

## Welcome to the Math Department Newsletter

Welcome to the new members of the Union math community!

The math department publishes a weekly newsletter to inform its readership about events in the math department (for example, seminars, math club activities, math contests), resources and opportunities for students interested in math (for example, Research Experiences for Undergraduates (REUs), internships, and jobs suited for math students) and news from the greater mathematical community. The newsletter is distributed via email and is also posted on the math department's website, <https://www.union.edu/mathematics> under the Activities tab.

If you would like to contribute to the newsletter, or you have ideas for the newsletter, or you would like to be added to our mailing list, please email **Professor Paul Friedman** at [friedmap@union.edu](mailto:friedmap@union.edu).

## UNDERGRADUATE MATH SEMINAR

During each academic term, the Math Department runs an Undergraduate Mathematics Seminar. This fall, **Professors Jeff Hatley** and **Roger Hoerl** will be coordinating the seminar, a weekly series of ~45-minute talks about math – current research, famous older problems, interesting topics from fields outside of the standard curriculum, etc. The seminars will be announced in the newsletter, via email, and online on the math department's website under the Activities tab, or directly at <https://www.union.edu/mathematics/upcoming-student-seminar-talks>.

The first seminar of the fall term is

**DATE:** THURSDAY, September 15  
**Time &** 12:30 – Pizza in Bailey 204  
**Location:** 12:50 – 1:45 Seminar in Bailey 207



Professor  
Julius Barbanel

In this seminar, Union College Professor of Mathematics, Emeritus, **Julius Barbanel** will present the following talk.

**Title: The Ancient Greeks and Irrational Numbers: discovery, crisis and resolution**

**Abstract:** Pythagoras and his followers (who lived and worked about 2500 years ago) thought it obvious that any two line segments are commensurable, or, in other words, that given any two line segments, there is some third line segment that measures each. This assumption turns out to be equivalent to the statement "all real numbers are rational." Many ancient Greek geometric proofs used this assumption. When it was discovered that this assumption is false, it caused a mathematical crisis. We shall explore the reasons why the Pythagoreans made this commensurability assumption, the discovery that it is false, the ensuing mathematical crisis, and the resolution of this crisis by Eudoxus.

## Calculus Help Center: free calculus tutoring!

The math department runs a Calculus Help Center (CHC) that offers **free, drop-in, tutoring** in calculus courses through Math 117. It is open Sunday through Thursday nights 7:30-10:00pm and is in the SORUM HOUSE seminar room.

**There's more – meet the new math faculty ... turn the page!**

## Meet the New Math Faculty

This fall, the math department is excited to welcome two new faculty members, **Professors Rylan Gajek-Leonard** and **Junqing (Jenn) Qian**. Each of them has written an article to introduce themselves.

From Professor Gajek-Leonard: *I am absolutely delighted to be joining the mathematics department at Union!*

*I was born in Alberta, Canada, but grew up mainly on Salt Spring Island, a small island off the coast of British Columbia. I moved to upstate New York for my undergraduate studies at Bard College, where I completed a double degree in mathematics and cello performance. I then did my master's degree at the University of Cambridge, where I also played cello in the Cambridge Philharmonic, and then moved back 'over the pond' to complete my PhD at UMass Amherst.*

*My research is in number theory. I'm especially interested in L-functions (e.g., the classical Riemann zeta-function) and understanding what they can tell us about arithmetic and geometry. For example, the famous 'class number formula' in algebraic number theory relates L-functions to a wealth of invariants attached to number fields. My current research is mainly in Iwasawa theory, where I work with objects called 'p-adic L-functions'. These are built by p-adically interpolating algebraic values of usual L-functions (think 'analytic continuation' with respect to the p-adic metric). One can attach p-adic L-functions to things like modular forms (unusually symmetric complex analytic objects which encode arithmetic information) and, amazingly, the study of the roots of p-adic L-functions can tell us about the structure of rational points on elliptic curves.*

*Outside of math, I enjoy playing my cello, gardening, baking bread, cooking, and listening to podcasts. Lately, I've also been (casually) getting into bird watching.*



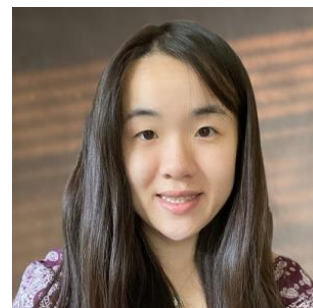
Professor  
Rylan Gajek-Leonard

From Professor Qian: *I am very excited to be joining the Mathematics department at Union College. I was born and lived in Beijing, China, until going to college in another city, Hefei. I graduated from the school of gifted young at the University of Science and Technology of China (USTC) with a B.S. in Mathematics in 2014. I went to the University of Connecticut (UConn) for my Ph.D. in Mathematics under Prof. Damir Wu and graduated in 2020. Being attracted by a particular research field, I spent almost two years at the University of New Mexico as a visiting assistant professor before coming to Union.*

*My research interest is at the intersection of number theory and differential geometry. More precisely, I am primarily interested in capturing algebraic*

*information to help with problems in geometry and geometric analysis. For example, I discovered a connection between the Kahler-Einstein metric on punctured spheres, a subject in differential geometry, and modular functions, a subject in number theory; this connection overcame the obstacle from other methods and settled the metric problem, a problem in geometry. World-leading mathematicians projected the existence and importance of further relations between the two different fields. Some discovered ones have been applied in physics, such as string theory. Naturally, I am also interested in topics in both fields. On the algebraic side, I am interested in studying and developing the theories of arithmetic differential equations and geometry; on the analytic side, I am interested in Calabi flow on toric manifolds and exploring mathematical physics.*

*Besides math, I was professionally trained in the sense of practicing 5-6 hours per day as a pianist until high school. I was particularly interested in pieces adapted from classical Chinese traditional music. Due to this reason, I was half homeschooled before college. At the same time, I am always interested in math and have participated in mathematics competitions. I was admitted into my college without taking the national college entrance examination and got into a special math program as the only girl among a total of 30 students. Last and most importantly, I love to spend time with my dog Puffy. She is a Coton de Tulear, a larger version of Maltese. She is fluffy, cute, and gentle and has been described as a rolling snowball. Puffy is serving as the supporting assistant in the class I am teaching this term.*



Professor  
Junqing (Jenn) Qian