

UNDERGRADUATE MATH SEMINAR

The next math seminar on the term will be

DATE: THURSDAY, April 28

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

Location: 12:55 – 1:45 Seminar in **Bailey 207**

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



Professor Julius Barbanel

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

Abstract: Pythagoras and his followers (who lived 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.

In Memoriam – Arnold Seiken (by Professor Emeritus Kimmo Rosenthal)

Have math students ever wondered whence the wonderful atmosphere and ethos in the department? It would not be hyperbolic (nice use of a math word) to suggest that it has its origins in one particular member of the department, **Professor Arnold Seiken**. Professor Seiken recently passed away at the age of 94. In 1967, he was hired as department chair to revitalize the department and chart a new course towards excellence. And that he did, serving as department chair for 13 years, instilling in the department erudition, wit, generosity of spirit, and the sense of a community striving towards a common goal. These traits have remained and been nurtured to this day, becoming part of the very fabric of the department.

A long time ago, although I find it hard to imagine, I was actually twenty-five years old, coming to my first-ever job interview in my first-ever bespoke suit replete with vest and tie. It was a simpler, more innocent time. I would not have to meet with an army of administrators, nor with a congeries of campus committee members. I met Prof. Seiken for breakfast. With a look of solemnity and gravitas he informed me of the most salient features of the job. If, perchance, I happened to be in possession of sheep, then I could graze them by the Nott and, were I to meet a most unfortunate demise while here, I could be buried in Vale Cemetery. I began to think this might be my dream job! He then gave me two pieces of advice that served me in good stead for decades to come. First of all, no matter what, the students come first - always! Second, take your job and work seriously, but never take yourself too seriously. Words to live by.

I soon discovered that he had instituted a practice whereby at departmental celebratory occasions department members should recite poems - odes for the person being honored - with the stipulation that they be witty and clever. Prof. Seiken was unmatched at these readings, our Homer, in comparison the rest of us mere acolytes; to this day I do my best when called upon. I will be reading a poem at his memorial service. The Yiddish word *mensch* means "a person to emulate and admire; a noble character". My poem is entitled *The King of the Menschen*.

Pieces from Thesis – by Mickey Shea

Mickey Shea wrote his senior thesis this past winter term, supervised by Professor Paul Friedman.

This winter, I wrote my senior thesis with Professor Paul Friedman. Entering the term, I did not know what to expect. My previous math courses were a combination of homework sets, quizzes, and exams. The answers to these assignments were largely contained in-class notes and assigned readings. Reaching these answers required creative and analytical thinking; however, they generally cited familiar concepts. I

$$\frac{2}{\pi} = \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{2+\sqrt{2}}}{2} \cdot \frac{\sqrt{2+\sqrt{2+\sqrt{2}}}}{2} \dots \quad (\text{Viète 1593})$$

$\frac{\pi^2}{6} = 1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \dots$ (Euler 1753)

$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)! (1103 + 26390k)}{(k!)^4 396^{4k}}$ (Ramanujan 1914).

knew that my thesis experience would be different. For the first time in my math career, I would have to independently research, learn, and present new material. I was worried about this shift and unsure if I would be able to produce novel results in mathematics. Early in the term, Professor Friedman assured me that these fears were unnecessary. He explained that an undergraduate thesis was more about learning about and reporting on topics you were interested in rather than publishing groundbreaking results. He described the resulting thesis as an expository piece. This perspective was a relief to me, and I feel like it is helpful advice for anyone nervous about having to write a math thesis in the future.

For my thesis topic, I chose the Historical Computations of Pi. I started looking at formulas used 4000 years ago in ancient Egypt and slowly progressed to the use of modern supercomputers. Along the way, I looked at how famous mathematicians, including Archimedes, Viète, Newton, Euler, and Ramanujan, computed π . (See the figure for some of their formulas.) For these results, I included proofs and relevant background information. I also looked at the effectiveness of each method. Over the ten-week term, the direction of my paper changed multiple times. I added topics and formulas that were interesting to me and removed ones that were not. I enjoyed this freedom and encourage future thesis students to choose a topic they are interested in. It makes the process easier and the final thesis better overall.

Union Alumna Miaoqing (Andie) Jia '16 Talks with Econ and Math Clubs

This past Thursday, April 21, the Economics Club and the Math Club, along with their respective departments, sponsored an event hosting Union alumna **Miaoqing (Andie) Jia '16**. Andie was a double Math and Economics major, with a Seward Organizing Theme minor while at Union. Since graduating, Andie has been at Boston University working toward and recently earning her PhD in Economics. *Congratulations Dr. Jia!*



Dr. Andie Jia '16 discussing life after Union

At the event, Andie talked about the various post-collegiate degree options for Union Economic students and her experience in the PhD in Economics program at Boston University. After that, she discussed highlights from the three chapters in her dissertation related to health care economics and the decision-making process people make regarding treatment involving antibiotics. Following this, there was a lively question and answer session.