❧ Bryn Mawr Math Alumnae Newsletter ❧

Fall 2016 - Spring 2017

Welcome to this year's edition of the math alumnae newsletter! Here you'll find a selection of news and photographs from the past year. Be sure to check us out online as well: the math department has a new website, and also a new Facebook page![1]

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Park Science Gets a Facelift

Phase One of the Park Science Building renovation has begun, and the math department finds itself in the middle of the construction. Faculty and staff with offices facing the courtyard have been temporarily moved to other parts of the building while their former exterior wall becomes part of a new glass atrium. Displaced faculty members will eventually end up with offices in Collier Science Library, the department lounge will be relocated further down the hall, and some math classrooms will be moved and updated as part of the project.

In explaining the purpose of the renovation, President Kim Cassidy describes the need for "better use of some existing spaces, improved teaching spaces, systems upgrades, and better support for the collaborative and increasingly interdisciplinary nature of science." In addition, the Bryn Mawr community can expect better lighting, more study space, and improved ease of navigation as a result of these changes.

"We have sought to be good stewards of our capital budgets and of the environment while keeping the focus on supporting faculty and student learning and teaching," assures Cassidy. A long process of negotiation with faculty and architects preceded the breaking of ground on the project. Fundraising for Phase Two is ongoing.

Park is Ready for Action[2]

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Bertrand Russell Visits the Math Department (1896)

Bill Dunham

The Mathematics Department of Bryn Mawr College has a rich history. Its founding chair was Charlotte Angas Scott, the first woman to earn a mathematics Ph.D. in Britain. It was home to Anna Pell Wheeler, a University of Chicago Ph.D. and one of the original trustees of the American Mathematical Society. And it welcomed the great Emmy Noether after she fled Nazi Germany in the 1930s.

Perhaps less well known is that Bertrand Russell—philosopher, mathematician, social critic, atheist, Fellow of the Royal Society, and Nobel Laureate—had strong connections to the department. Here we discuss his November, 1896, visit when he gave a series of geometrical lectures on campus. This was his first appearance at any U.S. college or university.

Bertrand and Alys Russell[3]

In being invited to speak, Bertrand had a distinct advantage: his wife, Alys Pearsall Smith, was a member of the Class of 1890 and—better yet—the cousin of BMC president, Carey Thomas. In a letter to Carey of February, 1896, Alys raised the subject: "If thee really can find him [Bertrand] a few, even one or two hearers, for six lectures ... he would love to give these lectures at Bryn Mawr." Although Russell became world famous in the 20th century, he was at this time still an obscure scholar, so Carey Thomas asked Professor Scott to check him out during her summer trip home to England. Scott met with Russell, discussed topics for his Bryn Mawr lectures, and endorsed an invitation with the observation that "He seems to be getting quite a reputation in Cambridge among those whose opinion is worth having."

And so, Bertrand and Alys Russell sailed to the United States in the fall of 1896. They stayed on campus for an extended period, and Bertrand gave his promised lectures to "30 people." He later crafted these into a book, *An Essay on the Foundations of Geometry*, that was published by Cambridge University Press in 1897 ... and is still in print.

The *Lantern*, Bryn Mawr's student newspaper, covered the story. "Mr. Russell in his first lecture," they reported, "stated that his object was to determine which of the axioms of Geometry were to be regarded as *a priori*, and therefore involved in any conception of space, and which were empirical, or dependent on the experience of some special form of space." The *Lantern* also observed that "Not the least pleasant circumstance ... was the privilege of meeting Mr. Russell at the close of the hour, when questions were asked and answered in regard to any obscure or knotty point."

All of this was fine. But Russell, the great contrarian, was ever ready to rock the boat. Besides his mathematical lectures, he spoke to the Graduate Club of Bryn Mawr on the topic of socialism. Meanwhile Alys, in her own address, raised the possibility of women's forgoing motherhood for a career. These were controversial topics during what was—*literally*—the Victorian Era.

After the Russells left for Baltimore, President Thomas got an earful from parents who were alarmed that their daughters had been radicalized by visitors from England. "I slept well last night," Carey wrote in the midst of the uproar, "and this in spite of receiving ... disgusting and disturbing letters from the mothers of two girls about Alys and Bertie." She even addressed the matter before the student body in Taylor Hall, stressing that the Russells' comments were "entirely without my knowledge and approval."

This reaction is odd because Carey Thomas was an unmarried woman who poured her energies into an academic career. "Half of what they say—indeed I fancy all of it—is exactly what we believe," Carey confided, "but it is all the worse to have it said." As president of a college, she sought to minimize unwelcome publicity.

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[3]Image: Used with kind permission of The Bertrand Russell Archives, McMaster University

M. Carey Thomas[4]

Then, having tamped down parental criticism, Carey got blasted by David Scull, a College trustee so conservative that he was known to remove books from the library because their contents were unfit for young women's eyes. An irate Scull wrote to Carey about a passage he'd seen in a Philadelphia newspaper: "Only the other day, a woman came here from England and lectured before a lot of college girls saying that women should not be hampered by motherhood. Such teaching is harmful to the greatest degree." The paper did not explicitly mention Bryn Mawr, but Scull thought that people would figure it out and predicted an enrollment debacle in the coming year. Although his prediction never materialized, he made Carey Thomas's life even more miserable.

As a result of this situation—when an innocent invitation to address the Math Department somehow morphed into a firestorm of controversy—Carey Thomas never again invited Bertrand Russell to campus. Decades later, she recalled "the great agitation" that his 1896 visit had caused.

Nonetheless, Russell did return on two occasions. One was in 1914 at the private invitation of Professor Lucy Donnelly, a revered professor of English and dear friend. The second, and more extensive, visit came in $1943 - 44$, after Russell's views on sex, marriage, and religion had cost him his appointment at City College of New York (CCNY). There, the judge who vacated the appointment famously concluded that Russell should not occupy a "chair of indecency" at CCNY. Russell temporarily found a position at the Barnes Foundation near Philadelphia, but this ended abruptly when he was fired by the eccentric Dr. Barnes. Although larger universities ignored his plight, Russell was given refuge at Bryn Mawr through the assistance of Paul Weiss of the Philosophy Department. With gratitude, Russell observed that the College had demonstrated "no small degree of courage" in providing a home to so controversial a scholar.

This suggests, correctly, that Bertrand Russell was a fan of Bryn Mawr. He described the students he met during his 1896 visit as superior to the women he had known at Cambridge. After that visit, Russell had given his geometrical lectures at Johns Hopkins but chose not to repeat them on other U.S. campuses because, as Alys put it, "Bertie ... feels that Johns Hopkins and Bryn Mawr are the best." (Take *THAT*, Harvard!) Through his friendship with Lucy Donnelly, he met her roommate, Edith Finch of the BMC Class of 1922, who became his (fourth) wife in 1952. And, at a period when his life was especially turbulent, he wrote wistfully to Lucy that "I can still see in my mind's eye the beauty of Bryn Mawr in autumn."

Apple of Bertie's Eye[5]

So, even if Scott, Pell Wheeler, and Noether deserve top billing in the history of the BMC Math Department, Bertrand Russell is surely a distinguished member of our supporting cast.

Sources:

Karen Parshall, "Training Women in Mathematical Research: The First Fifty Years of Bryn Mawr College $(1885 - 1935)$," *The Mathematical Intelligencer*, 37 (2015), pp. $71 - 83$.

William Dunham, "Bertrand Russell at Bryn Mawr," *The Mathematical Intelligencer*, 38 (2016), pp. $30 - 40$.

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[4]Image: Used with kind permission of Bryn Mawr College Special Collections
[5]Image: Amy N. Myers

No Longer an Enigma: New Elective Sparks Interest

Veronica Benson-Moore '17 and Westley Mildenhall '17

"I think people who take the class are puzzle-solvers" says Penny Dunham, Visiting Professor and Research Associate, who taught the new elective Math 295: Codes and Ciphers at Bryn Mawr this past spring.

The course combined mathematical theorems and historical context in an overview of cryptology from the first century B.C.E. to the present.

"Secret-writing and keeping information private have been an important part of history," Dunham continues. Over the course of the semester, her course emphasized this theme. As an early example, students learned how the breaking of an enciphered message used by Mary, Queen of Scots, ultimately led to her execution.

Cipher Victim: Mary Stewart[6]

Ciphers considered by Math 295 include Vigènere, a polyalphabetic cipher in which a repeating pattern of different shifts are used to change the letters of the plaintext message, and Hill, in which the plaintext is converted into a matrix of numbers and then multiplied by a key matrix.

A highlight of the course involved learning the mathematics behind Enigma, the famous German cipher machine broken by Alan Turing and the team at Bletchley Park (subject of the 2014 dramatization *The Imitation Game*).

Enigma: Giving Off Sparks?[7]

Penny Dunham came to Bryn Mawr from Muhlenberg College where she taught from 1992 until her retirement in 2014. While at Muhlenberg, she took a course on cooperative learning and group work. This course illustrated these techniques with exercises involving the encoding and decoding of messages. The experience sparked Dunham's interest in the subject of cryptography.

Penny Dunham at Bryn Mawr[8]

When given the opportunity to design her own course, Penny chose to do cryptography. As a result, she taught Codes and Ciphers every other year until she retired. When Bryn Mawr needed visiting professors to teach in the Spring 2017 semester, she jumped at the chance to introduce cryptography to our students.

Dunham enjoys teaching Codes and Ciphers because it uses number theory, a field of mathematics that originally had no applications and was simply an exploration of the properties of whole numbers. With the advent of cryptography and its usage in technology, however, it has become integral to our daily lives.

Dunham says that teaching at Bryn Mawr has been a good experience, and she has been "impressed with the varied interests of the students here." When asked what her favorite part of teaching is, she responded, "It's exciting to see that spark in somebody's eyes when they finally get it."

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[6]Image: www.wikipedia.org
[7]Image: www.wikipedia.org
[8]Image: www.brynmawr.edu

Close Knit

Ruby Mills '17

If you recently walked by the entrance to Collier Science Library on a Friday evening, you may have been confused by the combination of heartfelt groaning and boisterous laughter that spilled out from the room across the hall. Every week, the students of Math 502 (Graduate Real Analysis II) met with Professor Djordje Milićević for an "optional" problem session. By the end of the semester, this meeting became jokingly referred to as "the first problem session" by those students who congregated again on Saturday afternoons and Monday mornings to continue the discussion. Taking part in both the groaning and the laughter, I was one of those students.

The Bryn Mawr Math Department allows undergraduate students to enroll in graduate-level courses. There are several reasons why students choose to take advantage of this opportunity. Some participate in the AB/MA program, and need such courses for their master's degree. Others want to prepare for graduate school elsewhere, and to show potential programs that they have what it takes to master advanced material. And then there are people like me: I chose to challenge myself with an advanced course out of a peculiar sense of fun.

Graduate Real Analysis II fulfilled my expectations of a challenge. Working alongside graduate students inspired me to push myself to gain a deeper understanding of the material. A benefit I didn't expect was the rapport that developed among members of the class, including the professor. I asked one of the graduate students, Isaac Craig, about his experience in the course.

"I love how close knit the department is," Isaac responded. "You quickly realize that your study friends are your real friends." The students in Math 502 became study friends out of necessity, but real friendship emerged from the ways we encouraged each other. "As students, we all seem to belong to some network of support. You always know someone's struggling with you. It's a family."

The bonds we built were forged in broken chalk, cryptic textbook passages, torn out hair, and occasional moments of mathematical clarity. What strikes me as I prepare to leave Bryn Mawr, is how this class was just a magnified example of what the math department and Bryn Mawr are more generally: a little pain, a lot of work, and a strong community.

Senior Plans

Class of 2017 has big plans. Here is what a selection of math majors shared with us.

- Yiling Bai will be teaching calculus in China.

- Claire Billington will spend a month visiting family and friends in Wyoming and California before coming back to Philadelphia to start working at Tech Impact.

- Tianyi He will be moving to Texas and working for American Airlines.

- Rose Kaplan-Kelly will be a Ph.D. student in the Department of Mathematics at Temple University.

- Tina Kloufetos will spend the summer moving into her new house in Texas with her boyfriend and traveling up the West Coast on her dream road trip. Then she will be working at Allen Academy, a private school in College Station, Texas, teaching 6th, 7th and 8th grade math. She will be working with the school headmaster to roll out a personalized learning plan for 6th grade math, and is excited to act as a leader for integrating technological resources into math education for middle school students.

- Luwei Jiang will visit several parts of the United States with her mom and friends, and return to China to enjoy the rest of the summer (AND FOODS!). Later she will go to Baltimore to start a master's degree program in engineering management at Johns Hopkins University.

- Cynthia Li will spend the summer doing an internship at Greysteel Company, and then pursue a master's degree in systems engineering at University of Pennsylvania in the fall.

- Jingling Li will spend the summer working at Facebook as a Software Engineer, and then enroll in the Ph.D. program in computer science at the University of Maryland, College Park.

Math Appreciation Week

The celebration formally known as "Math Awareness Week" has been renamed. "Awareness" weeks are for undesirable things: October, for example, is Breast Cancer Awareness Month, and Eating Disorder Awareness Week happens in February.

This year the math department celebrated Math Appreciation Week with a number of fun events including the two pictured below: The Pringle Ringle Wrangle, and The Great Samannah's Mathe-"magical" Afternoon of Wonders.

Aja Ould '17 Wrangles a Ringle

Success!

Math Photographer Jill Li '18 (left) and Great Samannah I, Hannah Schwartz

Great Samannah II, Samantha Pezzimenti

Euclid, Euler, and Emmy: A Fall 2016 Conversation with Bill Dunham

Tina Kloufetos '17 and Sam Kacir '17

Tell us a little bit about yourself. How did you get connected to Bryn Mawr?

My permanent job was at Muhlenberg College in Allentown, PA. I taught my last class there three years ago. My wife, Penny, and I moved to Bryn Mawr when we retired. I should note that Penny was also a mathematics professor at Muhlenberg. The Bryn Mawr Math Department made us "research associates," so we have had an affiliation with the College for a while.

Since retiring, I have had opportunities to teach courses on the history of mathematics at some great schools: Harvard, Princeton, Cornell and Penn. Next on the docket is Bryn Mawr. In the spring semester of 2017, I'll be teaching a history of math class here. Penny will be teaching here as well, offering a course called "Codes and Ciphers." We are looking forward to meeting the students and becoming a more significant part of the Bryn Mawr family.
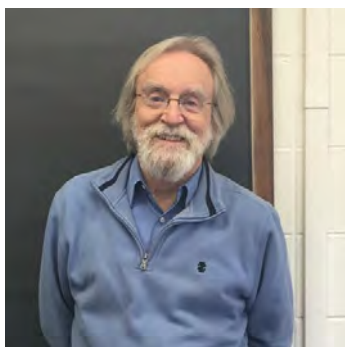
Making History: Bill Dunham[9]

Tell me more about the course you'll be teaching next semester.

It is a mathematics class, but my math is the "old stuff." For instance, we will examine Euclid's Elements to see how he started with a few definitions and postulates, built a tower of ever more sophisticated propositions, and finished Book I with brilliant proofs of the Pythagorean theorem and its converse. It's quite an amazing logical development. And remember, this was done in 300 B.C.E. Besides Euclid, we'll look at results from Archimedes, Newton, Euler, Cantor, and others. The course will thus sample some of the great landmarks of mathematics.

How did you get interested in math history?

When I was your age as an undergrad at the University of Pittsburgh, I was torn between mathematics and history. I chose the former as my major and then went on to Ohio State and got a Ph.D. in mathematics. But I never abandoned my love of history. In particular, I wanted to know how mathematics got started, where it came from, and what it looked like two hundred—or two thousand—years ago.

What was the first article you wrote?

It was called "The Bernoullis and the Harmonic Series." In 1689, the brothers Jacob and Johann Bernoulli each devised a proof that the harmonic series diverges. Their arguments are not what people see in modern textbooks. I went back to look at their wonderful old results (written in Latin!) and then wrote an account of how they did it. Both of these proofs, by the way, will be in my course when we get to the Bernoullis.

What is the process like when you are writing a math history book?

Well, first you must have an idea. After the idea has brewed in your mind, you pitch it to the publisher. If the publisher likes it, you are given a contract, and then away you go. For the four books I've done, the writing took the better part of a year, from first word to finished manuscript. At that point, there is a sense of being done. The surprise is that, with the manuscript submitted, you are really only half done. There is so much more to do: get editorial feedback, make revisions, prepare an index, get permissions for photographs, choose a title, consider cover designs, check and recheck the galleys, etc. I'd describe this ordeal as the closest I've ever come to having a baby—except instead of being "with child" I was "with book." A very large part of one's life is consumed by the process. It's a very rewarding experience, though.
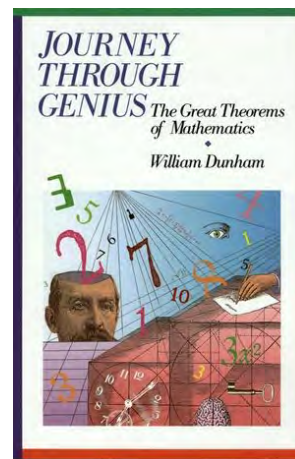
Required Reading[10]

The first book I wrote was *Journey Through Genius: The Great Theorems of Mathematics* (Wiley, 1990). My course at Bryn Mawr will be largely based on that. It covers landmarks from thousands of years of math history, going from Hippocrates of Chios in 440 B.C.E. all the way to Georg

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[9]Image: www.brynmawr.edu
[10]Image: www.wiley.com

Cantor at the end of the 19th century.

Who is the most interesting mathematician you've studied?

I would definitely say Leonhard Euler. He's my favorite. For one thing, Euler was off the charts in terms of the *quantity* of work; he was history's most prolific mathematician. But he was also off the charts in terms of the *quality* of his work. He made significant contributions to number theory, analysis, discrete math, geometry, applied math, and the list goes on. Euler was the dominant mathematician in the 18th century. Whereas nowadays mathematicians are specialists, it's been said that Euler's specialty seemed to be omniscience.

One other thing: for much of his life he was half-blind, and for some of his life he was totally blind. Yet this never slowed him down. As a result, Euler is, for me, the most inspirational figure in the history of mathematics.

If you could interview anyone, dead or alive, who would it be?

Euler! He was brilliant and by all reports a nice person. Some of the characters from math history would have been tougher dinner companions, though. For example, Newton, was not the sweetest guy in the room. He was mean-spirited, jealous of Euler's reputation, slow to praise, and easily offended. Of course, Newton might well have been the smartest person who ever lived, but talent can come in strange packages.

Euler: Quantity and Quality[11]

Any other interesting facts about the personalities of some of the mathematicians you've studied?

Well, Archimedes was famously absent-minded. There's the "Eureka" story, where he jumped out of his bath in the thrill of discovery and ran through the streets shouting joyously ... but forgot to put on his clothes. Likewise, Archimedes was famous for forgetting to eat or bathe or do other routine tasks. I'm sure you're shocked that a mathematician could be absent-minded.

Have you heard the story of his death? Archimedes was in his hometown, Syracuse in Sicily, at work on a theorem as the invading Romans broke through the fortifications and rampaged across the city. A Roman soldier came upon Archimedes and tried to take him prisoner, but Archimedes refused to go until he had completed the proof he was working on. The soldier, furious, killed him on the spot. Ever since, it has been regarded as the ultimate mathematical death!

What are some interesting things you can tell me about Bryn Mawr mathematicians?

Charlotte Angas Scott was the first math professor at Bryn Mawr when the College opened in 1885. Scott was the first woman to get a Ph.D. in mathematics in Great Britain. She was recruited to come to the New World and spent her career here, and she certainly set the bar high. Anna Pell Wheeler, who was hired by Scott, was another distinguished mathematician at Bryn Mawr. Wheeler was a charter member of the American Mathematical Society (AMS), which was largely a male bastion at the time. She was the first woman to give an invited address to the AMS.

I should mention another: Emmy Noether, one of the great mathematicians of the 20th century. She mainly spent her career in Germany, where she came to be called the "Mother of Modern Algebra." But, because she was Jewish, she had to flee when Hitler came to power, and she ended up at Bryn Mawr. Unfortunately, Noether was here less than two years before her unexpected death. Her ashes are buried in the Cloisters of Thomas Hall. The Mother of Modern Algebra thus lies forever on this campus.

So there is plenty of math history at Bryn Mawr, and I'd like to think that that history is still being made.

Your Correspondent Tina K.[12]

EY and REU: Summer Opportunities for Math Majors

Rose Kaplan-Kelly '17

In November 2016, the BMC Math Department hosted a panel discussion to inform students about internship opportunities and research experiences for undergraduates (REUs). Yichen Wang '17, Lia Yoo '18, Xinning Yu '16, Westley Mildenhall '17, and I spoke about our participation in research and internships during Summer 2016, and gave advice to fellow students looking for similar options. Yichen was a research assistant in biostatistics at The Wharton School at University of Pennsylvania, Westley had participated in the Mathematics TEU (Teaching Experiences for Undergraduates) Program at Brown University, and Lia was a project management summer intern at Vision Driven Consulting in Philadelphia. After the panel, Xinning kindly agreed to talk more about her experience at Ernst & Young, which, along with my time at an REU, highlight the diverse opportunities Bryn Mawr math majors have for summer work.

Finding an Internship or Research Position

Ernst & Young is a "global leader in assurance, tax, transactions, and advisory services." [13] Xinning had known about this company for a long time, and regularly checked its website for internship opportunities. In February 2016, she applied online and received an invitation to fill out their online assessment a week later. After completing the online portion of the application, she had an on-site interview in April, and was soon offered the position.

I learned about the SMALL REU from the National Science Foundation website.[14] (The acronym comes from the names of the Williams College professors who founded it: Silva, Morgan, Adams, Lenhart, and Levine.) I was looking for a research program involving knot theory, and knew that Colin Adams (the "A" in SMALL), was leading a research group in that area, so I eagerly applied.

Exciting Opportunities and Learning Experiences

Xinning enjoyed the opportunity to work as a consultant. "It is all about learning something new: getting to know unfamiliar industries, working with different people, challenging old ideas and forming fresh ones," she explains. For her summer project, she worked with people from several departments, and "dealt with multiple problems." She said that she "did not realize how difficult it was to build up a financial management system" until she talked to various departments and found that they all had very different needs. Despite the difficulties, she enjoyed getting to think about problems from a "different perspective and integrate all the factors together to achieve a solution."

An experience that stood out for me was getting to present at math conferences. My research group presented at the UnKnot III Conference and at MathFest 2016. At UnKnot we each had a chance to speak individually, and presented consecutively on topics that built on each other. My presentation was titled "Cusp Crossing Density: Flowers, and Packing in Hyperbolic Space," and I spoke about a hyperbolic knot invariant, called "cusp crossing density," that we had defined and studied as part of our summer research. At MathFest I presented with a partner on an introduction to hyperbolic space as part of a series of talks where the other members of my group followed with some of our results. It was a great opportunity, and a lot of fun.

Rose Kaplan-Kelly '17 with Thesis Advisor Lisa Traynor and Knot Diagrams

Challenges

Sometimes Xinning's work was "time-consuming and detail-oriented." Other times she would be given a very broad or vague topic to work on. She learned to manage the latter challenge by dividing the topic into smaller pieces in order to present "each part in an organized and understandable way to the clients."

There were also times when I felt frustrated by my research project. I was working on problems that no one had answered yet, so I could not look up the solution if I ran into a snag. For example, at one point I was working on what I thought was a family of knots that would end up giving high values for an invariant I was measuring, but it turned out that the values were all lower than those I already had, so I had to start over. At the same time, this experience was also one of the most exciting aspects of my

[13]Ernst & Young. (n.d.) LinkedIn [Profile page]. Retrieved December 7, 2016, from linkedin.com/company/ernstandyoung.
[14]See www.nsf.gov/crssprgm/reu/reu_search.jsp.

program because, despite temporary setbacks, it was exhilarating to create new mathematics.

Using Skills from Our Time at Bryn Mawr

Whether it was proof writing or presentations, collaboration or critical reading, I regularly used what I had learned as a Bryn Mawr math major in my summer research. While she too used the quantitative skills she learned at Bryn Mawr, Xinning added that she also relied on techniques and knowledge learned outside the math department.

From working as a financial consultant to participating in knot theory research, the math major at Bryn Mawr provides its students with useful tools for research and business applications. Bryn Mawr math majors can choose from numerous exciting and challenging summer opportunities.

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Women in Data Science

Prianka Ball '17, Yilun Tang '17, Kewei Qu '17, and Yunxuan Cai '17

On February 3, 2017, 400 data scientists gathered at Stanford University in Palo Alto, California, for the 2nd annual Global Women in Data Science (WiDS) Conference. Meanwhile, participants in more than 75 locations worldwide joined the conference through live stream. Bryn Mawr College and SAP Next-Gen co-hosted the Philadelphia gathering, at which local speakers augmented the live stream experience. Local speakers included Assistant Professor of Mathematics Erica Graham from Bryn Mawr.

According to the conference website, "WiDS inspires and educates data scientists worldwide, regardless of gender, and supports women in the field."[15] An impressive slate of speakers offered encouragement and advice to those in attendance.

Diane Greene, Senior Vice President at Google Cloud, shared her experience of doing what excited her, and not worrying about where it would lead. After getting her master's degree in computer science at the University of California, Berkeley, she worked as a software engineer, and started VMware with her husband and graduate students. Greene talked about how she got into racing and sailing, from which she learned to constantly optimize decisions. She also discussed how data science uses optimization: machine learning for financial services is optimization for money, while analytics in health is optimization for a better world. She used the example of Airbus, which utilizes satellites data, to argue that machine learning has become better than people ever predicted. At the end of her talk, she encouraged people to try new things because they are more likely to succeed if they are less preoccupied with stuff going wrong.

Executive Director of the Human Rights Data Analysis Group, Megan Price, also spoke at the conference. She showed how data science is increasingly important for humanitarian organizations, especially those working in conflict-driven areas. As an example, she described her work documenting deaths in Syria. The Office of the United Nations High Commissioner of Human Rights sponsored this project because it was hard to analyze the datasets available to get the results they wanted.

In addition to engaging streamed talks, the Philadelphia satellite conference also featured a live career panel. Nicole McCabe, Global Head of Gender Equality for SAP, talked about her role at the company and what attracted her to data science. Sue Metzger, Instructor of Accountancy and Information Systems at Villanova University, encouraged students to be willing to take risks in their professional life. Patricia Tillotson, a Data Scientist at SAP, talked about some interesting projects she has done. And Chelsea Crawford, a Pre-Sale Solution Engineer at SAP, talked about her experience serving as a bridge between clients and scientists.

The day before the conference, SAP Senior Data Scientist Patti Tillotson visited Bryn Mawr. She spoke about what data science is, how to prepare for a career in the field, and the exciting life of a data science professional. She discussed how data science is used to optimize pizza delivery, monitor heart health, and conduct server load prediction. She offered valuable suggestions to students considering the field, such as building a solid foundation in statistics, programming languages, machine learning, and more. A lively question and answer session followed the presentation. One student asked Tillotson about the most interesting case she had ever worked on, and she recalled a project for which she advised farms on whether or not to plant certain crops.

Overall the data science immersion weekend was informative, and students learned a lot. The authors of this article hope that Bryn Mawr College will continue to participate and support events like this in the future.

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[15]www.widsconference.org

Third Annual Philadelphia Undergraduate Mathematics Conference

Xiaoyang Chen '18 and Vitowe Mkandawire '17

Many Bryn Mawr mathematics students attended the Philadelphia Undergraduate Mathematics Conference, co-organized by Bryn Mawr College, La Salle University, and Temple University, and held this year on March 25th at La Salle University. Highlights of the conference included a plenary lecture by Donald Outing, Vice President for Equity and Community at Lehigh University (former Academy Professor in the Department of Mathematical Sciences of the United States Military Academy at West Point), a minicourse on mathematics in the game of SET by Liz McMahon and Gary Gordon, two math professors at Lafayette College, undergraduate mathematical presentations, a poster session, and a professional development session moderated by BMC's Professor Djordje Milićević. Two BMC math majors presented talks (Kewei Qu '17 on rewrite systems and Julia Lin '17 on the "Taxman" game), and Prianka Ball '17 gave a poster presentation on wind farms.

Bryn Mawr students and math faculty at LaSalle University

Photos from 2017 Philadelphia Undergraduate Mathematics Conference

Prianka Ball '17 gives poster presentation on wind farms.

Abigail Lee '19, Ruoyun Lei '17, and Maria Minaya '18 at the minicourse on SET
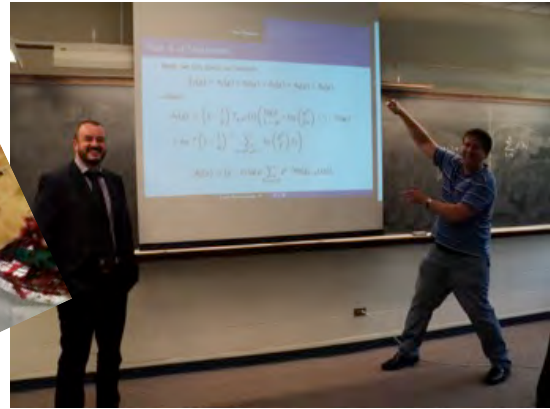
Photo Gallery

Pi(e) Day!

Penny Dunham's Homemade Contribution

Dr. Frank Romascavage with his Thesis Advisor Djordje Milićević

Ziva Myer, Ph.D., and her Thesis Advisor Lisa Traynor

Graduate Students (Mostly)

Holiday Party in the Teaching Theater

Time to Celebrate!

Awards and Honors

- In 1997, the last year of Mary Patterson McPherson's presidency at Bryn Mawr, the Trustees established the McPherson Fund for Excellence to celebrate the Bryn Mawr values that McPherson has personified, particularly her commitment to the entire College community. The **McPherson Awards** inspire and honor outstanding faculty and staff members, graduate students, and undergraduates. This year the graduate student and faculty recipients come from the Department of Mathematics! **Math Ph.D. student Samantha Pezzimenti** won the McPherson Award for Excellence at the 2017 Convocation on May 12, while **Professor Lisa Traynor** was presented the faculty McPherson Award for Excellence at the 2017 Commencement on May 13. Professor Traynor is the first math faculty member to obtain this award. Recipients are recognized for excellence and service to the community, either within or beyond the boundaries of this institution.

- **Rose Kaplan–Kelly '17** won the **2017 Mary Louise Cookson Prize in Mathematics** in recognition of her exceptional service that has contributed to the life of the department. This prize was established in 2007 in honor of Mary Louise Cookson's extraordinary contributions to mathematics at Bryn Mawr College.

Rose receiving the award from Provost Mary Osirim at the 2017 Convocation Ceremony [16]

- **A.B./M.A. student in mathematics, Boyang Su '18** was awarded the **Maria L. Eastman Brooke Hall Memorial Scholarship**, which was established in 1901 in memory of Maria L. Eastman, principal of Brooke Hall School for Girls, Media, Pennsylvania, by gifts from alumnae of the school. It is awarded annually to the member of the junior class with the highest general average, and is held during the senior year.

- **Math Ph.D. student Hannah Schwartz** was awarded the **Doris Sill Carland Teaching Fellowship** in recognition for excellence in teaching.

- **Emeritus Helen Herrmann Professor Rhonda Hughes** was honored at a special session of The Association for Women in Mathematics Research Symposium at UCLA on April 8 and 9 in 2017.

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[16]Image: Paola Nogueras

Awards and Honors

- **Ruoyun (Leila) Lei '17**, an A.B./M.A. student in mathematics, and **Westley Mildenhall '17**, a math major and Gender and Sexuality Studies minor, both received the **Charlotte Angas Scott Prize in Mathematics**. Below are Leila and Westley receiving their awards from Provost Osirim. [17]

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[17]Images: Paola Nogueras

More Awards and Honors

- **Kewei Qu '17**, a double major in computer science and mathematics, and **Yichen Wang '17**, a math major and Economics minor, received the **Anna Pell Wheeler Prize in Mathematics**.

Yichen receiving award from Provost Osirim at the 2017 Convocation Ceremony [18]

- **Kara Breeden '18**, a double major in computer science and mathematics, made the **2017 Centennial Conference Winter Academic Honor Roll** in recognition of her academic performance and her performance on the basketball court.

- **Math major Emily Shinault '18** was awarded the **Thomas Raeburn White Scholarship** established by Amos and Dorothy Peaslee in honor of Thomas Raeburn White, Trustee of the College from $1907 - 1959$. This scholarship provides funding for summer language instruction, usually abroad.

- **Professor Victor Donnay** received a \$120,000 **National Science Foundation grant** that will be used to support the School District of Philadelphia's new Green Futures sustainability plan. The project will create a model for master teacher development in education for sustainability that prepares teachers to teach STEM content using themes from sustainability. The teachers will learn to incorporate hands-on pedagogies that put learning into action by providing opportunities for students to address authentic sustainability challenges in their own schools and communities.

- **Assistant Professor Erica Graham** received a **grant from The Alliance to Advance Liberal Arts Colleges**. This grant will support a two-day workshop titled "Strategic Optimization: Focusing Undergraduate Research to Maximize Scholarship in Applied Mathematics". The workshop will help faculty create a portfolio of accessible and structured undergraduate research projects. These projects will advance current faculty research and develop a repository of modules that faculty may use to provide their undergraduate researchers with important background knowledge.

- **Assistant Professor Djordje Milićević** recently received a **National Science Foundation grant** to support his research on "Arithmetic Manifolds, Automorphic Forms, Exponential Sums, and L-Functions" for $2015 - 2018$.

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[18]Image: Paola Nogueras

More Awards and Honors

- Math major and economics minor **Tianyi He '17** and math major **Julia Lin '17** were the senior recipients of the **Gail Ann Schweiter Prize** awarded to science or mathematics majors who have demonstrated excellence in both their major field and in musical performance.

Julia Lin in her final Bi-College Chamber Singers Concert at Commencement 2017 [19]

- Math major and education minor **Manroocha Singh '18** also won the **Gail Ann Schweiter Prize**, which is awarded to a junior or senior science or mathematics major who has shown excellence both in her major field and in music.

- **Haley Varnum '19**, a member of the College's Cross Country and Indoor Track and Field Teams, made the **2016 Centennial Conference Fall Academic Honor Roll** and **2017 Centennial Conference Winter Academic Honor Roll** in recognition for her performance in the classroom and on the field. Haley is a double major in mathematics and chemistry.

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[19]Images on this page: Paola Nogueras

The News in Brief

- The College community came together for a viewing of *Hidden Figures* at the Bryn Mawr Film Institute. Tickets were paid for by a grant from the Center for Science of Information awarded to computer science professor Deepak Kumar.

- Assistant Professor Djordje Milićević (Bryn Mawr) and Visiting Assistant Professor Heidi Goodson (Haverford) received a Tri-Co Faculty Forum Seed grant for the weekly Philadelphia Area Number Theory Seminar, which brought nationally recognized researchers to Bryn Mawr to present to an audience of area number theorists, graduate and undergraduate students.

- Professors Paul Melvin and Lisa Traynor are among the co-organizers of the monthly PATCH (Philadelphia Area Topology: Contact and Hyperbolic) Seminar. The seminar rotates between Temple, Penn, and the Bi-Co. In September, the seminar met at Bryn Mawr with Roger Casals (MIT) and Jason Deblois (Univ. of Pittsburgh) as speakers; in March the seminar met at Haverford with David Treumann (Boston College and IAS, Princeton) and Anastasiia Tsvietkova (Rutgers University) as speakers. The PATCH seminar has become well known across the country.

- Math Ph.D. student Ziva Myer successfully defended her Ph.D. dissertation entitled "A Product Structure on Generating Family Cohomology for Legendrian Submanifolds". She will be starting a post-doc at Duke University in the fall.

- Math Ph.D. student Frank Romascavage successfully defended his Ph.D. dissertation entitled "Explicit Formula for the Mean Square of Dirichlet L-Functions to Prime Power Moduli". Frank is currently working creating math problems for an online learning platform.

Assistant Professor Djordje Milićević and Dr. Frank Romascavage at Commencement 2017

- Professor Paul Melvin was a visiting scholar at the Institute of Advanced Study in Princeton during his sabbatical in the Fall 2016 semester.

- Professor Lisa Traynor and Orsola Capovilla-Searle '15 (now a math graduate student at Duke University) recently published a paper titled "Nonorientable Lagrangian cobordisms between Legendrian knots" in the *Pacific Journal of Mathematics*.

- Research Associate Walter Stromquist is a co-author of the paper "Catch-Up: A Rule that Makes Service Sports More Competitive". The article proposes an alternative rule for "service sports" (tennis, volleyball, handball, etc.). In most such sports, whoever wins a point serves to the next one. According to the "catch-up" rule, whoever loses a point serves to the next one. One surprising result in the paper is that (under very general assumptions) the change in rule does not affect the probability that the first server wins a match.[20]

- Math major Jill Li '18 created and maintains the Bryn Mawr College Mathematics Department Facebook page.[21]

- Math Ph.D. student Danielle Smiley attended harmonic analysis workshops at the Mathematical Sciences Research Institute in January 2017.

- Helen Moore, a nationally distinguished applied mathematician and Associate Director in Quantitative Clinical Pharmacology at Bristol-Myers Squibb, gave a keynote Math Appreciation Week talk titled "Mathematical Optimization of Combination Therapy", in which she presented real-world uses of control theory and systems of differential equations to optimize combinations of therapies and identify potential drug targets and toxicity.

- Bryn Mawr math major alumnae Aparajita (Opu) Bhattacharyya '12, Abigail (Abby) Kay '92 and M.A. '94, Michelle Lawson '92, Samantha Lopez '13, and Janita Patwardhan '14 returned to the Bryn Mawr Math Department for a career panel discussion during Math Appreciation Week. Opu is currently a M.B.A. candidate at The Wharton School at University of Pennsylvania, Abby is a physician and assistant professor at Thomas Jefferson University Hospital, Michelle is a sustainability and change management leader in Pennsylvania, Samantha is a mathematics and entrepreneurship teacher at Boys' Latin of Philadelphia Charter School, while Janita is a graduate student in applied math at University of Maryland, Baltimore County.

- The "Great Samannahs" (also known as math Ph.D. students Samantha Pezzimenti and Hannah Schwartz) presented a spectacular array of mathematical magic tricks at an event for Math Appreciation Week.

- Math Ph.D. students Danielle Smiley and Samantha Pezzimenti attended the EPaDel conference in Kutztown. Sam gave a talk entitled "Knot Polynomials and the Information they Encode".

- Math Ph.D. students Samantha Pezzimenti and Hannah Schwartz gave talks at the Graduate Student Geometry and Topology Conference at Michigan State University.

- Julia Lin '17 won the Senior Hoop Race at May Day. This is the second year in a row that a math major has won the Hoop Race.

- Kara Breeden '18, Co-President of the Student Athletic Advisory Committee, is organizing a speakers' series combining sports and academics in different departments (*e.g.*, history, mathematics, and sociology) for the $2017 - 2018$ academic year.

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[20]www.maastrichtuniversity.nl/news/new-rule-makes-sports-more-competitive-and-fun-watch
[21]www.facebook.com/bmcmathematics/

Credits

Editor-in-Chief: Amy N. Myers, Senior Lecturer and Program Coordinator for the Math Department

Acknowledgements: The editor-in-chief would like to thank Lisa Traynor and her Senior Conference students for contributing articles to this newsletter. She is especially grateful to Leslie Cheng for contributed content and careful proofreading.

The Editor-in-Chief on Fall Break