

## Application Details

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### Manage Application: Faculty Award for Academic Outreach - 2018

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**Award Cycle:** 2018

**Internal Submission Deadline:** Friday, February 2, 2018

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**Application Title:** Fenton

**Application ID:** 002269

**Nominator's First Name:** Pablo

**Nominator's Last Name:** Laguna

**Nominator's Title:** Professor, Department Chair

**Nominator's Primary Organization:** CoS - Physics

**Nominator's Email Address:** pablo.laguna@physics.gatech.edu

**Nominator's Phone Number:** (404) 385-3907

**Nominee's First Name:** Flavio

**Nominee's Last Name:** Fenton

**Nominee's Title:** Associate Professor

**Primary Organization(s):** Physics

**Nominee's Email Address:** flavio.fenton@physics.gatech.edu

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# Nomination of Prof. Flavio H. Fenton for Faculty Award for Academic Outreach

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February 2, 2018

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Suite 457, Clough Commons  
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Atlanta, GA 30332-0383

Re: Academic Outreach Faculty Award Nomination letter for Professor Flavio Fenton

Dear Award Selection Committee:

It is my pleasure to nominate Professor Flavio Fenton for the Academic Outreach Faculty Award. Since joining the School of Physics in 2012, Flavio has systematically and passionately devoted a lot of his efforts to outreach. He established connections with several middle and high schools in the greater Atlanta area, both individually and through GoSTEM, a collaboration between Georgia Tech and the Gwinnett County Public School District. This outreach was not restricted to K-12 institutions; for instance, Flavio has organized and led several workshops aimed at getting undergraduate students involved in research. He has been actively involved with the Atlanta Science Festival and the annual meetings of the American Association of Physics Teachers and Georgia Science Teachers Association.

A minority himself, Flavio has also been a diversity pioneer, reaching out to Hispanic students and women in particular, with inspiration and encouragement to pursue careers in STEM-related fields. With one of his female students, he organized the 2016 annual Conference for Undergraduate Women in Physics under the auspices of the Southeast Section of the American Physical Society. Flavio also is a regular participant in the Latino College and STEM fair and the afterschool Pathways to College program.

To sum up, Flavio has shown himself to be a leader in communicating science to the broader public and generating excitement about research outside of Georgia Tech. I think he is a perfect candidate for this award, as illustrated by all the supporting material that follows, therefore I give him my highest recommendation.

Sincerely,

A handwritten signature in blue ink that reads "Pablo Laguna".

Pablo Laguna  
Professor and Chair  
School of Physics

Before coming to Georgia Tech, I had been a research faculty member for several years at another university, and while my environment was good for research, my opportunities for outreach were very much limited. Therefore, I have been thrilled since I arrived at Georgia Tech, as I have been finally able to develop strong outreach programs and pursue outreach with the same passion I have for research and teaching. Over the past five and half years at GT I have dedicated my efforts to disseminate science in general as much as possible and to attract the attention of students ranging from middle and high-schools to undergraduates into study STEM fields and learning how science can help them individually as well as society at the same time. My outreach activities could be classified into the following 7 main activities.

### 1) Engaging with Middle and High School Students.

I find it very important to interact with young students and teach them about science, thus over the past four years I have routinely visited Middle and High schools with activities and talks about science to motivate students to go into university and study STEM fields. Particularly I have partner with Radloff Middle school, Lilburn Middle school and Meadowcreek High school which are largely attended by unrepresented minorities. Every year I attend these school's science events with a series of physics demonstrations, and regularly participate giving lectures and carry out hands on science activities at some of their afterschool programs. For non-local schools such as Rabun County middle school and Osborne high school, I have given high definition interactive TV science presentations with the help of Direct 2 Discovery. In respect to my research and lab, I have an open door lab policy where I encourage people and students to stop by any time and learn about our experiments. We also often give lab tours to teachers and high school students.



Interactive presentations (D2D) from our lab at GT (A) to two different classrooms at Rabun middle school (B) and Osborne high school (C). Afterschool physics of rollercoasters activity at Lilburn middle school (D).

### 2) Participation at Science and STEM Events.

Since 2012 I have attended the annual stem fair for students and their families at Meadowcreek high school by bringing several physics demos and activities to excite the curiosity of students, each year I bring with me several of my graduate and undergraduate students not only to help with the various activities but also to act as role models. For the past 3 years I also have participated at the annual Latino College and STEM Fair with a booth with information about undergraduate studies in physics and astronomy and interactive physics demonstrations. I also given presentations at the Georgia Science Teacher Association Annual Meeting and the American Association of Physics Teacher's meetings, given 7 public scientific talks, five national and two international, and was invited to be the Keynote Speaker for the 1st Step into Stem Conference, organized by Junior STEM at GT in 2016.



A) Mundo Hispanico, Atlanta's Hispanic local newspaper reporting on the Latino STEM Fair of 2016, B) Interacting with Meadowcreek High school students with physics demonstrations.

### 3) Conferences and Workshops for Undergraduate Students.

Since 2006, the American Physical Society (APS) has been running an annual conference for undergraduate women in physics, which mission is to help recruit and maintain undergraduate women in physics and guide them with their professional development. With the help of one of my graduate students (Andrea Welsh) we co-organized the south east site conference in 2016 where more than 200 undergraduate women from universities around the south east, as well as some local high school students came to the meeting at GT (<http://www.cuwip.gatech.edu/>). At the conference, students attended research talks given by local and invited faculty and other women scientist working in industry, panel discussions, lab tours and their own students' talks and poster sessions.

I have also developed an undergraduate workshop on Excitable Systems in collaboration with Lehman College (Bronx NY, from 2011-2015) and then with Rochester Institute of Technology (Rochester NY, currently 2016- on ). The goal of these week long workshops is to give undergraduate students from around the US an opportunity to learn about interdisciplinary research in STEAM fields and in particular the dynamics of excitable and oscillatory systems in biology and medicine from a mathematical, experimental, and computational perspective. Students attend lectures, laboratory activities and learn to use and develop high performance computer codes to solve biological problems and work on a final project that they all present at the end of the workshop. Several of my graduates students and postdocs participate as co-instructors on these workshops, giving them further experience in teaching and outreach.



Undergraduate workshops, where students attend A)lectures, B) hands on laboratory activities and c) perform high performance computing.

#### 4) Research for High School Students.

I believe that it is never too early to learn about research and I have been fortunate to have had 10 high school students that have worked in my lab since 2015 (3 women and 5 underrepresented minorities). Six of these students came through a collaboration with the GIFT program (Georgia Intern Fellowship for Teachers) which I have been part of for the past 2 years. In this program, we are paired with a high school teacher and three of their students to work for a month in a science project in our lab, with a final presentation at the end of their study. I'm happy to say that all 10 students are now enrolled or are currently applying to a universities on a STEM related fields.

#### 5) Research for Undergraduate Students.

In the lab, I continuously encourage my postdocs and graduate students to joining me in mentoring undergraduate students, and thanks to them and their efforts we have had since 2013, 24 undergraduates doing research in our lab (10 women and 3 international visiting students). We take their research very seriously and after one semester of working in the lab and demonstration of understanding their research project, we encourage them to apply for research and travel funding so they can continue their research and present it at conferences. We are fortunate that 10 of our undergraduate students have been awarded a GT PURA (President Undergraduate Research Award), 3 have obtained a Petit Scholarship, and 2 a GT-URSA research award. Our undergraduates have presented over 30 posters and talks at several local and national meetings and have received several awards for their research, including the School of Physics Metha Phingbodhipakkiya Award, CoS Joyce & Glenn Burdick Award, CoS Leddy Family Award and a best undergraduate talk presentation at the Annual American Physical Society meeting.

#### 6) Upgrade of the GT Physics Demo Room.

Through my classes and outreach events, I have seen how real life applications of physics often help students not only to better understand the topics but also get excited about science. Because of these, over the years I have constructed several physics demos for my classes and to bring to outreach events. Then last year, I learned about GT (Tech-Fee) grants and I immediately prepared and submitted, with one of our academic professionals (Ed Greco), a proposal to upgrade our very old physics demo room. The vision, is to make ours, the most complete physics demo room in the nation so we can use a variety of demonstrations in all our physics classes and also increase the range of outreach events we can do at the school of Physics. The proposal was well received by GT and we were able to obtain \$180,000 to buy and construct more than 2,000 different physics demos ranging from simple ones like bouncing balls with different elastic coefficients to complex ones like ultrasound levitators and a superconductor magnetic Mobius strip track. While we are still organizing and cataloging all the new experiments from our demo room, we have already seem this year a clear increase in the use of demos in our introductory physics courses. In addition, our outreach events are now reaching more students and people as we get now regularly calls from many student organizations within GT to borrow equipment for outreach events. Finally, as we are currently cataloging the experiments, we are making videos of them and creating an online outreach you-tube channel library that will be accessible not only to our own students, but to other students and the public in general.

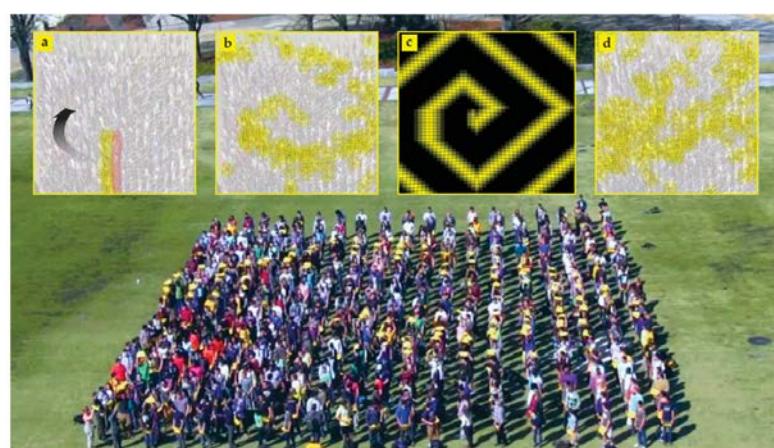
## 7) General Public Outreach:

Promoting science to the general public is also a passion for me. I have participated since its beginning at the Atlanta Science Festival (ASF), first as a part of a TV ad for its promotion in its first year and with a science booth at the Expo event. Then every year, we have participated with an Expo booth, and helped our physics graduate students with designing and implementing physics demos related to fermentation, for their science of beer events. Also I have organized with the help of my students and about 600 other GT students, staff and faculty, an activity to perform a crowd spiral wave. This is a science activity designed to promote science and heart arrhythmia awareness that we have performed twice as part of the ASF, and once last year at the March for Science in Atlanta with the more than one thousand participants.

To reach people in general and make available information about how mathematics and physics can be used to study and help cure heart arrhythmias, I have created and maintained for over 12 years now, an interactive and teaching website ([TheVirtualHeart.org](http://TheVirtualHeart.org)). This website includes movies and interactive simulations of mathematical models of the heart that is used by many students and teachers at several universities and it is visited by around 3 to 4 thousand people per month. Some of the program developed for the website have also been shared with other educational websites such as the SIAM (Society of Industrial and Applied Math) Dynamical Systems website.

With two of my graduate students we have developed a new high school student's summer physics camp (based on the success we have had with the undergraduate's workshop) to be given this year, as part of the GT Summer PEAKS Programs (Programs for Enrichment and Accelerated Knowledge in STEM).

Other general outreach activities, include collaborations with our SPS (Society of Physics Students) helping organize and obtaining all necessary permits to perform events such as their physics Field day for high schoolers and the annual liquid nitrogen frozen-pumping drop (now on its 3<sup>rd</sup> year) from the Howey's physics building.



Picture from one of the spiral wave's event, part of the ASF at GT that was published in Physics Today last year.

I am writing this letter in support of Dr. Flavio Fenton's application to the Faculty Award for Academic Outreach. Dr. Fenton has been a dynamic participant in many GoSTEM initiatives since he arrived at Georgia Tech in 2012, and in the past five years he has provided unique enrichment opportunities to high school and middle school minority students involved in our program.

The GoSTEM program is a collaboration between Georgia Tech and the Gwinnett County Public School District to enhance the educational experience of Latino students in Georgia and strengthen the pipeline of these students into post-secondary STEM education. In order to fulfill our mission, we rely on Georgia Tech's faculty engagement in educational outreach activities outside the classroom and the laboratory. Since his arrival to Georgia Tech, Dr. Fenton has become an invaluable collaborator to our program.

Since 2012, he has participated in our Fall Latino STEM Education Day event held at Meadowcreek High School. This event attracts between 100 and 200 Latino family members from our partner cluster schools for a day of STEM hands-on activities, and college workshops. Dr. Fenton has prepared educational presentations and science demonstrations related to his research for high school and middle school students on these events. Furthermore, he has engaged graduate students from his lab in these activities, which provides younger students in our program with valuable role models in STEM careers.

Dr. Fenton has attended in multiple times the afterschool Pathways to College program and conducted interesting hands-on activities for middle school students. Dr. Fenton has given inspiring and motivating presentations about careers in STEM and his own experiences as a minority scholar and physicist and has encouraged students in our program to reach higher and pursue their dreams. He also supports this program by opening his lab at Georgia Tech and accommodating students who are visiting our campus on field trips.

Dr. Fenton has also engaged in our teacher professional development opportunities by offering coordinated lectures with teachers via teleconferencing to high school classrooms. In the summer, Dr. Fenton has also hosted science physics teachers and groups of students through the Georgia Intern Fellowship for Teachers (GIFT) program. In addition, he serves on the GoSTEM program Faculty Advisory Board tasked with providing guidance on how to reach out more effectively to minority K-12 students, and bridging the gap between K-12 institutions and higher education.

In sum, Dr. Fenton is an exemplar educator and his commitment to the younger generations and minorities students is not only palpable, but it serves as great inspiration to other faculty, staff and students at Georgia Tech. His incessant effort to bring knowledge and encouragement to all students around him is indeed worthy of the highest commendations.

Sincerely,



Diley Hernandez, Ph.D.  
Senior Research Scientist  
GoSTEM Program Director

Center for Education Integrating Mathematics,  
Science and Computing Georgia Institute of Technology  
Phone 404.385.2424

To: Faculty Award for Academic Outreach Committee

I am writing this letter of recommendation in support of Flavio Fenton's nomination for the Faculty Award for Academic Outreach.

Last summer, being part of the GIFT program (Georgia Intern Fellowship for Teachers), I had the privilege to work for a month in professor Fenton's lab along with 3 of my students from Meadowcreek High School.

My students and I had a great learning experience there. Everybody in the lab was very friendly and eager to share with us information about their area of research. Even though they were all busy, they took time to present and explain to us the experiments they were working on.

Also, everybody was very supportive in helping us complete our assignment, "Studying the period of a density oscillator".

During that time, my students learned a lot about methods of research, collecting, processing and interpreting data, programming, and writing a presentation.

I was able to use the new information and new ideas in order to prepare a unit lesson plan for my high school students.

My students took the results of their work to the Science Fair Competition, and I was able to incorporate some of the elements of the density oscillator setup into a lab I am doing with my students for Electricity unit.

I am very grateful for the learning experience my students and I had at Georgia Tech and I am looking forward to continue our collaboration. Professor Fenton is scheduled to come in our school to do some Physics demonstrations for our students this semester.

It is with my deepest convictions that I eagerly recommend that Flavio Fenton be selected as the recipient of the Award for Academic Outreach.

Sincerely,

Ana Ille

Physics Teacher

Meadowcreek High School

678 559 8594

# ATLANTA SCIENCE FESTIVAL

191 Peachtree Street NE, Suite 3400  
Atlanta, GA 30303  
770-322-4992  
[AtlantaScienceFestival.org](http://AtlantaScienceFestival.org)

January 29, 2018

To Academic Outreach Faculty Committee:

It is my pleasure to support the nomination of Dr. Flavio Fenton for the Georgia Tech Faculty Award for Academic Outreach. Flavio has been an active and enthusiastic participant in the Atlanta Science Festival since its inception in 2014.

The Atlanta Science Festival is a two-week celebration of local science and technology, with 100 public science events throughout metro Atlanta. In 2014, Flavio joined us at an initial meeting with WSB-TV, the local ABC affiliate, where his physics demos helped set the stage for the network's media partnership with the Festival. He was later featured with one of his graduate students in an on-air segment demonstrating forces and momentum to promote the Festival's learning opportunities. Each year since then, Flavio has participated as an exhibitor at our Expo event, which draws 20,000 curious people of all ages to a free interactive science day in Centennial Park. Additionally, Flavio is an annual presenter at the Latino College and STEM Fair (drawing more than 1000 middle and high school attendees annually) and has also helped to produce a Science of Beer event for adults during the Festival, which involved mentoring graduate students to create demos that highlight various chemical and physical properties of beer and its production. But what Flavio did with the spiral wave demo was quite amazing! Flavio organized a live re-enactment of a spiral wave, using about 600 human volunteers in each of two years, in order to model the kinds of spiral waves of electrical signals that can occur among mammalian cells in epilepsy and cardiac anomalies. The demo was featured in a 2017 Physics Today journal article ([Welsh, Greco, and Fenton, 2017](#)), and is a fantastic example of engaging the public in science learning and scholarship.

I am thrilled to support Flavio's nomination for the Faculty Award for Academic Outreach. Thank you for your consideration.

Sincerely,



Jordan Rose, MPH  
Executive Co-Director & Co-Founder, Atlanta Science Festival, Inc.



#AtlSciFest

January 29, 2018

Dear Review Committee Members,

It gives me great pleasure to write this letter to nominate Professor Flavio Fenton for the Academic Outreach Faculty award. I have known Flavio since 2012 when I began working for him as a Ph.D. student. One of the reasons I decided to pick him as my advisor is because in his talk to the first year graduate students about his research, he also spoke about his commitment to outreach, which is a topic very important to me. He was the only professor that included this and so I knew that by working with him, not only would I be able to do research that I liked, but also have opportunities to give back to the community by teaching science to different groups of people. Thus over my past 6 years at GT, I have seen firsthand the strong commitment that Flavio has for outreach and the rich culture of science dissemination he sets for all of us in his group. Because the kinds of outreach activities he embarks on every year are too diverse and large to enumerate here, I will focus on only three in which I have interacted the most with him.

First, the American Physical Society Conference for Undergraduate Women in Physics (CUWIP). This is a conference that is held at various universities across the United States annually aimed at retaining women in science and physics by providing them with a professional development and networking opportunities. The conference had never been held in Georgia before and I wanted to host it at Georgia Tech in 2016. As a graduate student, I had no experience writing the proposal or even doing the logistics for hosting such an event. Flavio was very excited to help organize this conference with me and was very active over the course of 18 months preparing for all the aspects of the conference and guiding me. The result was a very successful CUWIP with over 200 undergraduate students from the southeast of the US and Puerto Rico as well as about 20 students from underrepresented minority high schools in Atlanta.

Second, I would like to talk about his involvement in GoSTEM, a collaboration between Georgia Tech and Gwinnett County Public School District. This district has a high population of Hispanic students, which is an underrepresented minority in science disciplines at the college level. There are multiple events that GoSTEM hosts each year that Flavio has been involved with since I have known him. For example, every November he attends an event at Meadowcreek High School preparing many wonderful demos for students in elementary, middle and high school to explore and learn from. Flavio also gives lectures and brings hands on activities through the year and attends the GoSTEM Annual Latino College and STEM Fair. At these events, not only the students love interacting with him but also their families do too as he talks to them both in Spanish and English and provides them with insight about being a Latino in STEM.

Finally, I want to talk about his involvement in the Atlanta Science Festival (ASF). Flavio has been involved with the ASF since its inaugural year in 2014. That year, Flavio worked with the lead organizers to help advertise the event. Flavio included me in a presentation of physics demos we did for executives at a TV station that then lead to a TV advertisement to promote the festival. Since then we have participated every year with various events at the festival including a science booth at the expo, a human spiral wave activity with about 600 participants to promote research and heart arrhythmias awareness, physics activities at the science of beer event organized by the School of Physics graduate students and the science parade, among others.

In summary, Flavio cares a lot about outreach and spends a lot of his time and effort working in many outreach events that target all kinds of groups of people, from very young students to the public in general. He never says no to any invitation or opportunity to promote and disseminate science, and he keeps his research lab open to anyone to visit and always encourage all of his students to give back to the community. Thank you for your consideration.



Andrea J. Welsh,  
Ph.D Physics Student at GT

For the consideration of the Faculty Award for Academic Outreach Committee:

Dr. Flavio Fenton always contributes to the scientific outreach community here at Georgia Tech. If a group on campus is in need of help with demonstrations or faculty volunteers, he is usually one of the first professors to lend a hand. In particular, Dr. Fenton supports the Graduate Association of Physicists Students (GAP) in our outreach events.

While I was the president of GAP, Dr. Fenton helped us for the least two years in the Atlanta Science Festival. His educational demonstration with 'elephant toothpaste' was very popular with the young adult audience during our Science of Beer event, which highlights the physics behind bubble formation and fermentation. He had an integral part in the organization of this years' Step into STEM event, a series of experiments targeted at students in primary education (K-12). He helped with the selection and training for the operation of several simple, interactive demos involving classical mechanics. Regardless of the target age group or the focus of the event, Dr. Fenton is a resourceful colleague for connecting with and spreading the joy of physics with any audience.

During my time at Georgia Tech and in GAP, I first hand observed how Dr. Fenton consistently volunteers his time and knowledge for philanthropic educational outreach. His positive attitude and willingness to get involved make him an exemplary member of the physics department and an ideal candidate for the Faculty Award for Academic Outreach.

Sincerely,  
Anna Miettinen  
Georgia Tech Physics  
GAP (President 2015--2017)



Some of the demos by GAP at the step into STEM for K-12

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To whom it may concern:

Dr. Flavio Fenton has visited our school several times over the past few years to support our annual STEM Night as well as our after school GoSTEM program. Each time Dr. Fenton visits, he engages students, parents, and staff alike with contagious enthusiasm and fascinating physics demonstrations. And as I believe we have the largest Latino population of any middle school in Georgia, it certainly helps that he is bilingual!

We can't wait until he makes his next stop at Lilburn Middle School!  
Mike Doyne  
Parent Instructional Coordinator  
Lilburn Middle School

Below are some exit comments and responses from students that have participated at the annual Workshop on Excitable Systems held annually by Dr. Fenton. This weeklong January workshop gives undergraduate students from various STEM fields including mathematics, physics, engineering, and computing an opportunity to learn about the dynamics of excitable and oscillatory systems from a combined approach of theoretical, experimental, and computational perspectives.

- *The labs definitely helped me to understand the scientific concepts in order to do analysis.*
- *I especially enjoyed the smaller reactions! Lab work was fun since I'm normally just on paper and pencil, since I'm a math major.*
- *The hands-on experiments were nice complements to computer simulations.*
- *The saline oscillator was quick to get up and running, as well as the best example for how we can vary different parameters and get different results.*
- *I found the heart dissection especially unusual, you assume a Mathematical workshop wouldn't allow for that experience but it did, and I'm so glad!*
- *Relating the dynamical systems theory to real life systems where we observe oscillations was especially amazing.*
- *I really loved the aspect where we dissected the heart of the pig to have a better understanding of the functions of the heart. This really helped me to appreciate and bridge the theoretical and practical knowledge about the heart.*

Overall, students have felt that they learn a lot from the workshop and it has helped to motivate them to pursue careers in STEM. Some of their summary comments are included below.

- *Running simulations on the TNNP [ten Tusscher-Noble-Noble-Panfilov] model that had never been done before was awesome! It felt like I was helping to advance science.*
- *It was amazing that we were able to work hands-on with the current model for human ventricular cells most used to study cardiac dynamics and interact with those who built it.*
- *It was extremely interesting to learn how math can be used to explain the reason for sudden cardiac arrests.*
- *Learning about using WebGL was extremely useful as parallelization is an essential tool in scientific computing.*
- *It was amazing to see the different aspects of dynamic cardiac research including: mathematical model development, physiological studies on real hearts, and the computer science side where models are implemented to simulate various conditions that could not otherwise be realized practically.*
- *I really enjoyed how we viewed these problems from so many different angles. Whether it was in lab, through lecture, in simulation, or when we dissected a heart, this workshop helped me to see the many different ways in which we could look at and analyze these problems.*
- *I liked that the three approaches (analytical, graphical, and computational) were used and taught together because if I felt weak in grasping one, the other bolstered it.*
- *Above all, I enjoyed the connection between the dynamics learned in coursework and real, biomedical solutions.*
- *I had a lot of fun seeing the systems we were studying come to life in our simulations and experiments. I wanted to experience how the math integrates with the biology, and I am happy to say that is exactly what I experienced!*