



# Department of Physics and Electrical Engineering

## 2016-2017 Alumni Newsletter

### Scranton Students Excel at 2017 IEEE Region 2 Student Activities Conference

Rowan University, Glassboro NJ - April 7-9, 2017



**Dr. Andrew Berger**, IEEE club advisor, **Dr. Robert Spalletta**, and **Prof. Nicholas Truncale '06** at the SAC Awards Banquet with the University of Scranton student group who attended the Region 2 SAC.

A few years ago, new strategies were implemented to engage more students in the IEEE Student Activities Conference and increase preparation for the individual competitions. The strategies, based mostly on upon student feedback, were:

- University of Scranton Student Government monies provide some equipment so competition teams can purchase their robot parts early and have working prototypes ready before the intersession break
- In the Spring semester, every other IEEE seminar meeting is devoted to a SAC update meeting where the teams give status updates on their preparation
- Micromouse Kit and Ethics competitors determined by class competitions in first-year ENGR/PHYS 150 Foundations of Physics and Engineering course
- A competition Micromouse maze was built so that the Micromouse teams practice on an actual maze
- Sample brown bag kits were developed from past SAC competition so students could practice



**Peter Kulick '19**, **Bradley Houdesek '17**, **John Bowers '18**, and **Wilson Ortiz '18** compete in the Brown Bag competition. Twenty-five students from the Department attended and participated in this year's 2017 Student Activities Conference. Scranton was listed in the SAC conference program as the school bringing the most students from Region 2. IEEE Region 2 includes Ohio, West Virginia, Pennsylvania, Maryland, Washington D.C., Delaware, and parts of Kentucky and New Jersey.

**Nicholas Chaump** (EE '18) took **3<sup>rd</sup> Place** in the paper presentation competition

**Ricky Olechna** (EE, '17), **Matthew Collier** (EE, '17), **Chris Gasper** (EE, '17), and **Bradley Houdesek** (EE, '17) took **2<sup>nd</sup> Place** in the Micromouse Scratch Competition

**Griffin Mulvihill** (Physics, '19), **Joshua Toth** (Biophysics, '20), **Joseph Delmar** (Biophysics, '19) and **Ben Loya** (Physics, '18) took **2<sup>nd</sup> Place** in the Physics Competition

**Tara Hambrose** (EE, '18) took **2<sup>nd</sup> Place** in the first annual Women in Engineering (WIE) Teaching Competition

**Natalie Krupka** (Physics, '20), **Zackary Walsh** (EE, '20), **Mark Pawelski** (EE, '20), and **John Radetich** (EE, '20) took **1<sup>st</sup> Place** in the Micromouse Kit competition (team shown below)







## The University of Scranton hosts the 65<sup>th</sup> Annual American Association of Physics Teachers (AAPT) – Central Pennsylvania Section (CPS) Conference

Loyola Science Center - April 21-22<sup>nd</sup>, 2017

**Highlights from the conference include:**



A Physics Teachers Resource Agents (PTRA) Workshop on Hands-On Electricity Lessons was held Friday, April 21st, in the introductory physics laboratory. An AAPT National Bauder Grant was secured by CPS Section PTRA Leader, **Pat Callahan** (in red), who is also the National PTRA Advisory Board Director. The grant allowed the high school teachers who attended the workshop to leave with electricity equipment from the CASTLE Curriculum.



On Friday evening, a banquet dinner was held in the LSC Atrium and remarks were given by Professor Emeritus of the Department of Physics and Electrical Engineering, **Prof. John R. Kalafut '60** (left), who was President of AAPT-CPS in 1974. He reflected on how the conference gave him one of his first opportunities to present his work. Following the dinner, a keynote talk was presented by an invited speaker **Dr. Matthew Farrar** of Messiah College and was titled: *Seeing Anew: How Advances in Microscopy are Changing the Life Sciences* held in the PNC Auditorium LSC 133.



Saturday included a day full of presentations by faculty and students from the CPS region. We also tried something new; we highlighted new equipment and demonstrations from our department to the conference attendees.



**Dr. Declan Mulhall** speaking to faculty attendees about *Modern Interferometry* equipment specifically about using Quadrature Detection.



**Dr. Robert A. Spalletta** demonstrating live *Radio Telescope* data to Dr. Matthew Farrar.



Students showcasing *Nuclear Magnetic Resonance (NMR)* Equipment during the conference demonstration session in the Loyola Science Center Atrium.



## IEEE-HKN Holds Mock Interviews

February 16<sup>th</sup>, 2017

This yearly event helps our students gain interview experience and have one-on-one time with professionals who are in the field, who interview engineers on a regular basis. Feedback was given on students' interview skills and resumes.



The advisor of IEEE-HKN, **Dr. Christine A. Zakzewski**, and the student members thank the following friends and alumni of the department for participating in the Mock Interviews this year:

### Ed Farrell '89

ATCALS & Range Threat Systems Engineering Branch  
Tobyhanna Army Depot - Production Engineering

### Michael J. Rusinko '89

Lead Industrial/Electronics Engineer  
Tobyhanna Army Depot - Production Engineering

### Jack Rosentel '09

Electrical Engineer, Sr.  
Lockheed Martin – Missiles and Fire Controls

### Carol Strauch '01

Mission System Sustainment Senior Program Manager  
Lockheed Martin - Rotary and Mission Systems (RMS)

### Ted Brunelle

Engineering Coordinator  
Reaction Technologies LLC

### Michael Coleman '97

Senior Manager  
Infinera - Line Module Operations

### Charles Oleski '03

Electronics Engineer  
Tobyhanna Army Depot – Production Engineering

## 2017 Kane Competition

April 4<sup>th</sup>, 2017

This year's theme was **Time Travel**. High School students traveled back in time to variations of some of our most successful events culminating in going *Back to the Future* to our newly named "*The Hayes Family Science Competition*". Because of the generosity of **Ed '61 and Margaret Hayes**,



next year and going forward, the department's High School competition is re-named with the Hayes Family also funding the annual Kane Scholarship to keep the "Kane" name alive in the competition. The competition is administered by **Prof. Nicholas Truncale '06** with the engineering expertise of our lab equipment manager, **Mr. Majid Mokhtari '15**.



A team from **Berwick High School** took first place in the 2017 Kane Competition and took home the perpetual trophy. The team was coached by Mr. Matthew Shrader.

## 2016-2017 Hayes Family Equipment Donation

With this year's equipment donation fund from **Ed '61 and Margaret Hayes**, the Physics/EE faculty will utilize part of the funds on a new **Electronics Student Makerspace**: In one of our labs, we will create a student electronics stockroom/makerspace where any of our department students can access electronics parts, components, supplies, utilize soldering workstations, microcontrollers, etc. The idea of makerspaces has been very popular recently. Our makerspace will give our students the opportunity to experiment with building things outside the classroom and spark their creativity.





## Student Internships and REUs

### Summer 2017

**Nicholas Constantinou '20** – Web Developer Intern, Cresco Data, Singapore

**Madison Ashby '19** – Intern, C&S Companies, Syracuse NY and San Diego, CA

**Daniel D'Agostini '19** – US Marine Corp Officer Candidate, Quantico, VA, Flight Training

**Joseph Delmar '19** – REU University of Arkansas

**James Flynn '19** – Technician, Reading Technologies, Reading, PA

**Shawn Foy '19** – Apprentice Electrician, Five Star Electric, NYC

**Joshua Toth '20** – Research Intern, Geisinger Commonwealth School of Medicine, Scranton, PA

**Tara Hambrose '18** – Sustainability Intern, University of Scranton Office of Sustainability

**John Bowers '18** – Electrical Engineering Intern, Aviation Development Team at CH2M, Philadelphia, PA

**Nicholas Chaump '18** – Engineering Intern, Lockheed Martin, King of Prussia, PA

**George Ebeid '18** – Engineering Pathways Program, Tobyhanna Army Depot, Tobyhanna, PA

**Matthew Reynolds '18** – Research Internship, The Rockefeller University, NYC

**Nicholas DePierro '18** – Radar Systems Intern, BAE Systems, Wayne, NJ

**Alexander Pinarreta '18** – IT Technician, Massachusetts Governor's Office, Massachusetts Department of Transportation, Boston, MA

**Zachary Black '18** – Intern, Pride Mobility Products Corporation, Duryea, PA

**Brian Kohler '18** – Intern, Buchart Horn Inc., Marlton, NJ

### Highlight

Sophomore EE, **Peter Kulick '19**

Quality Engineering Intern, Crestron Electronics - Summer 2017



Peter will be interning at Crestron Electronics in Rockleigh, New Jersey. Peter is a University of Scranton Presidential Scholar and was the **2016-2017 SAC Advisor** responsible for organizing and planning this year's student participation in the Region 2 IEEE SAC. Much of this year's success can be attributed to the work Peter contributed to the Scranton IEEE!

## Graduating Senior Highlights



Graduating seniors shown from left to right: **Richard Olechna, Matt Collier, Bradley Hodousek, and Christopher Gasper** with their 2<sup>nd</sup> place Micromouse Scratch Award at the 2017 IEEE Region 2 SAC.

**Sara Gleco** - Biophysics, Class of '17  
North Carolina State University - Raleigh, North Carolina  
PhD Program in Material Sciences and Engineering  
specializing in Biomaterials

**Richard Olechna** - Electrical Engineering, Class of '17  
ON Semiconductor - Mountain Top, PA  
Electrical Engineer Technician

**Christian Johnson** – Electrical Engineering, Class of '17  
Army Signal Branch - Fort Gordon, Georgia  
Basic Officer's :Leadership Course

**Matt Collier** - Electrical Engineering, Class of '17  
Tobyhanna Army Depot, Tobyhanna PA  
Electrical Engineer

**Karissa Barbarevech** – Biophysics and EE, Class of '17  
Drexel University - Philadelphia, PA  
Accepted to Drexel Medical School

**Christopher Gasper** – Electrical Engineering, Class of '17  
Lockheed Martin - Owego, NY  
Electrical Engineer Associate



## Undergraduate Research Projects

### Tunneling and thermionic currents in Graphene /semiconductor Schottky diodes

**George Ebeid '18 – Advisor: Dr. AC Varonides**

The extra ordinary properties of Graphene (e.g. high electron mobility current density on SiO<sub>2</sub>/Si junctions, high mechanical strength, and high melting point) make it an excellent material for Graphene-based Schottky-Barrier diodes (G/SB). In such junctions, graphene mono-layers replace the metal forming G/semiconductor interfaces with several carrier transport mechanisms. In this project, we reviewed Schottky junctions and described two carrier-transport mechanisms: tunneling and thermionic emission through potential barriers formed at the junction between graphene and n-type semiconductors.

### Designing and Building a Watt Balance to find an Adjustment for Plank's Constant

**Matthew Anzelmi '17– Advisor: Dr. Juan D. Serna**

The watt balance is a relatively new instrument, which is currently being developed to redefine Planck's constant, and, in turn, redefine the kilogram in terms of the new fixed value of the constant. The scientists at the National Institute of Standards and Technology (NIST) have been designing and testing one of these balances for this purpose, and have measured Planck's constant to 6 significant digits. The goal of this project was to design and build one of these balances based on various methods and designs previously implemented. Specifically chosen magnets and coil designs were used to optimize voltage and current output readings to reduce overall error normally present during the operation of these instruments. The final product is meant to be designed in such a way that it is suitable for use in a modern physics laboratory setting, while also being cost-efficient enough to be built by any university student. Accompanying the balance, I wrote programs that assist the user with data acquisition and calibration control with an Arduino microcontroller.

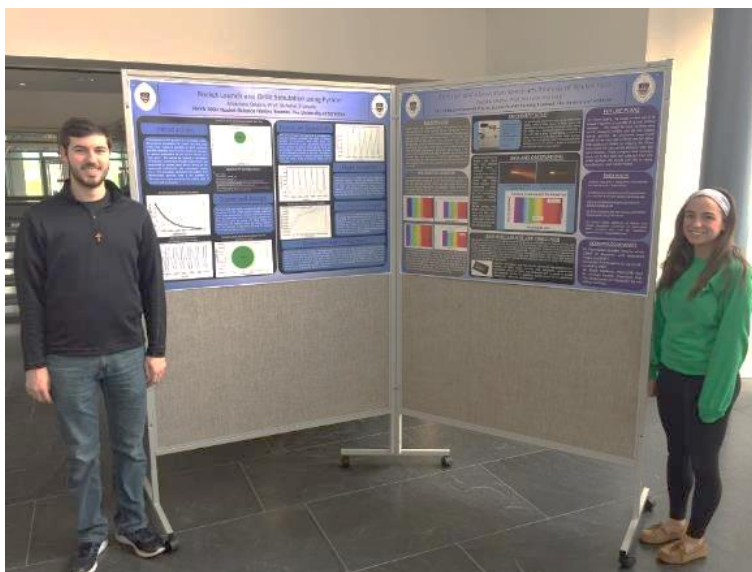


Mrs. Laurie McCoy, Tara Hambrose '18, Mr. Majid Mokhtari '15, and Dr. Christine Zakzewski at the 2017 Kane Competition.

### Emission and Absorption Spectral Analysis of Rocket Fuel

**Natalie Krupka '20 – Advisor: Prof. Nicholas P. Truncale**

To observe the emission and absorption spectrum of rocket fuel, we will be using a PASCO spectrometer in two ways: known light absorption spectrum comparison with a liquid sample in a cuvette and direct light collection through a fiber optic cable. The spectrometer has an input, which allows one to place a liquid sample in a cuvette and measure the absorbed light of that substance. Light from a tungsten source passes through the samples in the cuvette and a high diffraction grating to detect the light that makes it through. Whatever light does not make it through, must be absorbed by that substance in the cuvette. This allows the production of the absorption spectra of the substance. The fiber optic cable captures light through a narrow slit and passed that light directly through a high diffraction grating allowing the spectrometer to show the emission spectrum of the source. Using these two methods, I hope to be able to determine the elements in rocket fuel.



Matthew Owens and Natalie Krupka with their posters at the University of Scranton's Office of Research and Sponsored Programs Celebration of Student Scholars, May 2017.

### Rocket Launch and Orbit Simulation using Python

**Matthew Owens '17 – Advisor: Prof. Nicholas P. Truncale**

The purpose of this project is a to create a two-dimensional simulation of rocket launches and orbits that makes it possible to both replicate real launches and see the results of changes in various parameters of the launch vehicle and flight path. We started by creating a simulation of Newton's Cannonball thought experiment and proceeded by adding other forces acting on the spacecraft individually (air resistance, thrust, etc). The simulation calculates the rocket's two-dimensional position over a set number of discrete time steps and plots the orbital path of travel in the (x,y) plane.



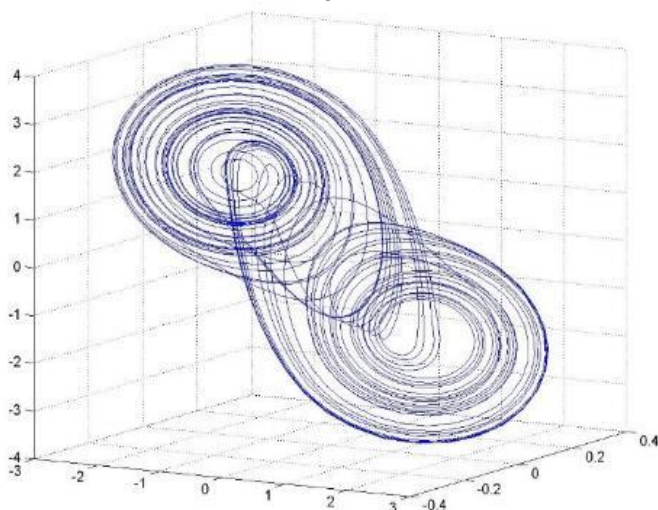


## Undergraduate Research Projects

### Generation of Multi-Scroll Attractors Using Fractal Network Processes

**Joseph Delmar '19 – Advisor: Dr. Juan D. Serna**

Over the past years, chaos control has become a very active area of research in nonlinear dynamics, as it has shown its potential in applied areas of science such as biomedical engineering, digital data encryption, image processing, and power systems protection. Different control methods have been used to generate and study the dynamics of hyperchaotic structures characterized by the evolution of chaotic attractors and resulting in intricate patterns. In this project, we study a novel technique used to generate multi-scroll and multi-wing chaotic attractors based on fractal network processes. In particular, we examine the evolution of a multi-scroll Chua's attractor produced by multiple iterations of a Julia fractal algorithm.



### An Atomic Force Microscope Investigation into the Effect of Antibiotics on the Strength of Ant Cuticles

**Joshua Toth '20 – Advisor: Dr. Robert A. Spalletta**

The strength of ant cuticles is altered by exposure to antibiotics. The definition of hardness in biological systems, where structural changes can range from the macroscopic to the molecular, is not clearly defined. This investigation uses an AFM to study the topology of a portion of the cuticle from an ant thorax. This is the first report of topology that includes features in the range from 10 angstroms to 25 microns. Preliminary studies show that the cuticle is made up of thin plates (Approximately 100nm thick) with a surface area of order 10 square microns. These studies do not show a statistical difference between the plate topology of treated and untreated ants. These studies do show a statistical difference between the roughness of the plates between the two groups, as detected by lateral force measurements with the AFM.

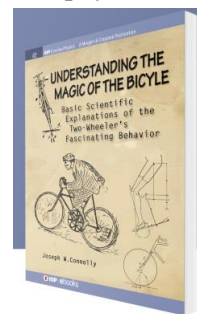
## Understanding the Magic of the Bicycle

December 2016



**Dr. Joseph W. Connolly '68** recently published a book on the physics of the bicycle offering basic explanations to the “Two-Wheeler’s Fascinating Behavior” through the use of introductory physics topics. Taken from the promotional flyer

for the book: “The bicycle is a common, yet unique mechanical contraption in our world. In spite of this, the bike’s physical and mechanical principles are understood by a select few. You do not have to be a genius to join this small group of people who understand the physics of cycling. This is your guide to fundamental principles (such as Newton’s laws) and the book provides intuitive, basic explanations for the bicycle’s behavior. Each concept is introduced and illustrated with simple, everyday examples. Although cycling is viewed by most as a fun activity and almost everyone acquires the basic skills at a young age, few understand the laws of nature that give magic to the ride. This is a closer look at some of these fun, exhilarating, and magical aspects of cycling”.



–Morgan & Claypool Publishers

The book can be purchased from the publisher at the link below, with a free chapter example. Use the “authorcoll” code for an additional 15% off. [Magic of the Bicycle](#)  
The book can also be found on Amazon for purchase as both a hardcopy and an e-book: [E-Book from Amazon](#)



Graduating seniors with **Dr. Zakzewski** at our annual end of the year Celebration on May 10<sup>th</sup>, 2017 at Kildare’s Irish Pub.



## University of Scranton Goldwater Scholar is Model Scientist of the Future

May 8<sup>th</sup>, 2017

Excerpts Taken, with permission, from a University of Scranton Press Release: [Reynolds Receives Goldwater Scholarship](#)

The University of Scranton's **Matthew Reynolds**, became the 12<sup>th</sup> Scranton student in 15 years to earn a prestigious Barry M. Goldwater Scholarship, the premier undergraduate scholarship for the fields of mathematics, natural sciences and engineering. Reynolds, a member of Scranton's class of 2018, is a biology and biophysics double major with minors in mathematics and computer science and a member of the University's undergraduate Honors Program.



Reynolds, of Apalachin, New York, was among just 240 students from 157 colleges in the nation to earn a Goldwater Scholarship for the 2017-18 academic year. He is one of only six students from Jesuit universities to be awarded a Goldwater Scholarship this year. Reynolds takes a pioneering approach to research, applying his studies across the disciplines of biology, physics, mathematics, and computer science for scientific discovery.

Reynolds has already developed software for image processing and analysis for biological applications that are available to University students for the cellular biology lab, where he serves as a undergraduate teaching assistant. He has also written software programs for his own research.

A full-tuition Presidential Scholarship recipient at Scranton, Reynolds is a member of Alpha Sigma Nu, the national Jesuit honor society; Sigma Pi Sigma, national physics honor society for physics; and IEEE's (Institute for Electrical and Electronic Engineers) Eta Kappa Nu honor society. He has served as a peer tutor for general chemistry and cellular biology at the University's Center for Teaching and Learning Excellence. A member of the biology club, chemistry club and IEEE, Reynolds is a staff writer for *The*

## Alumni Highlight



**Caitlin DeMarest M.D., Ph.D.**, a 2008 Biophysics graduate of the department, recently completed her Ph.D in Biomedical Engineering from Carnegie Mellon with the thesis "Prolonging the Useful Lifetime of Artificial Lungs". Already completing medical school at New York Medical College, Caitlin was in her third year of a surgical residency at *Presbyterian/Columbia* University Medical Center in New York City when she decided to accept an offer at Carnegie Mellon to pursue her Ph.D. Along with her family, she will move back to New York City to continue her surgical residency at Columbia and eventually begin a 2-year fellowship in Thoracic Surgery.

## ABET Industrial Advisory Board Meeting and ABET Team Visit

Our ABET accreditation team visit will occur in the Fall 2017 semester along with an Industrial Advisory Board Meeting to discuss the visit and other department items.

### NEXT IAB MEETING:

6:00 pm - Friday October 27<sup>th</sup>, 2017  
Brennan Hall 5<sup>th</sup> Floor



**Nancy Laffey, Dr. Berger, Dr. Spalletta, Dr. Brian Conniff** - *Dean of the College of Arts and Sciences*, and *Computer Science Professor Emeritus* **Dennis Martin**, Consultant to the department on ABET accreditation.





**Thank you for reading our  
2016-2017 Physics/EE  
newsletter! Feel free to  
contact any of us at any time!**



**Dr. W. Andrew  
Berger**  
Department Chair

[wandrew.berger@scranton.edu](mailto:wandrew.berger@scranton.edu)

## **Dr. Joseph W. Connolly Retires**



Dr. Connolly's career includes teaching close to four dozen different courses over five decades. Additionally, he served in the United States Army, Signal Corps. Some of his other professional activities include many years in industry and two decades of industrial consulting in computer aided design and digital image processing. Some of his future plans include the development of a book on the use of MATLAB for digital image processing. He will also spend time playing with his grandchildren, woodworking, and riding his many bicycles.

**Thank you for your years of service, Joe!**



**Dr. Paul  
Fahey**

[paul.fahey@scranton.edu](mailto:paul.fahey@scranton.edu)



**Dr. Declan  
Mulhall**

[declan.mulhall@scranton.edu](mailto:declan.mulhall@scranton.edu)



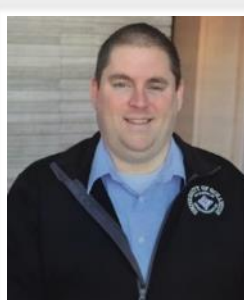
**Dr. Juan  
Serna**

[juan.serna@scranton.edu](mailto:juan.serna@scranton.edu)



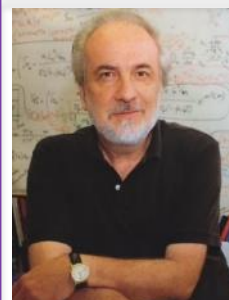
**Dr. Robert  
Spalletta**

[robert.spalletta@scranton.edu](mailto:robert.spalletta@scranton.edu)



**Prof. Nicholas  
Truncale**

[nicholas.truncale@scranton.edu](mailto:nicholas.truncale@scranton.edu)



**Dr. Argyrios  
Varonides**

[argyrios.varonides@scranton.edu](mailto:argyrios.varonides@scranton.edu)



**Dr. Christine  
Zakzewski**  
Department  
Chair

[christine.zakzewski@scranton.edu](mailto:christine.zakzewski@scranton.edu)



**Mrs. Laurie  
McCoy**  
Admin.  
Assistant

[laurie.mccoy@scranton.edu](mailto:laurie.mccoy@scranton.edu)



**Mr. Majid  
Mokhtari**  
Lab Equip.  
Manager

[majid.mokhtari@scranton.edu](mailto:majid.mokhtari@scranton.edu)

**A BIG thank you to Dr. Zakzewski for serving 10 years as chair of the department. Your unwavering leadership in the department helped us grow and improve over the years.**

