The Sum Times

March 2017

"Mathematics consists of proving the most obvious thing in the least obvious way." -- George Polye

Message from Dr. Norton

Dr. Douglas Norton
Dept. of Mathematics and Statistics Chairperson

Here we are, with "Spring" Break over before spring technically began. Forget "technically": did we just see temperatures in the 70s give way to a day off for snow removal?!? All before the Vernal Equinox. (There's a cool name for you.) Even the Full Worm Moon is past. The ground thaws and the worms emerge, so can the robins and migrating worm-eaters be far behind? Next thing you know, flowers will begin to spring forth from the earth. Oh, is that why we call it Spring?

As we spring into the home stretch of the semester, here is a tidbit at the intersection of mathematics and climatology, both of which we hope survive the recent trend away from science and facts and thinking and all of that elitist stuff. Jean-Baptiste Joseph Fourier, of Fourier series and Fourier transform fame, calculated that given the Earth's size and distance from the sun, the Earth should be colder than it is. Without using the phrase we attach to the idea now, he proposed the greenhouse effect in *Annales de chimie et de physique*, way back in 1824. Folks like Claude Pouillet and John Tyndall and Svante Arrhenius ran with the idea, but it was a mathematician – one of us!! – who was first. Mathematical climate models are making a comeback; look up the Budyko-Sellers energy balance climate model and "snowball earth" for more.

Happy registration (or graduation!), happy March Madness, happy home stretch, and happy all things vernal.

Inside this Issue:

Math Club

The Math Club at Villanova welcomes everyone from all schools and majors. The club has events throughout the entire year such as quizzo, career night, study parties, and movie nights. We host bake sales each semester to raise money for the Starfish Foundation, a non-profit organization founded by Villanova Math Major Alums, which provides scholarships and mentoring to youth living in extreme poverty in Ecuador. This year we will be hosting new events to increase faculty involvement, including "Teacher TED Talks" and Lunch with the Faculty. Through the Math Club, we hope to help students learn what the Math Department has to offer, while being an active member of the Villanova community.

"One cool thing about mathematics is they don't have to be able to understand math to see the passion that makes it so exciting to them."

— Paul Pierce

Math Club Officers

Co-Presidents: Elizabeth Leonard
eleonar5@villanova.edu
Ron Berna
rberna@villanova.edu
Treasurer: Saurabh Verma
sverma@villlanova.edu
Social Chair: Meghan Carlock
mcarlock@villanova.edu

Join the Villanova Math Club page on Facebook for more information and updates!

Math Club Dates

Check your email and the board outside the Mathematics and Statistic Department for updates!

Request to follow us on twitter! Our **twitter** name is VUMathStat.

Join the Math Department's page on **LinkedIn** to connect with alumni and students and faculty. This is a great way to find out about internships and to form a network!

Become a fan of the **Department of Mathematics and Statistics at Villanova University** page on **Facebook**.

Mathematics Learning And Resource Center (MLRC)

Location: 211 Falvey Library

Dates: January 23 —March 2
March 13 — April 11
April 18 —May 4

Hours: Sunday 6:30-9:00pm
Mon.-Thurs. 1:00-5:00pm
& 6:30-9:00pm

Phone: 610-519-MLRC (6572)

Check out our web page at www.villanova.edu/mlrc for more MLRC info regarding Villanova math course, tutoring schedules, math links, and MLRC email.

If you think dogs can't count, try putting three dog biscuits in your pocket and then giving Fido only two of them.
~Phil Pastoret

Department of Mathematics & Statistics

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Staff: Marie O'Brien, 610.519.4809
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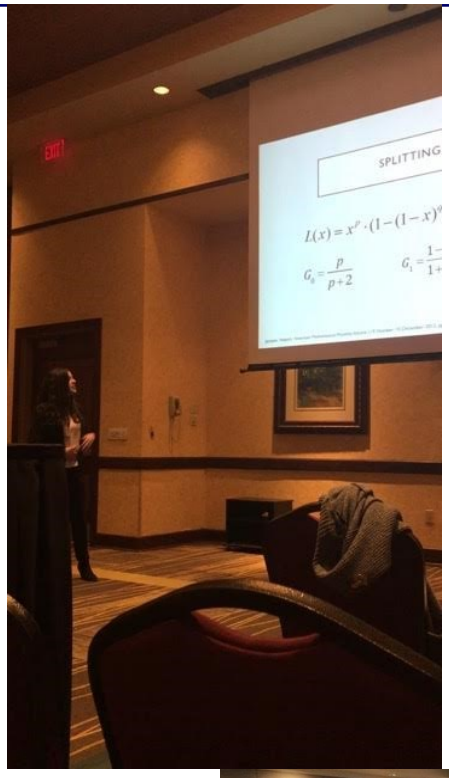
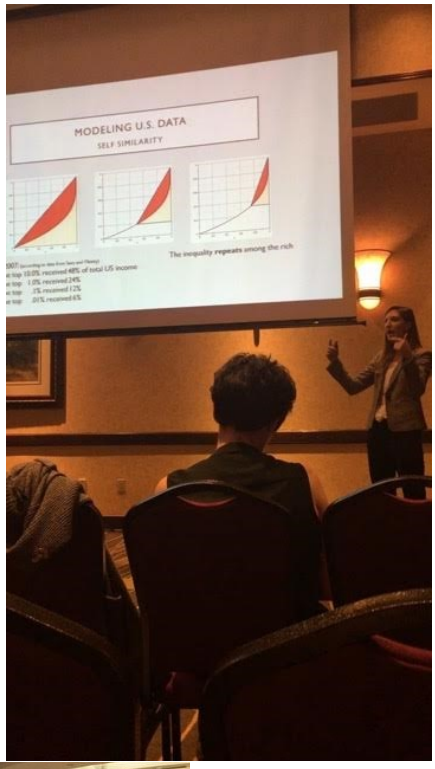
Association for Women in Mathematics (AWM)

Members of AWM and Villanova math majors Tasha Boland and Shantel Silva spent the weekend of February 3, 2017 at the 19th annual Nebraska Conference for Undergraduate Women in Mathematics (NCUWM). Tasha and Shantel gave a research talk entitled "New Metrics of Economic Inequality," in which they described their work applying Monte Carlo methods to compare metrics of income inequality. In addition to student talks, NCUWM also featured plenary talks by prominent mathematicians, professional development panels, and student poster sessions.





Student highlights

Villanovans #Ignitechange everyday. On March 9, 2017 some of our students attended the 2017 BNY Mellon International Women's Day event about #BeBold-ForChange

From left, Ashden Personius, '18 CLAS (Math Major), Alycia Heggs, '19 VSB, Liz Klotzbach, '18 CLAS, Claudia Alarco, '18 CLAS and Imani Flowers, '17 CLAS

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Fall 2017 MAT Electives

MAT 4110 - Combinatorics (Dr. Paul Pasles)

Combinatorics is the study of enumeration (counting) and related topics. Combinatorial questions involve the arrangement of objects into patterns: when do these patterns exist, and in how many different ways can they be constructed? The answers to such questions have relevance in computer science, biology, probability, and plenty of other subjects. This course covers permutations and combinations, counting methods, induction, the binomial theorem and much more.

MAT 4550 — Mathematics of Financial Derivatives (Dr. Klaus Volpert)

This course covers topics from Financial Mathematics, such as:

- The ins and outs of Mortgages and Loans
- Inflation and other Interest rates
- What are Stocks? Bonds? Options?
- A Random Walk on Wall Street
- Volatility of stocks
- the concept of Arbitrage
- Put-Call Parity;
- the Black-Scholes Model for Option Pricing
- Monte Carlo Methods for Option Pricing

The course is also helpful in preparation for actuary exams FM and MFE.

MAT 4310 — Stats Methods (Dr. Elise Pasles, Dr. Joseph Pigeon)

This course is an introduction to data summarization and various statistical methods that will allow students to begin to build up a toolbox of statistical techniques for handling data analysis. The class will study probability distributions that will serve as the foundation for these methods. The statistical methods that the class will study include point estimates, interval estimates and hypothesis tests for population means, variances and proportions, categorical data analysis , regression and correlation. Prerequisite: MAT1505

MAT 5700 - Math Stats I (Dr. Paul Bernhardt) (This counts as the second analysis)

The course covers the basic principles of the theory of probability and statistics. Topics include: probability, random variables, discrete and continuous probability distributions, important families of distributions, multivariate probability distributions, and functions of random variables. Prerequisite: MAT2500 & 2705

"I'm sorry to say that the subject I most disliked was mathematics. I have thought about it. I think the reason was that mathematics leaves no room for argument. If you made a mistake, that was all there was to it."
— Malcolm X

MAT 3930 History of Math (Dr. Alan Gluchoff)

This course provides a brief survey of the development of mathematics and mathematical ideas from ancient to modern times. Mathematics is viewed in the context of the epochs in which it evolved. Specific theorems and concepts are presented along with historical events which accompanied them. As examples: we study some geometry of Euclid's Elements and the mathematics of later Greek and Hellenistic times while emphasizing the importance of the Elements as an educational force throughout the centuries, the role of Persian civilization in preserving Greek accomplishments and producing new algebraic ideas, the extension of algebra which accompanied the Renaissance and the Italian trading empires, the first European scientific academies and their nurturing of the new calculus, the mathematization of science and the resulting change in philosophical world view made possible by it, and the coming of the modern view of mathematics, which we tend to think of as having emerged full-grown.

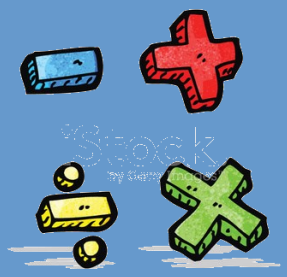
MAT 5920-001 Introduction to Bayesian Statistical Data Analysis (Dr. Al Marrero)

Generally, at present, Bayesian statistics is only taught at the graduate level. This course gives Villanova undergraduates the opportunity to learn about this important area of statistics. The course is an introduction to the statistical data analysis from a Bayesian viewpoint. We assume no previous knowledge of Bayesian statistics. The course is intended to give the students a taste of what it is like to work as a statistician, doing statistical analyses and writing statistical reports. It is meant to be a practical, hands-on learning experience.

MAT 5920--002 Data Science (using R) (Dr. Michael Posner)

Data-savvy professionals are in high demand in businesses, public agencies, and nonprofits. The supply of professionals who can work effectively with data at scale is limited, and is reflected by rapidly rising demand and salaries for data scientists, currently rated the #1 job in the US in 2016. This course explores how real-world data from a variety of disciplines are gathered, managed, and used for making decisions or predictions. Core Topics will include data wrangling, visualization, multivariable thinking, text processing, data mining, ethics, and simulation-based inference. This course will introduce students to the statistical programming language R to accomplish these tasks. Prerequisite: any introductory statistics course (MAT1230, MAT1250, MAT1430, MAt4310, Mat1313, or similar).

SAVE THE DATE!
Pi Mu Epsilon Induction



Fall 2017 MAT Seminars

MAT 5900-001 Seminar: Mathematics and Social Justice (Dr. Pollack-Johnson)

Jane Addams said, "In the unceasing ebb and flow of justice and oppression we must all dig channels as best we may." For us, this means turning to mathematics. In this capstone seminar for math majors, we will use mathematical and statistical models, logic, reasoning, and other tools to understand and work toward social justice. We will vonsider the individual/personal, small group, organizational, political (city/town, state, country, multi-country, etc.), and societal levels as we explore essential questions such as: What do we mean by "social justice"? How does mathematics inform how we could structure things differently to bring about more social justice? How do we measure social justice and how has this evolved over time? How can we increase the level of social justice in our lives and in our world at all levels?
Mathematical/statistical topics presented will depend on the interests of the students in the class, and could be drawn from game theory, social choice theory, voting systems and power indices, math modeling, statistical inference, multivariable thinking and data visualization, causal inference, fair division, gerrymandering, the Gini index of economic inequality, and utility theory. Students will work on projects related to social justice, perhaps in partnership with local or larger organizations such as nonprofits, and will make presentations both about work on their projects and on math/stat topics related to individual projects or the theme of the course. The course will be co-taught with Drs. Posner, Volpert, and Malmskog.

MAT 5900-002 TOP: Monte Carlo Methods (Dr. Jesse Frey)

Monte Carlo methods are methods for answering questions by using random numbers. They are widely used in statistics, finance, the sciences, and many other fields. Students who take this course will learn how to design Monte Carlo studies, how to implement them using the statistical computing package R, and how to appropriately assess the error in Monte Carlo estimates. Specific topics to be covered include random number generation, Monte Carlo integration, the bootstrap, and Markov chain Monte Carlo. Each student will complete a major project that involves using Monte Carlo methods to solve some problem of interest. Each student will give a series of project-related presentations and also write up their project results as a paper.

What did one math book say to the other?

Don't bother me. I've got my own problems!

VILLANOVA UNIVERSITY

Spring Semester Dates to Remember:

April 5 (W) — Last Day for Authorized Withdrawal Without Academic Penalty (WX)
April 12 (W) — Easter Recess Begins after last class
April 18 (Tu) — Classes Resume
May 2 (Tu) — Deemed a Friday Class Day and follows a Friday schedule for UG Day only
May 3 (W) — Deemed a Monday Class Day and follows a Monday schedule for UG Day only
May 4 (Th) — Final Day of Classes
May 5 (Fri) — Reading Day
May 6-12 (Sat - F) — Final Examinations (No exams on Sun. May 1)
May 15 (M) — Final Grades Due - (12 Noon)
May 19-20 (Fri - Sat) — Baccalaureate and Commencement
June 30 (Fri) — Last day for submission of work to remove incomplete ("N") grade

Save the Date!
Pi Mu Epsilon Induction
Friday, April 7, 2017
2:30 PM
Guest speaker: Dr. William Martin, Worcester Polytechnic Institute
Topic: You do the Math!

Throughout our lives, in the media and in casual conversation, we not only hear people brag that they "can't do math", but we often hear "you do the math!" as a dismissal by someone perhaps unable to perform their own arithmetic. It's easy to get gloomy about the state of affairs; it seems that so little math is needed in life these days. But! There are people in this nation who really DO MATH, and that mathematics they do is important. Mathematics, particularly employed in creative ways by engineers and computer scientists (and I'm not talking here about the "creative math" one might see in politics!) has an enduring positive impact on the quality of our lives. Spiraling out from personal experience, I will list various reasons for us to celebrate this amazing profession we have chosen to explore.

To All Students: Set up an appointment to meet with your advisor to prepare for registration.

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Preparing for Registration

Meet with your Academic Advisor:

Discuss your course options for next semester
Receive your Registration PIN (a.k.a. Alternate PIN)

Registration PIN:

Save it to your phone or email
Changes each semester
Spring Registration PINs begin: sp _ _ _ _ (four random numbers)
Fall Registration PINs begin: fa _ _ _ _ (four random numbers)
Take the time to test your PIN before your registration time begins

How to "Test" your PIN: Go to your *Student* tab –> *My Schedule and Registration* –> *Login to Register* –> Select the appropriate term –> type your PIN

If you enter the correct PIN, the system display your registration time appointment
If you enter an incorrect PIN, you will receive an error message*: Authorization Failure – Invalid Alternate PIN*
If you feel you have the incorrect PIN, contact your Advisor or your Advising Center
Note: The system is "case sensitive." The letters are lower case.

Check your Registration Status link will display the following:

Date and time you can begin registering and the date and time online registration ends.
An alert if you have Holds on your account which will prevent registration
Link to *View Holds* is at the bottom of the screen
Your Academic Standing
Your Student Status
Your Class for registration (example: *Sophomore* class will not permit registration into courses restricted to Juniors and Seniors only)

Holds that prevent registration: (Holds most often seen – not a complete list)

Acad Integ Pledge – VPAA – student has not completed the Pledge
No Med Form – Call Health Center
No Social Security # on file – Bursar's Office needs this to complete tax forms for students
Bursar Registration Hold – student has a balance owing
Must Call Dean of Students
Financial Aid Hold – Call FinAID
Note: Hold can only be removed by the originating office

Search for Classes: The *Master Schedule Class Search* will allow you to search the semester's course offerings using various criteria. You can be as vague or as detailed in your search as you want. For example, you can search by just selecting an Attribute Type like Diversity Requirement 2.

When planning your schedule, be flexible and make notes of your options. Some sections may be filled and you will need to select a different time or teacher or course.