

Congratulations to Drs. Buchanan & Shao Sabbatical Leaves used to author textbook on PDEs!

During the summer of 2009, **Drs. J. Robert Buchanan and Zhoude Shao** started outlining the topics to be included in a new textbook on the topic of partial differential equations (PDEs) suitable for undergraduate mathematics and science majors. They felt there was a need for a new textbook in this area since the existing textbooks either were too advanced, requiring advanced calculus or complex analysis, or too elementary, being merely a cookbook approach to finding solutions to initial boundary value problems using separation of variables and Fourier series. The goal was to develop a textbook on PDEs requiring only multivariable calculus and a course in ordinary differential equations (the equivalent of Millersville's MATH 311 and MATH 365) as prerequisites. The textbook would provide solution techniques to a variety of first and second order PDEs and in addition would provide justification for the results written at an appropriate undergraduate level. The textbook would also explore properties of initial boundary value problems and their solutions.

During 2017, they are completing this textbook project with the title of *A First Course in Partial Differential Equations*. It will be published by the

fall of 2017 by World Scientific Publishing Co. Between 2009 and 2016, most of the work on the textbook took place during summer breaks, but during the 2016-2017 academic year they were both fortunate to be granted sabbaticals which enabled them to concentrate their efforts on the final stages of preparing the manuscript for publication. During the sabbaticals, four chapters and two appendices have been written from scratch, interactive examples for many chapters have been written in the computational document format, example programs have been written in the Java language to illustrate the finite difference method of approximating solutions to PDEs, complete separate instructors' and students' solution manuals have been composed, and the textbook manuscript has been extensively proofread and edited to make it ready for publication.

Within the next three months the publisher will begin promoting the textbook on its website, through email advertising, in print advertising, and placing it on display at conferences and academic and professional meetings. They look forward to using the completed book in their classes in the future at Millersville.

Dr. Umble makes plans for Spring 2018

Dr. Ron Umble, our resident algebraic topologist, will be on sabbatical leave during the spring 2018 semester. He will spend the month of February at University of Seville's Institute of Mathematics, in Seville Spain, followed by two weeks at the Mathematical Institute of the Czech Academy of Sciences in Prague, Czech Republic, and two weeks at the A. Razmadze Mathematical Institute in Tbilisi, Republic of Georgia. He and his collaborators hope to apply techniques from algebraic topology to problems in computer vision and biomedical image processing. Their goal is to improve upon existing algorithms for visual recognition and analysis of complex biomedical structures in real time.

Get to know our faculty: Dr. Ximena Catepillan Mathematics = A Doorway to the World

Dr. Catepillan, MU Math faculty member for 26 years, shares her experiences regarding teaching ethnomathematics.

One of the more fascinating parts of my job has involved traveling to indigenous areas of the Americas to teach courses and do research on ethnomathematics, the study of math among different cultures.

I have taught the course Mathematics in Non-European Cultures in Mexico's Yucatán Peninsula several times since 2006. In addition, my more recent trips have included the following:

In March 2016, I traveled with 12 Millersville University students—as well as a Millersville social work professor and an archaeoastronomer from the Maya Exploration Center—to Mexico, to study the calendars and mathematics of the Maya. Our group also visited Mayan ruins and did community service at a school in the village of Yaxunah, where I had the opportunity to teach Maya arithmetic to a class of about 20 students who spoke Maya as well as Spanish.

In June 2016, I traveled with two Millersville students who gave a presentation about the number systems of the indigenous peoples of the Patagonia, during a conference at Universidad del Valle in Sololá, Guatemala. The university serves mostly K'iché students of the highlands of Guatemala; most attend classes wearing their indigenous attire. (See photograph of me with some of these students, above.)

I'm currently planning a July 2017 visit to communities of the Tukano and Dessana tribes in Brazilian Amazonia. I will be working with a group of professors from across the United States, led by a Maya Exploration Center archaeologist. In preparation, I am studying Portuguese, hoping to be able to communicate with indigenous people who speak that language in addition to their own native dialects.

Maya Exploration Center: <http://www.mayaexploration.com/>



Retirement: Patricia Brislin

Mrs. Patricia Brislin will retire June 2017 having served the department since 1989 first as an adjunct instructor and then as a longtime permanent part-time faculty member. Mrs. Brislin earned her teaching certificate at MU and has supported students in a wide variety of ways, including as a diligent, supportive and caring advisor of undecided students for twenty-four years. She also served the university as the APSCUF union Treasurer for thirteen years. Congratulations to Mrs. Brislin and many thanks to her for her dedication to our department, the university, and students! Best wishes for an enjoyable retirement.

Math Teacher Volunteers Needed!

Dr. Janet White is looking for potential interested MU Alumni who are current mathematics teachers (any grade level, any school, any location) to partner with during her proposed 2018-2019 sabbatical leave. If you are interested in learning more about Dr. White possibly visiting your classroom for a week of co-teaching, please contact her via email: jwhite@millersville.edu.

Like what you read about the Mathematics Department?

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Gifts may be designated to the Mathematics Department Scholarship funds and can be listed as restricted or unrestricted.

At the January 2017 Joint Mathematics Meetings in Atlanta, GA as well as at an MU/F&M Colloquium, **Drs. Noel Heitmann** and **Michael Wismer** shared some of their recent research on the history of the Mathematics Department at Millersville University.

The mathematics department of Millersville University has a rich and storied history. Millersville was formed after the success of The Lancaster County Normal Institute, a three-month program in the summer of 1855, founded by James P. Wickersham, the namesake for the building which is home to the Mathematics Department today. The summer institute was designed to provide teachers in the region with the



opportunity for professional development. The first professor of mathematics at that institute was John P. Stoddard. In the fall of 1855, Millersville formally opened as a year round school initially called the Lancaster County Normal School. Professor Stoddard became the Principal of the school and Edward Brooks took over the majority of the teaching of mathematics.

Professors Stoddard and Brooks were giants of mathematics education at this time when the idea and merits of public education were still being hotly debated in our country and both contributed greatly to the young school becoming well known and respected. Professor Stoddard was the author of ten mathematics textbooks, two of which were printed in over twenty editions and which remained in print for over a century after his death in 1873. Professor Edward Brooks was also a prolific author with twelve mathematics textbooks to his name. He was a beloved professor, widely recognized as a pioneer in mathematics education. His career at Millersville spanned thirty years, seventeen as a professor and chair of the mathematics department and eighteen as Principal of the school (with five years serving in both capacities). During this time he extended the reputation of the school nationally and as Principal he oversaw a huge expansion of the school's grounds, buildings, and enrollment.

In 1857, two years after the formation of the school, Pennsylvania passed the Normal School Law which put in place standards required of the state's education of teachers. Two years later, the school changed its name to The Millersville State Normal School, and was recognized as the first normal school in the state of Pennsylvania. In these early years, Millersville was very different than it is today. All of the students at this time were learning the skills necessary to teach in a classroom. On the school grounds was a "model school" filled with local children. The Millersville students of the time would learn the theory of teaching mathematics and then go on to hone their skills in the model school, gaining valuable experience under direct supervision. At the time, there were three courses of study. The "Normal Course" was for currently practicing or prospective teachers who would teach in the upper grades. This education was more subject specific. The "Model School Course" was for elementary school teachers. And finally there was the "Rural Course" which was designed for teachers in rural areas who would work in a one-room schoolhouse and thus need to be able to work with children of all ages simultaneously. The teaching of the time was very practical in nature. There was a great deal of emphasis on arithmetic and "mental math." Courses were also taught in plane and solid geometry, surveying, and mechanics.

In 1927 the school changed its name again to Millersville State Teachers College, reflecting the changing needs of its students and the expansion of the school's offerings more generally. With this change, Millersville began granting its first Bachelor of Science in Education degrees. In the mathematics department the course offerings began to open up as well. Statistics was first offered in 1935. In 1936 Millersville began

to offer two semesters of Calculus (a third semester in multivariable calculus was not offered until 1950). In 1937 we first offered a course on the History of Mathematics. As further indication of Millersville's ongoing commitment to meet the needs of its students (and the country) Spherical Trigonometry and Navigation were two courses introduced in the war years (1942-1943). Also, in 1950 Millersville began offering Engineering Mathematics for students who would move on to Penn State's engineering program.

As the times changed the mathematics department continued to hire excellent educators in mathematics that made significant contributions at various levels. Some noted mathematics faculty members are:

- D.S. Sensenig, 1870-75 - Author of Appleton's Series on Mathematics.
- George W. Hull, 1876-1921 - Author of numerous nationally popular math textbooks.
- P. Monroe Harbold (class of 1898), 1898-1901 - returned to Millersville as director of the Model School from 1905-11 and then became Principal of the school from 1912-18.
- Landis Tanger (class of 1898), 1904-05 - President 1929-43, presided over heroic efforts to save the school during the Great Depression and early years of WWII.
- William S. Schlauch, 1910-23 - Served as Vice President and then President of the National Council of Teachers of Mathematics.
- Lee E. Boyer, 1934-57 – Wrote the nationally recognized masterpiece "Introduction to Mathematics for Teachers."

In 1959, Millersville's name changed again to Millersville State College when the needs of the populace again changed. The dropping of the word "Teachers" from the name reflected the offering of degrees beyond education degrees. In 1976, the math department became the Department of Mathematics and Computer Science as the very young subject of computer science began to be taught. This marriage lasted until 1990 when Computer Science formed its own department. The final change of the school name came in 1983 when we became Millersville University of Pennsylvania.

The Mathematics department has continued to grow and expand, now offering options in Statistics, Actuarial Science, and Applied Mathematics and courses too many to name. Although our focus continues to be on the preparation of educators the department now sends its graduates into a wide variety of fields of work and onto graduate schools in mathematics and statistics as well.

Additionally, the faculty of the department continue to make waves in mathematics education, mathematics, and statistics regionally and nationally through research, collaborations, and presentations. Interestingly, the department has kept up with our early tradition of writing textbooks that are used nationally (and in some cases internationally). In particular, the following current and recent faculty members are authors of textbooks:

- Charles Denlinger (1964-2005)
 - Algebra Review, 1978 (with Elaine Jacobson)
 - Calculus for the Management, Life, and Social Sciences, 1992 (with Bernard Kolman)
 - Elements of Real Analysis, 2010
- Robert T. Smith (1987-2009)
 - Calculus: Early Transcendental Functions, 2004 (with Roland Minton)
- J. Robert Buchanan (1995-present)
 - An Undergraduate Introduction to Financial Mathematics, 2006
- Ronald Umble (1984-present) and Zhigang Han (2009-present)
 - Transformational Plane Geometry, 2014
- Ximena Catepillan (1991-present)
 - Mathematics in a Sample of Cultures, 2015 (with Waclaw Szymanski)

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MATHville Students

MEMU: Mathematics Educators at Millersville University, an NCTM affiliate

By: Christine Persun

This year in Mathematics Educators at Millersville University, also known as MEMU (NCTM Charter #432), the organization was busy planning events to not only benefit themselves as future teachers, but also the community. In the fall of 2016, the organization planned and put on the



third math fair at Wickersham Elementary School in the School District of Lancaster that contained approximately 25 games and hosted approximately 80 students from grades 1 through 5. The event was just as successful as previous years. The games were developed by MEMU students and incorporated algebraic, arithmetic, and geometric ideas to make learning math easy and fun for young learners. Because there was such a range in the ages of the students, members of MEMU needed to vary the questions in their games to accommodate all grades. To encourage students to involve themselves in the games and try as many as possible, stickers were handed out upon completion of a game that could then be exchanged at the end of the fair for prizes. This was also a useful method because young students quickly identified which games and concepts they preferred to others. For example, some students liked the geometric games better than the algebraic ones. This game-based learning method allows students to make connections with academic material and the concept of play, which encourages them to retain information in a fun and easy way. Other volunteer opportunities this year included proctoring and grading exams for a local Math Counts competition, Math Contest for high school students, and judging a local STEM fair.

This year was spent exploring professional development opportunities and conducting useful activities that would aid in the journey toward becoming teachers. During monthly meetings when time was not spent planning community events or fundraising events for the organization, current teachers came to meetings to discuss keeping students engaged in the classroom and the best forms of instruction for teachers to use. Visitors also came to discuss professional development and opportunities to incorporate mathematics into the classroom in ways beyond the textbook, including a night on solving the classic Rubik's Cube facilitated by Mrs. Nicole Reppert. Not only were these activities fun and engaging, but they helped to develop the knowledge of members to seek out ways to direct instruction through nontraditional means.

Next year for MEMU, the organization plans to continue volunteering with local schools to promote a fun view of mathematics by putting on another math fair at a local elementary school and helping out at local school functions. Members also plan to continue moving toward developing their personal professional development skills so they can become the best teachers they can possibly be.

Get to know our math majors: Roxanna Keller, BSE

Why did you choose to major in math education? I chose to go into mathematics because I really like the problem solving aspect of the subject. It challenges me to think outside of the box and really think for an answer. I chose to go into education rather than another mathematical career because I love working with young adults and fostering them into the people they are meant to be, both in and out of the classroom.

Tell us about a good experience you've had as a math education major. One of the best experiences I've had as a math education major has been through my current Professional Bloc in Inclusive Education (INED). Recently, I was teaching a lesson on graphing inequalities, and it was really motivating to me as a teacher to see the lightbulbs all going off for these students and seeing them participate when they had a tendency to act out and misbehave. I don't know what exactly it was, but it was a really great feeling to see them listening and actively participating in class and getting it!

How has your perspective on teaching math evolved during your time at Millersville? I used to think that mathematics was just algebra and geometry, and that calculus was the farthest you could go. Now I know that there is more (harder) math out there that goes beyond the scope of calculus. I now also know that there's a lot more theory to math out there than I realized and wished I had learned in high school. Also, teaching is not as easy as it seems. Anyone who says "those who can't, teach" clearly hasn't been in charge of a classroom recently.

MU Math Majors featured speakers at MU/F&M Colloquium Presenting on their REUs (Research Experiences for Undergraduates)

As a result of their summer research projects via NSF's Research Experience for Undergraduates, some senior math majors presented their work at MU, and even at the EPADEL regional meeting. Here is a sample of what they studied and where they spent their summers.

- Jessica Butts, *Estimating the Distribution of Amino Acids at the Origin of Life on Earth*, Mathematical Biosciences, Ohio State University
- Carly Files, *Ecological Impact of Invasive Species on Nutrient Dynamics*, Rutgers University in Camden, New Jersey
- Rebecca Grube, *Saving the Whooping Crane, One Equation at a Time*, Mathematical Biology, Sam Houston State University, TX
- Jack Warner, *Locating Mutations in the Human PCSK6 Gene using Whole Genome Sequencing*, Mathematical Biology, University of North Dakota.



By: Jessica Butts
Carly Files
Rebecca Grube
Jack Warner

"I am glad that I was able to participate in this REU because it gave me some experience with how to conduct research, and it gave me a very different perspective than working on assignments in a class. Working with real data is different than working with clean data sets that are provided in a textbook. The REU required hard work, but it was also fun, and it helped to prepare me for future research in graduate school." Jessica Butts, 2017

"From my REU experience, I was able to grow personally as well as mathematically. Moving all the way to Texas allowed me to be more independent, and really allowed me to focus on my passion for math. Being able to create mathematical models that had real life implications, like providing information on the endangered Whooping Crane, was challenging and extremely rewarding. Also, being able to work with other students from all over the country, who also have a passion for math, was unbelievable. Not only did I learn more math than I even know existed, but I also made life-long friendships." Rebecca Grube, 2017

Spring 2017 Honors & Awards

In April 2017, MU's Math Department welcomed back alum Dr. L. Martin Eby who spoke to graduates and guests on "*From Those Who Have Been Given Much, Much Will Be Required.*" During the evening, featured departmental awards were given:

Class of 1866 Award:

- Krista Mamet
- Khalile Stackhouse

Mathematics Faculty Award:

- Rebecca Grube
- Quinn Minnich

Isaac F. Seiverling Award:

- Aaron Keglovits
- Joshua Larson

Harry E. Canter Statistics Award:

- Jessica Butts

Lee E. and Laura H. Boyer Award:

- Quinn Minnich
- Jamie Thorpe



2017 Graduates in attendance at the Honors & Awards dinner

Noyce Program Update

In 2011, a \$2.1 million grant from the National Science Foundation provided the financial backing for our department's Robert S. Noyce Scholarship program. Now sponsoring our 5th cohort of future mathematics teacher, the program will conclude in August 2018 having helped to better prepare 25 teacher candidates for teaching mathematics in high need school districts.

Local Schools' Participation in Department Programs

MU's MATH Department continues to sponsor well attended regional events for area high schools.

- This year, our **Annual Math Contest** hosted 75 students from 19 schools!
- For more than 20 years, MU's Math faculty members have been part of the regional **AP Calculus and AP Statistics Simulations** organized by the IU13. This year, MU's Math Department took over the coordination of the events and this led to on-campus participation from over 400 students, and 45 faculty members for schools in the area.
- Mathematics education faculty members sponsored the second **Early-Career Mathematics Teacher Seminar** series this year with four evening/weekend seminars throughout the year. During the two years, we have had over 20 different early career math teachers from sixteen different school districts!

If your school would like to participate in any of these events in 2017-2018, please contact the Math Department Office for more information.

Congratulations to Dr. Kevin S. Robinson who was promoted to Associate Professor and to **Dr. Cynthia E. Taylor** who received tenure and was promoted to Associate Professor in August 2016. **Dr. Taylor** is also congratulated on recently being selected as the President-Elect for the Pennsylvania Association of Mathematics Teacher Educators (PAMTE) – she will serve as president of the organization 2018-2020.

Congratulations to **Dr. Erin R. Moss** on the recent publication of *Philosophical Aspects of Teaching Mathematics to Pre-Service Elementary Teachers*, a book chapter in *Using the Philosophy of Mathematics in Teaching Undergraduate Mathematics* by the Mathematical Association of America (MAA, 2017). Dr. Moss coauthored an article, "Developing the Concept of a Radian" with **Dr. Roger Wolbert** (M.Ed. in Mathematics from MU, 2011) which was recently accepted for the *Mathematics Teacher*, a journal of the National Council of Teachers of Mathematics (NCTM). In addition, **Dr. Moss** had a VERY active year presenting at regional, national and international conferences. These included: "Relationships Between Video Club Participation and Identity in Preservice Elementary Teachers," at the International Congress on Mathematics Education (ICME) in Hamburg, Germany (July 2016); "Using Video to Prompt Reflection in Mathematics Courses for Prospective Elementary Teachers," at the MAA Mathfest in Columbus, OH (August 2016); "Implementing Open-Ended Tasks in Volume and Surface Area," at the NCTM Regional Conference in Philadelphia, PA (November 2016); "Progress and Resistance in Exploring Social Justice Mathematics with Graduate Students," at the MAA/AMS Joint Mathematics Meetings (JMM) in Atlanta, GA (January 2017); "Extracting Rich Mathematical Problems from a Real-World Context," at the NCTM Annual Meeting in San Antonio, TX (April 2017); and with **Dr. Tyrone Washington**: "Exploring Issues of Power, Privilege, and Opportunities to Learn Mathematics," at the NCTM Annual Meeting in San Antonio, TX (April 2017).

Dr. Ximena Catepillan was a featured speaker at a variety of events: she presented "A Course on the Mathematics of the Pre-Columbian Americas" at the MAA Mathfest in Columbus, OH (August 2016); she gave a Presentation for History of Math students entitled "The Calendars of the Maya" at Penn State Harrisburg (November 2016); and she was a Keynote Speaker at the PA-SSHEMA conference: "Ethnomathematics: Teaching About the Cultural Richness of Math," at Indiana University of PA (March 2017).

Drs. Noel Heitmann and **Michael G. Wismer** presented "Millersville University Department of Mathematics: Preparing Mathematicians and Educators for More Than 150 Years," at the JMM in Atlanta, GA (January 2017).

Dr. Baoling Ma had a very active year in presentations: "A Mathematical Model for the Interactions between *Plasmodium falciparum* Malaria Parasite and Host Immune Response," at the SIAM Conference on the Life Sciences (LS16) in Boston, MA (July 2016); "Demographic Analysis of Sperm Whales using Matrix Population Models," Mathematics/Computer Science Colloquium Series at Muhlenberg College (September 2016); "Finite Difference Approximations for a General Nonlinear Model for the Interaction of Structured Populations and the Environment," at the JMM in Atlanta, GA (January 2017); "Student-Centered Teaching Strategies in Ordinary Differential Equations," at the JMM in Atlanta, GA (January 2017); and "Mathematical Modeling as a Tool for Investigating Lethal and Sub-Lethal Impacts of Environmental Disasters on Sperm Whales," at West Chester University's Applied Mathematics Seminar (February 2017).

Dr. Lewis Shoemaker presented a talk on "Exploring Another Connection with Global Warming," at the PA-SSHEMA conference at Indiana University of PA (March 2017), and he will present "Probing the Association between the Magnetic Dip Poles and Climate Change Using Indicator Variable Regression," at Joint Statistical Meetings (JSM) in Baltimore, Maryland (July 2017).

Dr. Cynthia Taylor led a session for the annual meeting of the Pennsylvania Council of Teachers of Mathematics (PCTM) for "First time attendees," in Seven Springs, PA (August 2016); she presented twice for the Association of Mathematics Teacher Educators (AMTE) Annual Meeting: "Seeing what was once unseen," and "Secondary Mathematics Teacher Educators' Methods Course Goals, Tasks and Perspectives," in Orlando, FL (February 2017); and presented "Variation and intentionality in teaching mathematics methods courses," at the NCTM Research Pre-session in San Antonio, TX (April 2017).

Dr. H. Tyrone Washington presented “*Using iClickers or Plickers and Worked Examples in a College Algebra Course to Foster Discourse,*” at the JMM in Atlanta, GA (January 2017).

Drs. Tyrone Washington and **Janet A. White** led a cohort of Noyce Scholar presenters: Kristen Gochnauer, Andrew Hollinger, Robert Jones and Mason Musser at the annual PCTM meeting in Seven Springs, PA (August 2016). They also presented “*Lessons Learned – A Noyce Update,*” at the Pennsylvania Association of Mathematics Teacher Educators (PAMTE) Annual Symposium at Shippensburg University (May 2017). At the same conference, **Dr. White** also led a session on the “*Challenges of Mid-Level Educator Preparation.*” **Drs. Washington** and **White** are scheduled to present “*High Impact Experiences: A Two-Week Urban Immersion,*” at the Annual Noyce Summit in Washington DC (July 2017).

Dr. Mingquan Zhan spoke at the Japanese Conference on Combinatorics and its Applications: “*On s-hamiltonian line graphs of claw-free graphs,*” in Kyoto, Japan (May 2016).

Congratulations to the following MU alumni on recent accomplishments:

Rebecca Dickinson (2009), completed her PhD in Statistics at Virginia Tech, 2016

John Gemmer (2006), PhD-University of AZ, began tenure track position at Wake Forest University, Fall 2016

Matthew Keefe (2012), completed his PhD in Statistics at Virginia Tech, 2017

The following MU alumni began (or will soon begin) graduate studies (2016-present):

Shane Bookhultz, Virginia Tech University (statistics)

Jessica Butts, University of Minnesota (biostatistics). Jessica is also congratulated on the successful completion of her honors’ thesis: “*Comparison of Principal Components Analysis and Canonical Correlation Analysis*”

Justin Eastman, Colorado State University (applied math)

Mervin Fansler, Cornell (mathematical biology)

Carly Files, Rutgers (mathematics)

Christopher Grubb, Virginia Tech University (statistics)

Taylor Lagler, University of North Carolina (biostatistics). Taylor is also congratulated on being selected for the prestigious National Science Foundation Graduate Research Fellowship. This will enable her to pursue her interest in "gene expression profiles and single-nucleotide polymorphism associations."

Scott Singleton, Virginia Tech University (statistics)

The following MU alumni began (or will soon begin) teaching mathematics in the following schools (2016-present):

Olivia Brill, West Shore SD, Lewisberry, PA

Abbi Byers, Hedgesville HS, Berkeley Co, WV

Brittany Calvert, Franklin HS, Reisterstown, MD

Meghan Campana, Hanover HS, Mechanicsville, VA

Alanna Clark, JP McCaskey High, Lancaster, PA

Lauren Keller, Roxborough HS, Philadelphia, PA

Lindsay Eisenhut Mower, Penndale MS, Lansdale, PA

Katelyn Ort, Cedar Crest HS, Lebanon, PA

Pamela Snyder, Dover Area HS, Dover, PA

Jennifer Tran, George W. Nebinger School, Philadelphia, PA

Antonia Van Vliet, Eastern York High HS, York, PA

Amber Winters, Camp Hill SD, Camp Hill, PA

Ross Young, Rowland Academy, Harrisburg, PA