

## UNDERGRADUATE MATHEMATICS SEMINAR

We hope you enjoyed the first seminar of the term this past Monday! In an effort to make the seminar series attendable by the widest possible audience, some seminars will be on Mondays while others on Tuesdays. It is best to consult either the newsletter, the signs that will be posted throughout Bailey Hall, or perhaps the Student Seminar webpage on the Math Department website <http://www.math.union.edu/activities/seminars/student/welcome.html>.

**DATE:** **TUESDAY, September 21**

**Time and Location**    **3:45** Refreshments in the Math Common Room, **Bailey 204**  
**4:00** Seminar in **Bailey 207**

In this seminar, **Professor Herbert Gintis**, currently at Union College as a **Phi Beta Scholar Visiting Scholar** will deliver the talk described below. Professor Gintis is an external professor at the **Sante Fe Institute** and a professor of economics at **Central European University (Budapest)** where he heads a multidisciplinary research project, "The Social and Mental Dynamics of Cooperation." He is the author of several books, including *Game Theory Evolving*, and is an editor of prestigious journals in his field.



**TITLE: Some Antinomies in Epistemic Game Theory and the Modal Logics of Knowledge, Belief, and Rationality**

**ABSTRACT:** I will first explain the concept of Nash equilibrium and show the centrality of the "common knowledge of rationality" (CKR) in showing that players in a game will play Nash equilibria. I then show that CKR is a highly implausible epistemic assumption drawing on research in paradoxes in the modal logics of knowledge and belief.

**Opportunity for Students: Dinner with Professor Gintis.** The Math Department and Professor Gintis would like to have dinner with some students following the seminar. If you are interested in being considered for this opportunity, **email Professor Bill Zwicker this weekend:** [zwickerw@union.edu](mailto:zwickerw@union.edu)

### My Summer Experience, by Steven Neier '11

I am writing this article to enlighten people about my incredible summer internship working at the Mayo Clinic in Rochester, MN. I felt a need to tell people about my experience and to offer assistance in the frustrating and intimidating processes of searching and applying for internships. The other motivation for this article is to broaden the preconception that math majors either teach or go into finance. In the age of computers, there is a need for mathematicians to analyze the abundance of data in the medical sciences. This is only one application of mathematics; however, I hope my experience will reveal how mathematical skills can be applied in other career fields.

The first challenge in the internship process is identifying suitable programs. These include a variety of research opportunities available through various departments at Union. However if you wish to identify programs outside of Union, you must filter through a myriad of internship programs listed online. Thankfully, there are websites that list a collection of internship programs. The websites I found specifically helpful were

<http://www.ams.org/programs/students/undergrad/emp-internships>

<http://www.columbia.edu/cu/biology/ug/intern.html#labs>

[http://www.nsf.gov/crssprgm/reu/list\\_result.cfm?unitid=5047](http://www.nsf.gov/crssprgm/reu/list_result.cfm?unitid=5047)

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The next challenge in acquiring an internship is the application process. My experience taught me to apply to numerous internships, as these programs are all extremely competitive. Therefore applying to a variety of programs is advantageous. Since a majority of the programs have no application fee, there is no consequence to applying for an internship. Another piece of advice is to start early. Most programs require multiple recommendation letters and either official or unofficial transcripts. This requires that you provide your recommenders with enough time to write recommendation letters and to receive the copies of your transcripts. The last tip I have is to remain organized. These programs each have their own unique application, some online and others in hardcopy. Therefore, you need to remain organized to ensure all of the requirements are fulfilled for each application. Then once all of your applications have been submitted you can relax and wait for acceptances.

I was accepted into the Mayo Clinic's Summer Undergraduate Research Fellowship in Rochester, MN. I worked in the Immunology department under Dr. Kay Medina. My project was to determine if a specific protein (HoxA9) was responsible for regulating, i.e., controlling the quantity, a different protein (*cd34*). Therefore, my tasks included using a variety of mathematical algorithms and bioinformatical tools to identify if there was a genetic basis for this regulation. Then I used a variety of biological techniques in order to validate the genetic regulation of *cd34* by HoxA9. However, the biological techniques were inconclusive so the regulation of *cd34* by HoxA9 is still unknown.

This experience was truly incredible. The opportunity to combine my analytical mindset and implement complex algorithms was extremely rewarding. I also enjoyed having the chance to test theoretical mathematics and bioinformatics in model biological systems. Even as the only mathematics major in the entire department, I revealed the effectiveness of interdisciplinary research in biological research (even at an undergraduate level). This internship cemented my passion for utilizing mathematics to help solve the current problems of biology.

I would highly recommend applying to any internship program. These programs all provide an excellent opportunity to utilize existing skills even when you find yourself in an unknown setting.

### Research Display Case

Beneath the portrait of Frank Bailey on the second floor of Bailey Hall is a beautiful mahogany display case. It is used to display some of the research done by the math department faculty and students. Currently on exhibit are overviews and explanations of some of the work done by math majors from the Class of 2010. This exhibit will be changed to a new one next week (!), so if you have not done so already, come by and take a peek and read about the amazing work these students have done!



To read more about the display case, see the April 16, 2010 math newsletter by following the Math Department Newsletter link on the math website: [www.math.union.edu](http://www.math.union.edu)

### Problem of the Newsletter: September 17, 2010

Congratulations to **Tomas Kourim** and **Schuyler Smith** for submitting correct solutions to last week's problem. Solutions have been posted on the bulletin boards around Bailey Hall.

**Here is this week's problem:** Find, with proof, all primes  $p$  such that  $2^p + p^2$  is also prime.

**Professor Friedman** will accept solutions to this problem until noon Thursday, September 23<sup>rd</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.