

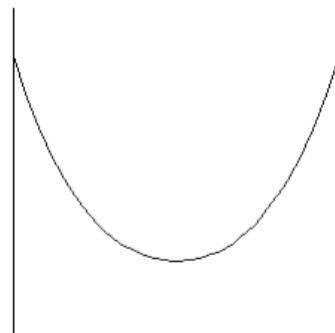
## UNDERGRADUATE MATHEMATICS SEMINAR

The next meeting of the seminar will be this coming **Thursday, October, 4<sup>th</sup>** with refreshments beginning at **3:45** in the **Math Common Room**, Bailey 204, and the lecture following at **4:00 in Bailey 201**.

In this week's seminar, **Professor Susan Niefeld** will present the following talk:

### TITLE: What Is the Shape of a Hanging Cable?

**ABSTRACT:** If you think it looks like a parabola, you're in good company. Galileo (~1600) thought so, too. But, in 1646 at age 17, Christiaan Huygens showed that Galileo was wrong! Later, Huygens coined the name "catenary" for the shape of a hanging cable and in 1691, together with Leibniz and one of the Bernoulli brothers, discovered an equation for the curve. In this talk, we will use exponential functions and integral calculus to derive an equation for the catenary curve.



### My Summer Experience, By Laura Hutchinson '08

I always knew math was everywhere, but it's a continual challenge to answer the ever-present question we've all heard so often: 'What can do with math?' This summer, I received a crash-course in applications of math throughout many branches of sciences, from geology to spectroscopy.

The project began in plant biology, studying moss. Scientific literature contains surprisingly little on this abundant family of plants, the bryophytes. With over 200,000 species of mosses, bryophytes are second only to wildflowers in number of species of the plant community. They are non-vascular plants with no nutrient-absorbing roots, and with leaves that are only a single cell thick! The red-stemmed moss, *Pleurozium schreberi*, grows throughout Canada and Russia and boreal forest regions of the north. Our team, composed of myself, Professors Rice and Black, and two biology students, Nathalie Neal and Jesse Mango, set out to chart equations that would model the life systems of this surely important plant.

Throughout the next eight weeks of gathering moss from the Adirondacks, designing eight different experiments, running tests, analyzing data, and typing reports, I was amazed at the role I was able to take in the project. Not being a biology student, most of the lab work was left to Jesse and Natalie, but different techniques of math were used throughout the project, from statistical methods in designing experiments to represent the moss accurately, to logic systems, equation design, and computer

programming in correcting for lab machinery errors. We drew upon statistical methods and analysis from geology, and theory and equations from spectroscopy. Of course, the real math began once the lab tests were finished. Using R, a downloadable statistics program, results were examined under several carefully chosen base equations, to find the best equation to model each set of results. This process of testing and analysis will continue until March, but our summer findings produced (among many speculations and abstract data) three equations, concerning *Pleurozium schreberi*'s photosynthetic rate as a function of light intensity, the distribution of mass vertically through the moss plant, and the light attenuation through the moss canopy:

1. With  $x$  being the light intensity in PAR,  $y$  being the photosynthetic rate in ppm/cm<sup>2</sup>/min,  $y = .0855(\pm .0085)\log(x) - .3518(\pm .0455)$
2. With  $x$  being depth measured from the top of the canopy,  $m$  being the mass of dry moss above this point,  $\log(m) = 2.384(\pm .076) * \log(x) - 7.381(\pm .204)$
3. With  $I_0$  being the amount of light at the top of the canopy;  $I$  being the intensity of light at the given depth  $x$ , measured from the top of the canopy,  $\log(I/I_0) = .2884(\pm .0837) - .8766(\pm .0219)x$

It was so interesting to see how these equations, taken for granted in so many Earth Science textbooks, were created. I learned more science than all of high school taught me, and that math really is useful through it all.

## Putnam Exam 2007: Get Ready!

Do you like challenging problems? Do you immediately seek out the Problem of the Newsletter when you receive this newsletter? Then you should consider participating in the William Lowell Putnam Mathematical Competition. Thousands of students from hundreds of colleges and universities across the U.S. and Canada take part in this one-day competition on the first Saturday in December each year. The competition consists of 12 challenging problems that students are given six hours to solve. On last year's exam, 40% of the participants scored 0! (Did we mention that it's challenging??) Here's a sample problem from the 2005 exam:

**Find a nonzero polynomial  $P(x,y)$  such that  $P([a],[2a])=0$  for all real numbers  $a$ .** (Note:  $[v]$  is the greatest integer less than or equal to  $v$ .)

This year's exam will take place on Saturday, December 1. If you think you might be interested in taking the exam, please contact **Professor Brenda Johnson** at [johnsonb@union.edu](mailto:johnsonb@union.edu) by **Friday, October 5<sup>th</sup>**. Although this is after the fall term ends, we can make arrangements for you to stay in your dorm room the nights before and after the exam, or possibly take the exam at an institution closer to your home.



Do you have any ideas for future newsletters?

E-Mail: [friedmap@union.edu](mailto:friedmap@union.edu)

### We're on the Web!

See us at:  
<http://www.math.union.edu>

under "Department Activities"

## Resources for Students

- eRecruiting in Full Swing The Becker Career Center (online at [www.union.edu/BeckerCareerCenter](http://www.union.edu/BeckerCareerCenter)) is a fantastic resource for all students ... not just for seniors. They can help you find Internships, Summer Jobs, Full-time Jobs, Winter Break Opportunities, etc. Check out the eRecruiting calendar (<http://union.erecruiting.com>) for dates and locations of upcoming events...and see how desirable math majors are!
- Seniors: Interested in Teaching? Carney, Sandoe & Associates is an educational recruitment firm that places teachers and administrators in private, independent and like kind (charter,

magnet, pilot and merit) schools across the nation and worldwide. CS&A wrote to the math department asking us to tell our interested seniors that they will be holding an information session at Union on Thursday, October 11th at 7:00pm (room TBA by the Career Center). The following day, Friday October 12th, we will be holding on-campus interviews. All students are welcome to attend the information session with no sign up needed. For them to be considered for an interview they simply need to submit their resume through e-recruiting, Union's online career service. If you have questions, you can contact Jonathan Ball, Director of Recruitment, at [jonathan.ball@carneysandoe.com](mailto:jonathan.ball@carneysandoe.com)

## Problem of the Newsletter: October 1, 2007

Congratulations to **Ronghua Dai**, and **Schuyler Smith** (with an honorable mention to **Brandon Bartell**) for submitting correct solutions to last week's problem. You can view a winning solution on the first floor bulletin board in Bailey Hall.

**Here is this week's problem:** A circle of radius 1 with center on the y-axis is inscribed in the parabola  $y = 2x^2$  (see the figure to the left). Determine the points at which the circle and parabola touch. (Hint: *some* calculus is helpful.)

Professor Friedman will accept solutions to this problem until 12:00 noon Friday, October 5<sup>th</sup>. Email your solution to him ([friedmap@union.edu](mailto:friedmap@union.edu)) or put it in his mailbox in the Math Department's office on the second floor of Bailey Hall.

