

## UNDERGRADUATE MATHEMATICS SEMINAR

The next seminar of the term will be:

**DATE:** TUESDAY, April 20<sup>th</sup>

**Time &** 3:45pm – Refreshments in the Math Common Room, **Bailey 204**

**Location:** 4:00pm – Seminar in **Bailey 207**

In this seminar, this year's student Mathematical Contest in Modeling (MCM) team, **Peter Bonventre**, **Steven Neier**, and **Pengfei Zhang** will discuss their experience and the problem that they studied.

How Sweet It Is:

An Analysis of the "Sweet Spot" of a Baseball Bat

**ABSTRACT:** The location of maximum power transfer of a baseball bat, the "sweet spot", has been known since the beginning of baseball. However, only in the last 30 years has research been conducted to determine the characteristics of such a location. We developed a model that explained the bat-ball collision in terms of the interaction between two spring systems. This interaction characterized the collision based on the velocity of the bat and ball, moment of inertia, center of mass, the colliding efficiency of the ball, and the recoil factors of the bat. It was determined that this location was at 71.5 cm along the length of the bat for a typical 86 cm (34 inch) bat. This position balanced the influences of the center of mass and vibrational modes. This model was also applied to "corked" and non-wooden bats, and these variations altered the location by no more than 2 cm. However, it was determined that "corked" bats did not provide any additional power, whereas metal bats increased the maximum speed of the ball.

### 24 Years in the Making: Union's New Student-Faculty Research Display Case, by Professor William Zwicker (the article, not the case!)

In 1986-87, a partial renovation of Bailey Hall created the current Mathematics Common Room along with the setback wall on the second floor, with its oak columns. The space between the columns was to hold two cases for displaying part of the college's famous collection of *Olivier Models*, among other items.

But, in a major surprise (well . . . we were young and naive) the architects used up all the money on the renovations, including the amount reserved for the display cases. Through the generosity of Union alums – math majors, of course – and that of the Stone family,<sup>1</sup> the department eventually gathered enough funds to purchase the handsome glass case that now holds a number of the models. That took a bit more than twenty years.

You may have noticed that a second case recently joined the first, finally completing the plans made over a quarter-century ago. The new case sits under Frank Bailey's portrait, and was built of natural mahogany by Leonard Bellanca, a local cabinet maker. What is in it today, and what will it hold in the future?

As a subject, Mathematics is continually growing – mathematicians continue to have new ideas, prove theorems that settle centuries-old problems, and develop new and useful applications. The

<sup>1</sup> William Stone (Union class of 1942) was a Professor of Mathematics at Union. He was instrumental both in renovating the Olivier models, and in seeing they received the attention they deserved.

mathematics that you learned in grade school, however, along with much of what you covered in high school, is not so new. Unlike most of the sciences, Mathematics does not have periodic revolutions that leave old ideas on the trash heap – when we prove something true, it tends to stay true!

Perhaps for this reason, some don't realize that Mathematics is alive, and changing. Your Mathematics professors participate enthusiastically – we have specialists in topology, geometry, applied mathematics, number theory, social choice and game theory, fair division, category theory, Lie groups, algebra, etc. who write and publish research papers and books containing truly new results. Research is an integral part of their lives.



The beautiful new mahogany display case on the second floor of Bailey Hall

You may know that Union students also do mathematics research, often as part of their senior thesis. Union undergraduates have published original mathematics research papers. They have translated papers (by famous mathematicians) that never before appeared in English, written computer programs to explore properties of new voting systems, etc.

We want visitors to Bailey Hall to know about all the research activity taking place here, by students and faculty both. That's what the new case is for. We plan to change the contents several times per year, highlighting the work of different people, as well as the tremendous variety in mathematical research. Later this Spring, for example, we plan to display theses written by senior Math majors in the class of 2010. Another thought is to feature work by former Union undergraduates who became research mathematicians.

As our inaugural display, however, we are showing some work done by one of our faculty members – **Professor Kim Plofker**, a distinguished scholar in the History of Indian Mathematics. So, take a few moments tomorrow to look inside the new case – you'll find books, chapters, research papers, illustrations, fragments of original manuscripts in Sanskrit and Arabic, and a paper written by Margaret D. Callahan, Union Class of 2009, who worked with Kim on the first translation of a work by Leonhard Euler, on the motion of comets.

***Our new case was made possible through the generosity of Union College Alumni.  
Thanks!***

## Problem of the Newsletter: April 16, 2010

Unfortunately, there were no correct solutions submitted for last week's problem. We will leave that problem open for you to work on. (Back issues of the newsletter are available through [www.math.union.edu](http://www.math.union.edu))

**Here is this week's problem:** Show that if the positive integers  $a$ ,  $b$ , and  $c$  satisfy  $a^2+b^2+c^2=1993$ , then  $a+b+c$  is not a perfect square.

Professor Friedman will accept solutions to this problem until 12:00 noon Thursday, April 22<sup>nd</sup>. Email your solution to him ([friedmap@union.edu](mailto:friedmap@union.edu)) or put it in his mailbox in the Math office in Bailey Hall.