science double major***

The Physics Club and the Physics Department welcomed Josh Bozeday '99 back to Wooster last March and enjoyed a wonderful talk and visit. Josh detailed his journey as a software engineer for Motorola to teaching high school physics at Adlai E. Stevenson High School in Lincolnshire IL. Pictured above with Josh are Dr. John Lindner, Manon Grugel-Watson, (lab coordinator and also Wooster Physics '99) and Dr. Don Jacobs, Emeritus).

# FACULTY



***Cody Leary, Associate Professor of Physics***

## TEACHING

(on leave Semester I)

Thermal Physics

General Relativity

Calculus Physics II Lab

\*\*\*\*\*

Five Wooster alumni are currently enrolled in U of Oregon's Physics PhD program. Dr. Leary managed to gather four of these physicists together in one place—one of his favorite old haunts from his graduate school days, McMenamins Cafe. Deepika Sundaraman '14, Dr. Leary, Tzula Propp '15, Nicu Istrate '15, and Andrew Blaikie '13 attended, and not present—but with them in spirit—was Amanda Steinhebel, who had recently left Oregon to spend a year on site at the world's largest particle accelerator (the Large Hadron Collider) at CERN in Switzerland. All attendees (plus Amanda) received this year's Wooster physics club t-shirt!



# FACULTY

## **Wave Lab Group 2018-19**

*Daniel Blaikie, Tanaka Chingonzo,  
Sam Nash, Joe Theiss, Abigail  
Ambrose, Dr. Manz, Matthew Lowe*



## **Niklas Manz**

### **Assistant Professor of Physics**

#### **TEACHING**

Algebra Physics I & II  
Calculus Physics Lab  
Modern Physics Lab  
Mechanics  
Environmental Physics  
3 Senior Independent Study advisees

\*\*\*\*\*

Dr. Manz was awarded an Andrew W. Mellon Foundation grant to work with a Russian language TA on the Belousov-Zhabotinsky reaction history project.

He gave two invited talks:

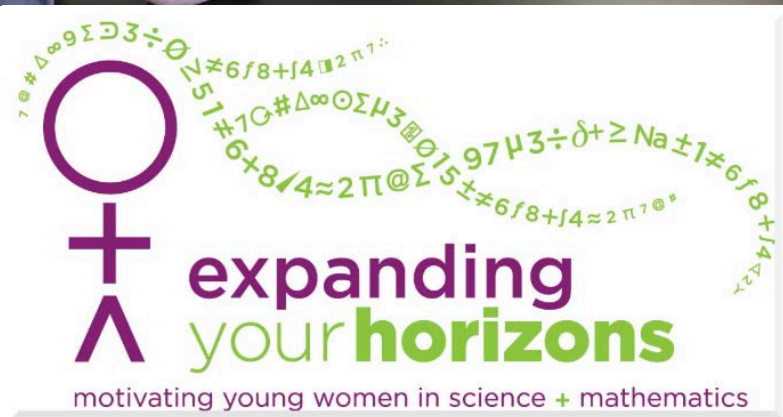
- "Patterns Around You: Excitable Systems in the Lab, in Nature, and on Humans", Harrington STEM Lecture Series, SUNY New Paltz, New Paltz, NY, 2018
- "Dynamics of table-top re fronts" Mini-symposium Simple Systems with Complex Dynamics at the 2019 SIAM Conference on Dynamical Systems, Snowbird, UT, 2019

Dr. Manz accompanied six students to the 2018 fall meeting of the APS Ohio Section at the University of Toledo where three of the students presented posters. He also co-organized the Joint Spring 2019 Meeting of the Ohio-Region Section of APS, Ohio Section of AAPT, and Zone 7 of SPS at The College of Wooster.

In addition to his publication in *Physica A* with John Lindner and students, Dr. Manz wrote a book chapter, "Patterns and Humans", in *Spirals and Vortices*, Tsuji & Muller, eds.

Dr. Manz and two physics majors served as judges at the Ohio Academy of Sciences "State Science Day" at Ohio State University.

# FACULTY



## ***Laura DeGroot, Visiting Assistant Professor of Physics***

### **TEACHING**

Calculus Physics I + Lab  
Calculus Physics II + Lab  
Astronomy of Stars and Galaxies  
3 Senior Independent Study advisee

\*\*\*\*\*

In addition to working with Susan Lehman to redesign the lab component of the introductory calculus physics labs, Dr. DeGroot teamed up with Dr. Lehman to lead the “Humpty Dumpty Experiment” at Expanding Your Horizons, a workshop for young women exploring STEM careers.

# FACULTY



## ***John Lindner, Professor of Physics, Moore Professor of Astronomy***

### **TEACHING**

First Year Seminar "Bridging Theology and Science"

Calculus Physics I Lab

Electricity & Magnetism

Math Methods for Physical Sciences

Computational Physics

3 Senior Independent Study advisees

\*\*\*\*\*

Dr. Lindner served as advisor to Physics Club, Astronomy Club, and Robotics Club.

With Niklas Manz and three undergraduates, Dr. Lindner co-authored an article in the March 2019 issue of *Physica A* – a computational study of the disruption and recovery of reaction-diffusion wavefronts colliding with obstacles, which may have applications to cardiac tissue. Also with Dr. Manz, he co-organized the spring 2019 meeting of the Ohio section of the American Physical Society, the first time this meeting was held at Wooster.

Dr. Lindner is a regular contributor to the Department's Physics Blog:

<http://woosterphysicists.scotblogs.wooster.edu/author/jlindner/>



# FACULTY



*Dr. Lehman and Dr. Leary accompanied five students to the March 2019 National Meeting of the American Physical Society in Boston.*

***Susan Lehman, Victor J. Andrew Professor of Physics, Chair***

## TEACHING

Calculus Physics I  
Calculus Physics II Lab  
Modern Physics + Lab  
Junior Independent Study  
1 Senior Independent Study advisee

\*\*\*\*\*

Dr. Lehman worked with Dr. DeGroot to completely redesign the lab component of the introductory calculus physics labs. The new lab activities are designed to engage students in thinking critically about how to make measurements, how to evaluate measurement quality and compare measurements to a model, how to design experiments, and overall how to think more critically about the scientific process.

Last fall, Dr. Lehman gave a presentation about ethics from the scientific perspective for a local leadership training program (Leadership Holmes County) for about 30 community members from all different backgrounds. In the spring, she enjoyed the opportunity to be the Honors examiner for seniors in Oberlin College's Physics Department.

# PHYSICS CLUB



## OFFICERS

Abigail Ambrose, President  
Chase Fuller, Vice President  
Megan Fisher, Treasurer  
Mili Barai, Secretary  
John Lindner, Advisor

## EVENTS

2018 August 31: Scot Spirit Day  
2018 September 5: Wooster Science Cafe  
2018 September 10: Pizza and LN2 Ice Cream Night at Luce  
2018 September 23: STEM Bash  
2018 September 30: General meeting & LN2 Training  
2018 October 4: General meeting, YouTube & OSAPS  
2018 October 25: General meeting, T-shirts  
2018 November 8: General meeting, Outreach & OSAPS  
2018 November 26: InSight Mars Landing  
2019 January 31: General meeting, OSAPS & Outreach  
2019 April 27: Community Science Day  
2019 April 28: Taylor Bowl 30 at Triway Lanes

IT'S  
ABOUT  
TIME

that Physics wins back  
the giant slide rule trophy!

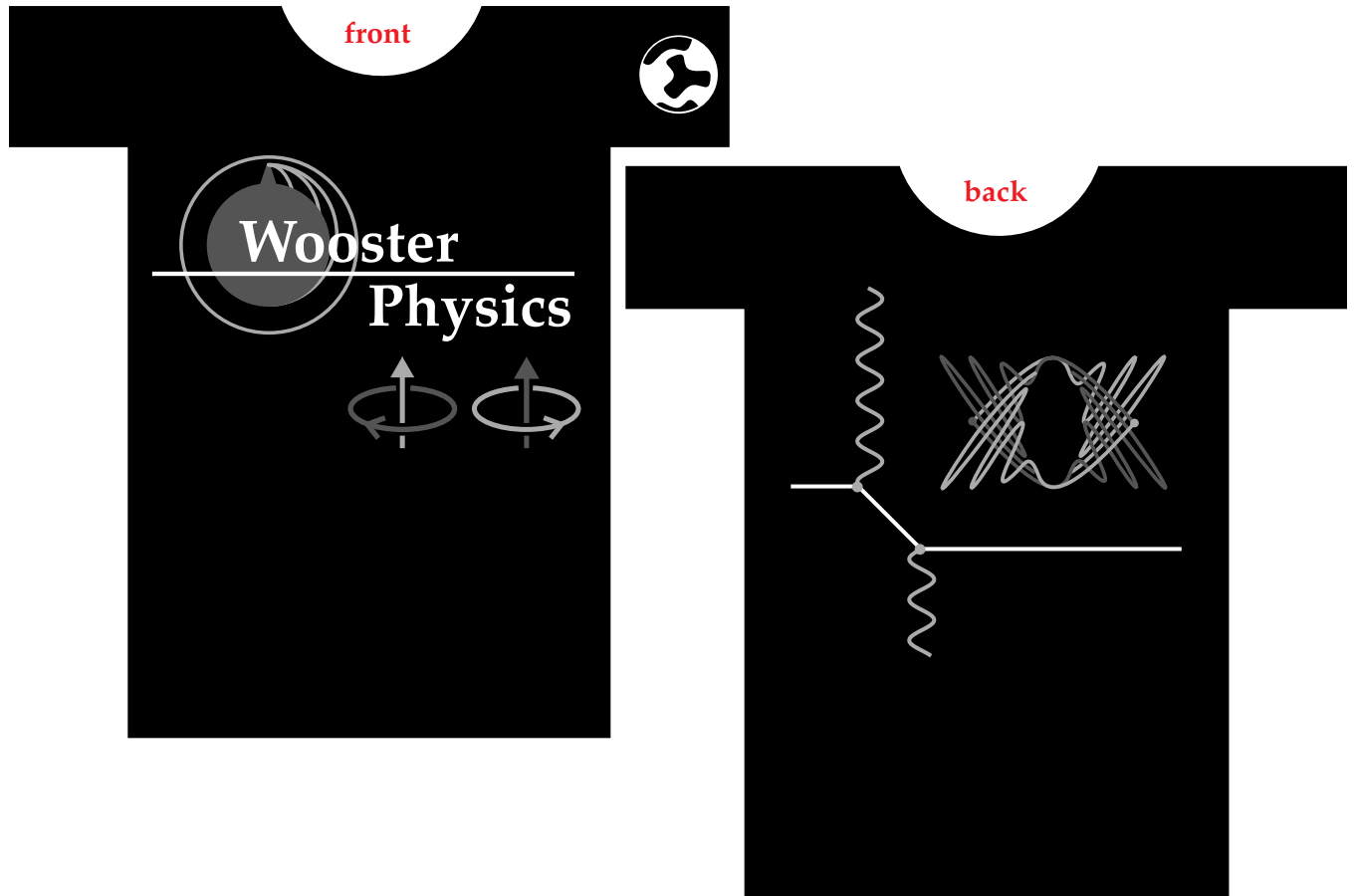
Taylor Bowl XXX

Physics 107.00

Math/CS 103.17

# PHYSICS CLUB

## PHYSICS CLUB T-SHIRT



Front Left: A cannon firing a cannonball from a mountain top at ever increasing speeds links Galileo's law of fall and Kepler's laws of planetary motion in Newton's universal gravitation, based on the Principia.

Front Right: Proton-electron spin-flip transition of neutral hydrogen produces 21-cm microwave radiation ubiquitous in interstellar space.

Back Left: One of two tree-level (first-order) Feynman diagrams contributing to the matrix element of the Compton scattering of an electron and a photon.

Back right: If the stable and unstable manifolds of a dynamical system's fixed points cross each other once, they intersect infinitely often forming a heteroclinic tangle.

Sleeve: Physicists are (in)famous for their "spherical cow" approximations, and we are The College of Wooster: physics at CoW.

# ASTRONOMY CLUB

*Independent Eyes, Observing Together*

## OFFICERS

President: Abigail Ambrose

Vice President: Kassady Martinez-Murphy

Treasurer: Mili Barai

Secretary: Megan Fisher



## INTERSTELLAR

Show Date: Tuesday 4/16/19  
7 PM Taylor 111

## ZENON GIRL OF THE 21ST CENTURY

Show Date: Thursday 4/18/19  
7 PM Taylor 111

## APOLLO 13

Show Date: Wednesday 4/24/19  
7 PM Taylor 111

## 3rd Annual Astrophotography Contest Grand Prize Winner

Hwan (Michelle) Bae

*Long exposure produces star trails: the northern hemisphere stars appear to rotate counter-clockwise about the pole star Polaris as Earth spins on its axis. Diagonal lines are aircraft or spacecraft. Horizontal red lines are street traffic. The College's roll-off-roof observatory is in the lower left.*





# CONFERENCES

## STUDENT PRESENTATIONS

\* denotes Wooster student; † denotes summer research student

Carlos Owusu-Ansah\*† and John Lindner

*"Spectral Stability of Gravitationally Interacting Rods"*

*Fall 2018 Meeting of the APS Ohio-Region Section, Toledo OH, September 2018*

Megan Fisher, David Falconer, Ronald Moore, Sanjiv Tiwari

*"Improving the Forecasting of the Drivers of Severe Space Weather"*

*Fall 2018 Meeting of the APS Ohio-Region Section, Toledo OH, September 2018*

N. Smith\*, R. Glaser†, V.W.H. Hui\*†, J. Lindner, and N. Manz

*"Reaction-diffusion wavefronts colliding with obstacles"*

*Fall 2018 Meeting of the APS Ohio-Region Section, Toledo OH, September 2018*

Rebecca Glaser†, Nathaniel Smith\*, Vincent W.H. Hui\*†, John Lindner and Niklas Manz

*"Disruption and Recovery of Reaction-Diffusion Wavefronts Colliding with Obstacles"*

*Nat'l Meeting of the American Physical Society, Boston MA, March 2019*

Daniel Blaikie\*†, Spencer Kirn\*, and Niklas Manz

*"Propagation of Light-Sensitive Reaction-Diffusion Waves in Inhomogeneously Illuminated Systems"*

*Nat'l Meeting of the American Physical Society, Boston MA, March 2019*

Carlos Owusu-Ansah\*† and John Lindner

*"Spectral Stability of Gravitationally Interacting Rods"*

*Nat'l Meeting of the American Physical Society, Boston MA, March 2019*

Kimberly Patterson† and John Lindner

*"Sliding on a Spinning Cuboid"*

*Nat'l Meeting of the American Physical Society, Boston MA, March 2019*

Katie Shideler\*† and Susan Lehman

*"Using Pressure Sensors to Characterize Avalanche Dynamics on a Conical Bead Pile"*

*Nat'l Meeting of the American Physical Society, Boston MA, March 2019*



# CONFERENCES

## STUDENT PRESENTATIONS

\* denotes Wooster student; † denotes summer research student

Daniel Blaikie\*, Spencer Kirn\* and Niklas Manz

*"Propagation of Light-Sensitive Reaction-Diffusion Waves in Inhomogeneously Illuminated Systems"*

*Spring 2019 Meeting of the APS Ohio-Region Section, Wooster OH, April 2019*

Carlos Owusu-Ansah\*† and John Lindner

*"Spectral Stability of Gravitationally Interacting Rods"*

*Spring 2019 Meeting of the APS Ohio-Region Section, Wooster OH, April 2019*

Megan Fisher\*, David Falconer, Ronald Moore, Sanjiv Tiwari

*"Improving the Forecasting of the Drivers of Severe Space Weather"*

*Spring 2019 Meeting of the APS Ohio-Region Section, Wooster OH, April 2019*

Abigail Ambrose\*† and Nicklas Manz

*"Effect of match types on the fire propagation speeds in a match stick array"*

*Spring 2019 Meeting of the APS Ohio-Region Section, Wooster OH, April 2019*

Joseph Theiss\* and Niklas Manz

*"Discrete Tree Based Fire Simulation"*

*Spring 2019 Meeting of the APS Ohio-Region Section, Wooster OH, April 2019*

Niklas Manz, Rebecca Glasert†, Nathaniel Smith\*, Vincent W.H. Hui\*†, John F. Lindner

*"Disruption and Recovery of Reaction-Diffusion Wavefronts Colliding with Obstacles"*

*Spring 2019 Meeting of the APS Ohio-Region Section, Wooster OH, April 2019*

David Morrow\* and Susan Lehman

*"Avalanche Dynamics and Angle of Repose of a Cohesive Conical Bead Pile"*

*Spring 2019 Meeting of the APS Ohio-Region Section, Wooster OH, April 2019*

# CONFERENCES

## **OSAPS / OSAAPT / SPS Frontiers in Nonlinear Science**



John Lindner and Niklas Manz co-organized the 2019 Spring Meeting of the Ohio-Region Section of the American Physical Society (OSAPS), in conjunction with the Ohio Section of the American Association of Physics Teachers (OSAAPT) and the Society of Physics Students (SPS) Zone 7, with the theme "Frontiers in Nonlinear Science". This was the first time these conferences were ever held at Wooster, with ~130 participants. The conference featured 7 plenary talks, 22 contributed talks, 39 poster presentations, and even a Society of Physics Students "physics obstacle race". Details on all the sessions can be found at:

<http://physics.wooster.edu/OSAPS/>



# CONFERENCES

## **OSAPS / OSAAPT / SPS Frontiers in Nonlinear Science**

**The College of Wooster  
2019 March 29-30**

### **Plenary Talks**

Stephen Morris, University of Toronto

*"Consider the Icicle"*

Swara Ravindranath, Space Telescope Science Institute

*"Galaxies across cosmic time - what shapes galaxies and their evolution?"*

Taviare Hawkins, University of Wisconsin LaCrosse

*"Updates in Microtubule Mechanics"*

Richard Field, University of Montana

*"The Luck of Good Timing in Physics: 60th Anniversary of the Belousov-Zhabotinsky Reaction"*

John Pojman, Louisiana State University

*"Order out of Chaos: How Molecules Can Organize Themselves"*

Stéphane Coutu, Penn State University

*"Experimental Particle Astrophysics"*

Tom Greenslade, Kenyon College

*"Bringing Early Physics Apparatus and Demonstrations into the 21st Century"*



# SUMMER RESEARCH

## WOOSTER NSF-REU

- ✿ Bennett Anderson (Wooster '22, advised by Susan Lehman)  
"Conical Bead Pile: Feel the Pressure"
- ✿ Jayne Blinkhorn (Wooster '21, advised by Paul Bonvallet)  
"Encapsulation of Benzoic Acid Inside SOMS"
- ✿ Samuel Cavender (Georgia College & State University '20, advised by Niklas Manz)  
"On The Horizon"
- ✿ Maria Cook (Lorain County Community College '20, advised by Laura DeGroot)  
"Studying the Bulges of Distant Galaxies"
- ✿ Brian Corbin (Hiram College '20, advised by Paul Bonvallet)  
"SOMS Force Generation: Force Analysis of Swelled Osorb"
- ✿ Chase Fuller (Wooster '19, advised by Niklas Manz & John Lindner)  
"Let's GP-Do It! GPU Acceleration & 3D Visualization of Reaction-Diffusion Simulations"
- ✿ Christian Julius (Wooster '20, advised by John Lindner)  
"It's Strange...Non Chaotic Motion"
- ✿ Andrew Kunkel (Wooster '21, advised by Laura DeGroot)  
"Spiral Structure of The Milky Way According to Density Wave Theory"
- ✿ Margaret McGuire (Wooster '20, advised by Niklas Manz & John Lindner)  
"What a Mouthful: Geographic Tongue as a Reaction-Diffusion System"
- ✿ Emmanuel Ogundipe (Grinnell College '21, advised by Susan Lehman)  
"Video Processing & Analysis of a Conical Pile"
- ✿ Dustin Savelli (Lorain County Community College '21, advised by Cody Leary)  
"The Transfer of Linear & Angular Momentum Between the Evanescent Electromagnetic Fields of a Nanofiber & Matter or...TRACTOR BEAMS!"
- ✿ Melita Wiles (Georgia Tech '22, advised by John Lindner)  
"Celestial Mechanics: Stability of Gravitational Interacting Rods"
- ✿ Yang (Fish) Yu (Wooster '21, advised by Niklas Manz & John Lindner)  
"Reaction-Diffusion Wavefronts Interacting with Spirals & Fractals"
- ✿ Xinchun (Ariel) Xie (Wooster '21, advised by Cody Leary)  
"Optomechanical Spin-Orbit Coupling"

# SUMMER RESEARCH

## OFF-CAMPUS

- ❖ Megan Fisher (Lockheed Martin) Solar & Astrophysics Lab
- ❖ Abigail Ambrose (OARDC) USDA Agricultural Research Service
- ❖ Handeul Son (OARDC) Ohio Agricultural & Development Center
- ❖ Carlos Owusu-Ansah (OSU) The Ohio-5 Sure Program
- ❖ Matt Klonowski (University of Oregon) REU Nazin Lab
- ❖ Maya Lapp (APEX Fellowship) Sustainability Without Borders
- ❖ Mili Barai (University of Toronto) SURP Program @ Dunlap Institute of Astronomy & Astrophysics

# ALUMNI TIDBITS