

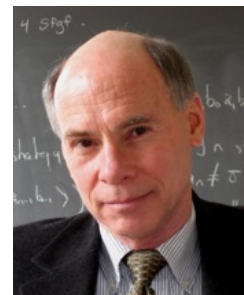
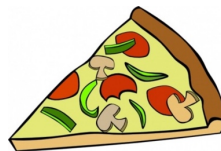
## UNDERGRADUATE MATH SEMINAR

The first seminar of the term will be

**DATE:** **THURSDAY, January 24**

**Time &** **12:30pm** – Refreshments in **Bailey 204**

**Location:** **1:00** – Seminar in **Bailey 207**



Professor Alan Taylor

In this seminar, **Professor Alan Taylor** from the Department of Mathematics at **Union College** will present the following talk:

### Title: Hall's Marriage Theorem

**Abstract:** Suppose we have a collection of women and a collection of men, and each woman finds some of the men acceptable (and the rest not). When is it possible to match each woman with a man she considers acceptable, subject to the obvious constraint that the matching be one to one? The answer to this metaphorical question is a beautiful result in finite combinatorics known as Hall's marriage theorem. We will discuss Hall's theorem, sketch a proof of it, and consider a couple of natural questions it suggests, all with the hope of providing an illustration of how research gets done in mathematics.

## Math Problem Solving Contest at Union College: Saturday, February 9

Attention Problem Solvers! The 13<sup>th</sup> annual **University of Rochester Math Olympiad** will be held on **Saturday, February 9** from 9:30am to 12:30pm. This contest consists of four proof-based problems to be solved over the three-hour time period with CASH prizes to the top three performers! For information about practice sessions, and to participate in this Olympiad, please contact **Professor George Todd** ([toddg@union.edu](mailto:toddg@union.edu)), Bailey 108D.

## What We Did This Recess

Between the fall and winter terms, many faculty use this non-teaching time to travel to attend and/or speak at conferences as they pursue their research. Some faculty have submitted some bullet-point highlights of their activities for publication in this, and some upcoming, newsletters.

- **Professor Christina Tønnesen-Friedman** wrote, "I went to Sanya, China to speak at the workshop "Global Aspects of Projective and Kähler Geometry" in honor of Professor Futaki's 65th birthday, at Tsinghua Sanya International Mathematics Forum (TSIMF) from January 4-6, 2019.

"Here is a group photo (courtesy of TSIMF) where Futaki is standing in the front row, third from the left.

"This was my first visit to China and I hope to return some other time for a longer visit. It is a beautiful country!"



Professor Tønnesen-Friedman, second row, second from left

## Summer Opportunity: Research Experiences for Undergraduates (REUs) in Math

The National Science Foundation (NSF) sponsors many Research Experience for Undergraduates (REUs) in mathematics at colleges and universities throughout the country. These are summer programs that last 6-8 weeks in which undergraduates are given the opportunity to learn new mathematics and to perform some mathematical research – and get paid for it (~\$3000-4000).

The range of research available to students among the programs is wide and the topics are varied. For example, there are REUs in: algebra, algebraic geometry, analysis (real or complex), combinatorics, computational mathematics, differential equations, differential geometry, discrete math, dynamical systems, fractals, geometry and physics on graphs, graph theory, knot theory, mathematical biology, mathematical physics, matrix analysis, number theory, probability, statistics, wavelets, and more! No matter what the field, the projects are designed to be accessible to undergraduate math majors.

Some universities put a twist on their summer program and have students take some specially designed, usually advanced undergraduate, coursework to help prepare students for graduate school. Cornell University does this, as do some others. Additionally, some programs target a specific audience, usually groups that are underrepresented in mathematics (women and certain minorities).

**Who should apply?** Math majors, typically in their junior or sophomore year, though some programs accept applications from current seniors (for the summer after graduation). Most applicants to REUs are considering going to graduate school in math or a related discipline and would like to see what math research is about. As REUs are generally funded by the US government through the NSF, these programs generally require participants to be US citizens or permanent residents. In terms of coursework, most programs require participants to have had multivariable calculus through Math 117, a course similar to Math 199, and/or a course beyond Math 199 that requires proof-writing.

**What are the options and how does one apply?** The primary source listing REUs is the website for the American Mathematical Society (AMS): <http://www.ams.org/programs/students/emp-reu>. Most of the REU programs listed there handle their applications through MathPrograms.org, a link on the AMS page above. **Be aware** that some programs start before Union's spring trimester finishes, so you might not be able to participate in them. **Act soon!** Most of the application deadlines to REUs are in February or early March. They typically require a personal statement describing your math background and your interests in math. They also require **letters-of-recommendation**, so you will need to plan NOW so that your letter-writers have time to write on your behalf.

**What now?** Go to the AMS website, browse through the different programs, and get excited by the opportunities. Also, feel free to contact **Professor Jeff Hatley** ([hatleyj@union.edu](mailto:hatleyj@union.edu), Bailey 206A), the math department's REU contact to discuss the different programs and your options.

**Math Club Meeting, Thursday, January 24, 2:00 (after the seminar)**  
**Math Common Room, Bailey 204**

### Problem of the Newsletter – January 21, 2019

**Last week's problem:** Congratulations to **Hoang Tran '22** for submitting a correct solution to last week's problem. A solution has been posted at the newsletter sites in Bailey Hall.

**This week's problem:** Let  $f, g: \mathbb{R} \rightarrow \mathbb{R}$  be functions so that for all real numbers  $x$  and  $y$ ,  $f(x + g(y)) = 2x + y$ . Find  $g(x + f(y))$ .

**Professor Friedman** ([friedmap@union.edu](mailto:friedmap@union.edu)) will accept solutions until midnight on Friday, January 25.