

ANALYTIC THREADS

Annual newsletter of the Department of Mathematics, Physics and Statistics

Fall
2019

Faculty News

Marlin Eby

On October 20, 2018, Dr. Marlin Eby and his wife Julie welcomed a son into their family when Andrew Johnson married their daughter Heidi.



Matthew Farrar

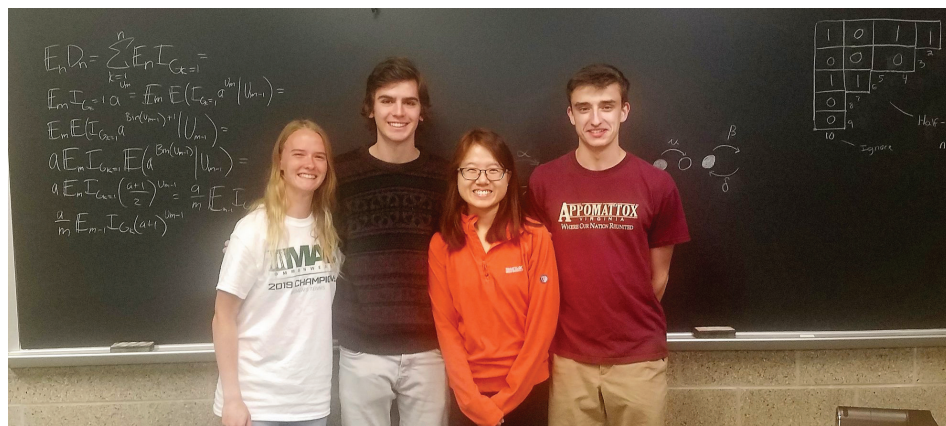
Drs. Matthew and Emily Farrar (Engineering) were blessed on March 20, 2019 with the arrival

of Felicity Jean Farrar. Felicity joined big sister Clara (4) and brother Finnian (2).

Messiah's 9th Annual Nobel Prize Seminar was held on December 4, 2018. The Nobel Prize in Physics 2018 was discussed by Dr. Farrar. That prize was awarded to A. Ashkin, G. Mourou and D. Strickland "for groundbreaking inventions in the field of laser physics; optical tweezers and their applications, and the method of generating high-intensity, ultra-short optical pulses."

Drs. Matthew and Emily Farrar presented *Empowering students in our digital age: Creating low-cost, highly engaging activities for STEM laboratory courses* at the 2019 Lancaster Learns Conference.

Congratulations to Dr. Farrar on his selection for the second cohort (2019-2020) of Sawyer Digital Proficiency Initiative Fellows at Messiah College. This cohort will explore ways in which technology can support and enhance their pedagogy, thus improving the digital proficiency of their students. These Fellows will participate in a summer intensive where they will gain foundational knowledge similar to that of students who register for the Digital Proficiency Certificate program. Fellows will build upon the intensive as they participate in a professional learning community (PLC)



Mathematics student research group, Left to right: Emily Wichert, Daniel Diethrich, Xin-Dee Low, Ryan Althoff

during the academic year. They also agree to share their experience and the results of their project with their peers.

Dr. Farrar, along with Kolkman, K. E. and Fetcho, J. R. published *Features of the structure, development, and activity of the zebrafish noradrenergic system explored in new CRISPR transgenic lines* in The Journal of Comparative Neurology (August 2018). <http://doi.org/10.1002/cne.24508>

Dr. Farrar mentored Kyler Shea ('19) in his research project on Fluorescence-Rayleigh Correlation Spectroscopy. Dr. Farrar also received a College Equipment Grant (\$6,000) from the Spectroscopy Society of Pittsburgh.



Angela Hare

Dr. Angela Hare (Dean of the School of SEH) taught MATH 494 – Senior Mathematics Seminar in Spring 2019.



Niklas Hellgren

In October 2018, Dr. Niklas Hellgren presented Growth of TiBx Thin Films by DC Magnetron

Sputtering and High-Power Impulse Magnetron Sputtering: Effect of Pressure

and Substrate Temperature at the American Vacuum Society's 65th International Symposium in Long Beach, CA.



Abaz Kryemadhi

Dr. Abaz Kryemadhi directed four students in undergraduate research: Nathan Chan ('20) –

Characterization of New Crystal Detectors for Gamma Ray Studies in Space, Brandon Weindorf ('21) and Aeowyn Kendall ('20) – *Development of Prototype Cerenkov Detector for High Energy Cosmic Rays*, and Trieu Luu ('19) – *Development of a Compact Cosmic Ray Muon Detector*.

Dr. Kryemadhi presented the work from his sabbatical project, *Search for Exotic Features in Cosmic Ray Showers*, at the Third International Workshop on LHC Results and Related Topics in October 2018 in Tirana, Albania. This workshop was sponsored by the French and Italian Embassies in Albania in addition to CERN (Conseil Européen pour la Recherche Nucléaire). He presented the same talk at the annual meeting of Mid-Atlantic Section of American Physical Society in November 2018 at the University of Maryland.

Faculty news, continued on page 2



Creation Station at Esperanza College, Top to bottom: Xin-Dee Low, Ryan Althoff, Daniel Diethrich



Faculty News

Continued from page 1

The 2018-2019 academic year marked the fourth year of Dr. Kryemadhi's 2016-2019 Templeton Foundation Grant. He is working with Dr. Robin Collins (Philosophy) to further the discoverability livability hypothesis drawing from particle physics.



Amanda Lohss

Dr. Mandy Lohss presented Regular Permutation Graphs in January 2019 at the Joint Mathematics

Meetings in Baltimore.

Dr. Lohss, with P. Hitczenko, published *Probabilistic Consequences of some Polynomial Recurrences in Random Structures and Algorithms* (October 2018). <https://doi.org/10.1002/rsa.20820>

Supported by an NSF (National Science Foundation) grant, Dr. Lohss worked with a team of four students – Ryan Althoff ('21), Daniel Diethrich ('19), Xin-Dee Low ('19), and Emily Wichert ('19) – to write a paper entitled *Expected Value of Statistics on Type-B Permutation Tableaux*. This paper has been submitted for publication.

In February 2019, Dr. Lohss and three students – Ryan Althoff ('21), Daniel Diethrich ('19), and Xin-dee Low ('19) – organized a table on the Menger Sponge for the community event *Creation Station* at Esperanza College in Philadelphia.



Creation Station at Esperanza College, Top Photo - Left to right: Xin-Dee Low, Daniel Diethrich, Ryan Althoff, Alexander Vetter (Villanova student), Bottom Photo - Top to bottom: Xin-Dee Low, Daniel Diethrich, Ryan Althoff



Douglas Phillippy

Dr. Doug Phillippy attended the 23rd Meeting of the Association of

Christians in the Mathematical Sciences at Indiana Wesleyan University from May 29 through June 1, 2019. He gave a talk entitled *Glimpses of God through a Mathematician's Eyes*. Messiah alumni in attendance were Ray Rosentrater ('73), Owen Byer ('89), and Nick Zoller ('03).

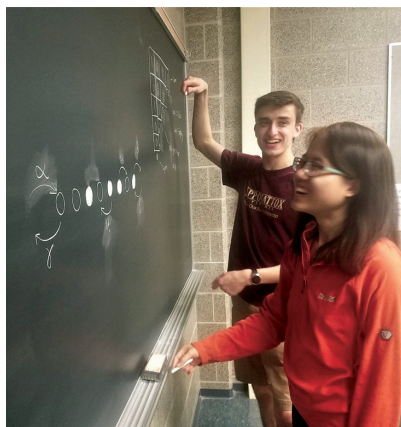
Dr. Phillippy and his wife Deb welcomed two daughters into their family this year. Son Michael married Briana Eshleman on November 11, 2018, and son Matthew married Joanna Cathone on June 30, 2019. Both brides are Messiah graduates.



Samuel Wilcock

In June 2019, Dr. Sam Wilcock was an eleventh-time participant in the Statistics AP

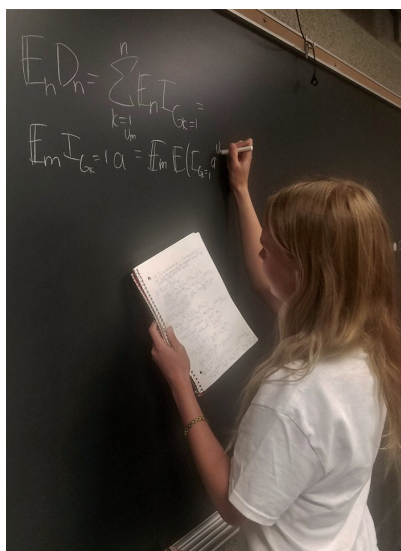
Reading held in Kansas City, MO. He joined these departmental alumni in that endeavor: Doug Tyson ('92), Leigh (Leisenring) Nataro ('92), Kevin Robinson ('93), Bryan Crissinger ('97), and Erica (English) Chauvet ('01).



Mathematics Research Group, Ryan Althoff and Xin-Dee Low



Mathematics Research Group, Xin-Dee Low and Daniel Diethrich



Mathematics Research Group, Emily Wichert

Student News

Honors

- Congratulations to the Department's top scorer on the *Mathematics Major Field Test*, **Alexander Sredenschek '19** (right)! Alex was also the Department's top scorer on the *Physics Major Field Test*.
- **Xin-Dee Low** graduated with department honors in Mathematics. Her thesis was entitled *Tweet the Bridge of Polarization? Two-Way ANOVA Test on the U.S. Political Partisanship*.
- **Kyler Shea** (right) graduated with department honors in Physics. His thesis was entitled *Neutron Detection with Boron Carbide Coated Plastic Scintillator*.
- **Alexander Sredenschek** graduated with department honors in Physics. His thesis was entitled *Co-sputtered TiBx Thin Films*.
- **Emily Wichert** graduated with department honors in Mathematics. Her thesis was entitled *Solutions to the Wave Equation*.
- **Brooke Firestone '20** (right) (women's soccer) was named First Team CoSIDA Academic All-District, an award that honors student-athletes for their abilities in the classroom and on the field. Brooke also went on to earn Third Team Academic All-American accolades.
- **Leanne Weaver '19** (right) ran the 6K race in the 2018 NCAA Division III Cross Country Championships hosted by the University of Wisconsin – Oshkosh in November. It was her first-ever appearance in the national championships.



Presentations

- **Xin-dee Low '19** presented *Social Media, 2018 Mid-Term Election, and Peacemaking* at the 2019 Messiah Humanities Symposium in February.
- In March 2019, **Ryan Althoff '21**, **Daniel Diethrich '19**, and **Emily Wichert '19** presented *Statistics on Type-B Permutation Tableaux* at the Spring Meeting of the MAA – EPaDel held at King's College.



Spring EPaDel meeting, Left to right: Ryan Althoff, Emily Wichert, Daniel Diethrich

Presentations at the 16th Annual Symposium of the School of Science, Engineering, and Health on May 3, 2019

Mathematics

- **Daniel Diethrich '19**: *The Shannon Switching Game*
- **Olivia Essig '20** (right): *Partial Differential Equations and Fourier Series*
- **Brooke Firestone '20**: *Properties of Adjacency and Incidence Matrices*
- **Xin-dee Low '19**: *Tweet the Bridge of Polarization? Two-Way ANOVA Test on the U.S. Political Partisanship*
- **Amanda Petersen '19** (right): *Sudoku Puzzles and Graph Coloring*
- **Alexander Sredenschek '19**: *Calculus of Variations*
- **Emily Wichert '19**: *Solutions to the Wave Equation*
- **Ryan Althoff '21**, **Daniel Diethrich '19**, and **Emily Wichert '19**: *Statistics on Type-B Permutation Tableaux*

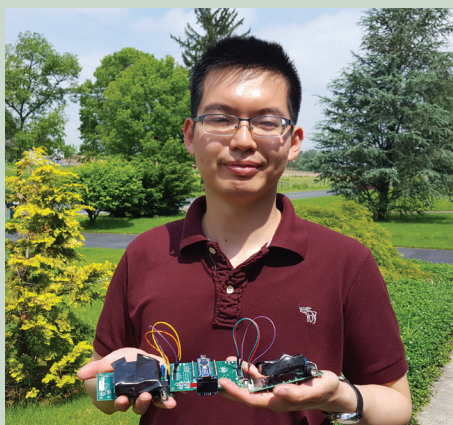


Student News

Continued from page 3

Physics

- **Nathan Chan '20**: Characterization of New Crystal Detectors for Gamma Ray Studies in Space
- **Trieu Luu '19** (below): Development of a Compact Cosmic Ray Muon Detector
- **Kyler Shea '19**: Fluorescence-Rayleigh Correlated Burst Analysis Spectroscopy for Quantification of Ultra-low Concentration Species
- **Alexander Sredenschek '19**: Growth of Titanium Boride Thin Films by Magnetron Co-sputtering
- **Brandon Weindorf '21** and **Aeowyn Kendall '20** (right): Development of Prototype Cherenkov Detector for High Energy Cosmic Rays



Trieu Luu with his prototype compact cosmic ray muon detector



Brandon Weindorf and Aeowyn Kendall with their prototype Cherenkov detector

Summer 2019 Activities: MPS Discipline-Related

- **Aeowyn Kendall '20** participated in a Physics/Aerospace Engineering (LAUNCH-UAS) REU (Research Experiences for Undergraduates) at Iowa State University.
- **Bailey Rhodes '20** (right) participated in a Physics (Material Science) REU at The University of Texas at Austin.



- **Kyler Shea '19** had a Physics internship in Penn State College of Medicine Department of Radiology (Division of Health Physics).
- **Morgan Zimmerman '21** (right) had a Biostatistics internship in Penn State College of Medicine Department of Public Health Sciences.



Class of 2019: Employment and Education Placements (To Date)

- **Laura Bigelow** (right) (Mathematics; Music and Philosophy minors): uFinancial in Mechanicsburg, PA – Administrative Assistant
- **Xin-Dee Low** (Mathematics and Peace & Conflict Studies; History minor): SUARAM in Malaysia – Assistant Program Coordinator
- **Amanda Petersen** (Mathematics; Secondary Teaching Certification): Wheaton High School in Silver Spring, MD – Mathematics Teacher
- **Kyler Shea** (Physics): Medical Physics (MS) at University of Florida
- **Alexander Sredenschek** (Mathematics and Physics): Physics (PhD) at The Pennsylvania State University
- **Emily Wichert** (Mathematics; Statistics and Computer Science minors): Deloitte in Mechanicsburg, PA – Solution Analyst



Department News

The Department of Mathematics, Physics, and Statistics houses six majors: Actuarial Science, Mathematics, Mathematics-with-Certification, Physics (B.A.), Physics (B.S.), and Physics-with-Certification. It also houses three minors: Mathematics, Physics, and Statistics. Full-time faculty members are Dr. Eby, Dr. M. Farrar, Dr. Hare (Dean

of the School of SEH), Dr. Hellgren, Dr. Huang, Dr. Kryemadhi, Prof. Lehman, Dr. Lohss, Dr. Phillippy, and Dr. Wilcock (Chair of the Department of MPS).

Address Reminder

Use the following address format to contact a faculty member by regular mail:

Name of faculty member
One College Avenue, Suite 3041
Mechanicsburg, PA 17055-6804

MPS Department Graduates

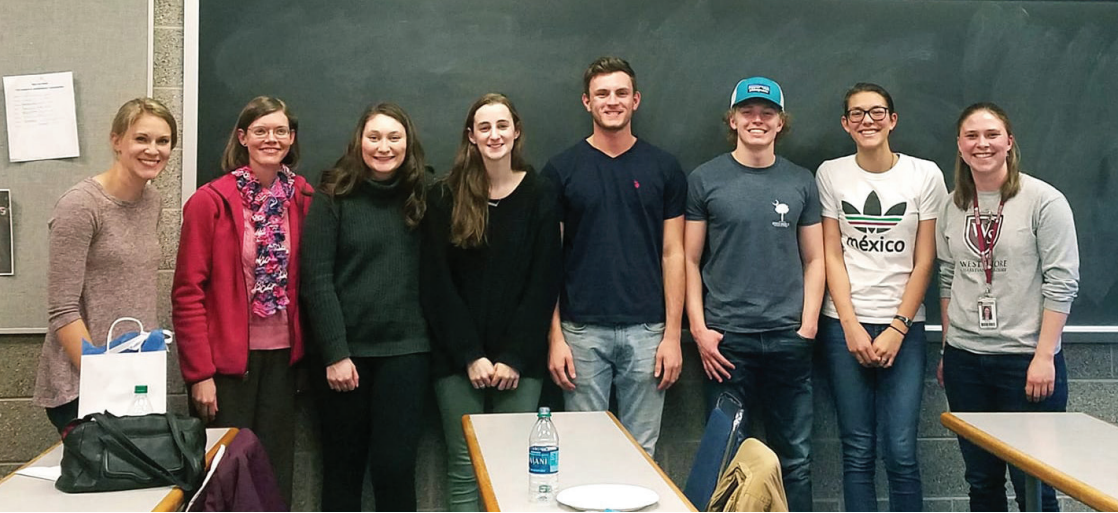
Six students graduated in December 2018 and May 2019 with majors in the MPS Department. Two of these had two majors: Mathematics with Physics and Mathematics with Peace and Conflict Studies. Here is the breakdown by major:

Mathematics: 5
Physics (BS): 1

Alumni Campus Presentations

Jennifer (Zeigler) Barnhart ('04) and Olivia Tamm ('18)

Jennifer Barnhart and Olivia Tamm spoke in the Math Problem-Solving Group *Careers in Mathematics Series* in March. This event focused on Mathematics Education.



Math Club: Mathematics Education career session, Left to right: Dr. Lohss, Jennifer (Zeigler) Barnhart, Kayla Flemmens, Kelly Mackin, Ian Parzyszek, Reece Horne, Emily Decker, Olivia Tamm

Program News

Actuarial Science

In Fall 2017, the Department of Mathematics, Physics, and Statistics launched the Actuarial Science (BS) major and enrolled its first majors.

We are building an Actuarial Science Resource List of Messiah College graduates who are working, or have recently worked, at any level in the actuarial science field. If you are one of these individuals and Dr. Eby has not already contacted you about having your name included on that list, please email him at eby@messiah.edu. Sometimes a student has a question that is best answered by a professional actuary. It is helpful for us and them if we can refer them to you and they can ask their question directly. We also hope that some of you, if your logistics allow, will be able to visit us sometime to meet with and speak to our students. Please do not feel any pressure from us to be involved more than you wish or are able to. Also, if you have not yet been in communication with Dr. Eby about internship possibilities with your organization, please contact him. We need to make internship placements beginning with the Spring 2020 semester.

Mathematics

With Dr. Lohss as advisor, the Math Problem-Solving Group was quite busy this year with these activities:

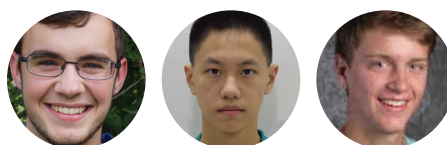
- **Solving the Rubik's Cube**
- **Mathematical Card Tricks**
- **Cryptology Scavenger Hunt:** Dr. Lohss organized a scavenger hunt for the students in which each station had an encrypted code along with a description and brief historical background of the cipher used.
- **Careers in Mathematics:** Two Messiah College alumni spoke in a panel session focusing on Mathematics Education.

Physics

The Physics Club presented the Funny Physics Phenomena Demo Show on May 3, 2019. Like previous shows, it was a rousing success. After the show, there were some hands-on demonstrations in the Frey Hall First Floor Lobby.

Three students were inducted into the Sigma Phi Sigma Physics Honors Society: **Chris Benner '20**, **Nathan Chan '20**, and **Keller Martin '20**.

Two courses were added to the Physics major: PHYS 317 – Optics and ENGR 212 – Programming for Engineers. PHYS 317 will be offered for the first time in Fall 2019 and will be taught by Dr. Farrar.



Left to right: Chris Benner, Nathan Chan, and Keller Martin

Collaboratory News

Staff and students from the MPS Department continue to be heavily involved in projects within the Collaboratory for Strategic Partnerships and Applied Research (messiah.edu/collaboratory).

Dr. Matthew Farrar continued as project mentor for the Diagnostics of Viral Disease Project which is targeted towards determining viral loads in developing countries with endemic HIV infections. This year, two students traveled to Zambia.

This past year, the SVOR (Straight Vegetable Oil Research) Collaboratory Project group completed its work and Dr. Phillippy transitioned from his role as an advisor for that group to an advisor for one of the Collaboratory's Discipleship Communities. SVOR prepared a work product for Messiah alumnus Matthew Walsh '00 who now serves as a missionary in Burkina Faso.

Opportunities

Future Events

Friday, May 1, 2020

School of Science, Engineering, and Health 17th Annual Symposium

The MPS Department's involvement in an event like this began as the School of Mathematics, Engineering, and Business (MEB) Scholarship Day. It then became the MEB Student Scholars' Expo. With the formation of the School of Science, Engineering, and Health, it became the School of Science, Engineering, and Health Annual Symposium. If you live within driving distance of the College, we encourage you to visit this symposium which is always held on the last Friday of the spring term and features student (mostly) and staff presentations. There is no registration fee and snack breaks are provided. For details including abstracts, check the SEH School website in Spring 2020 (messiah.edu/info/20729/about_the_school/1220/seh_symposium).

Request for Internship Opportunities

Does your employer hire interns in mathematics, physics, statistics, or actuarial science? Our Actuarial Science majors are required to complete an internship. Also, our majors often

pursue minors in Business, Economics, or Statistics and are seeking internships in their third and fourth years. Please inform the MPS Department of such opportunities by emailing Dr. Wilcock (swilcock@messiah.edu). Even if you live far from Messiah, we may have a student from a nearby hometown interested in a summer internship.

Support Opportunities

Your continuing support of Messiah College in all ways is greatly appreciated. With respect to financial support, some of you may wish to target donations to specific projects related to the Department. Of course, your gift is doubled when your employer has a matching gift program. Consider a gift to the College that is earmarked as described below. Send your tax-deductible gift – check made payable to Messiah College – to Office of Development, One College Avenue, Suite 3013, Mechanicsburg, PA 17055-6804.

- To make a donation to the Department of Mathematics, Physics, and Statistics, put *MPS Dept.* on the memo line of your check.
- To support the Collaboratory Diagnostics of Viral Disease project, put *Collab. – DVD project* on the memo line of your check.
- The SEH School has an enrichment fund that is used to fund student travel to out-of-state academic conferences to present their work. This fund rolls over year to year, so it is a great place for

one-time gifts. Donors should specify *SEH School – Enrichment Fund*.

- Online contributions to the Dr. Gerald D. Hess Research Fund for the Natural Sciences can be made at messiah.edu/HessFund. This fund allows for direct support of student and faculty research, including research supplies and conference travel, for students studying Physics.

If you are interested in contributing to a scholarship for students in the MPS Department, contact the Office of Development. It takes \$25,000 to underwrite (seed) a scholarship.

If you are interested in contributing to an endowed scholarship chair for faculty members in the MPS Department, contact the Office of Development. It takes \$2 million to underwrite an endowed scholarship chair.

Opportunities for Adjunct Teaching at Messiah College

Are you, or is someone you know, interested in teaching Mathematics or Physics at Messiah College? Interested persons with at least a master's degree in a related field are encouraged to send their resume and statement of interest to Dr. Wilcock at One College Avenue, Suite 3041, Mechanicsburg, PA 17055-6804. The MPS Department often needs part-time adjunct instructors to teach general education courses, and we welcome applications from alumni and their friends and family.

Homecoming Weekend

“Memories take us back,
dreams take us forward.”

Oct. 18–19, 2019



Mathematics

Reason logically to answer challenging questions.

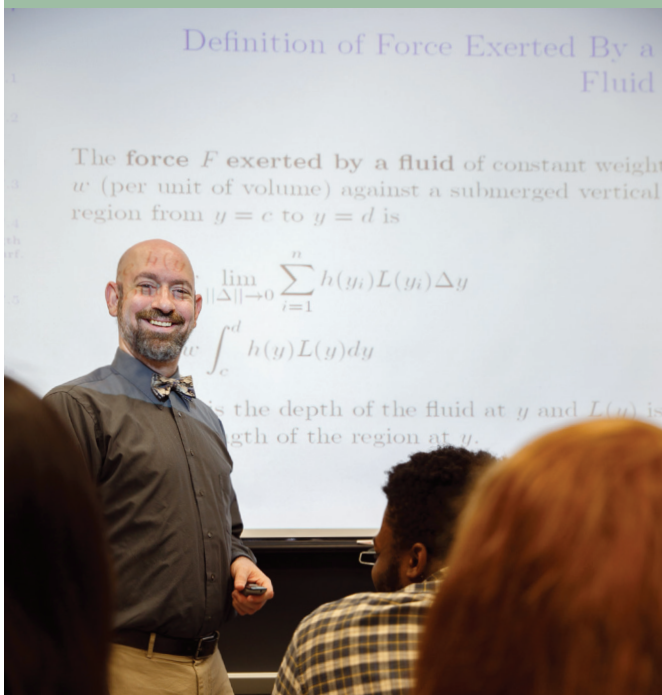
Go beyond the realm of mere facts and numbers as you develop creative problem-solving skills you can apply to complex problems in almost any field. With Messiah's Christian professors as your guides, experience the intricate balance of art and science and learn to maximize both your intuitive and analytical skills. You'll also grow to appreciate how your Christian faith and mathematics complement each other as you acquire the intellectual and spiritual vigor necessary to *interpret information and solve problems*.



Physics

Probe a universe of interactions.

Study the building blocks of the universe, from quarks to galaxies, and explore the basic laws and forces of nature. Then, with a solid theoretical foundation and hands-on research experience, you may just find yourself mapping out the dark matter in the universe or discovering the optimal atomic structure for next-generation solar cells. Study complex theories in class, then apply what you've learned through hands-on research or an internship where you'll *solve problems and serve communities*.





DEPARTMENT OF MATHEMATICS,
PHYSICS AND STATISTICS

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ANALYTIC THREADS

Analytic Threads is the annual newsletter of the Department of Mathematics, Physics and Statistics (MPS) at Messiah College. It is sent annually to alumni and is also available electronically at the website messiah.edu/MPS.

Parting Thoughts

We hope that all is well with you and your families.

We enjoy receiving updates and having you visit us at Messiah.

However, we will generally not publish your updates.

Since your circle of connections at Messiah College was bigger than the MPS department, we encourage you to send the updates that you want to be published to the Class Notes section of *The Bridge*, the College's magazine for alumni, parents and friends (messiah.edu/alumni/sendnews).

To update your email address, please contact our Administrative Assistant, Alisa Sentz, at asentz@messiah.edu.

Editor: Dr. Marlin Eby (Eby@messiah.edu)