

# Logical Times

*"News You Can Count On"*

Denison University

Spring 2006, issue 1

**New math requirements**

Read below about changes to the requirements for the math major. Do I see computer science mentioned down there!?

**New book**

Dr. Bonar and Michael Khoury '03 have written a new book together. See page 2 for more information.



**Dan Bucatanschi needs your face**

Well, he really just needs a few photos of it for a research project. For more information on how you can help, see page 4.

**Student news**

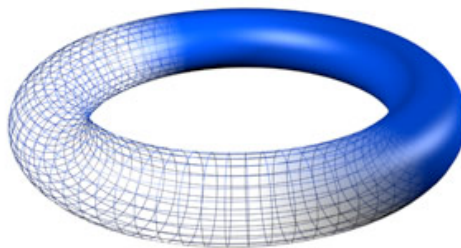
Math and computer science students have been busy! Read about some of their accomplishments on pages 3 and 4.

## New math requirements!

The department is proposing new requirements for the B.A. and B.S. degree in mathematics. These changes will be in effect for the Class of 2010, pending faculty approval. Current students will also have the option of operating under the new requirements. Both new degrees will require students to take courses in discrete mathematics and continuous mathematics while the B.S. degree will require a full year of both Real Analysis and Abstract Algebra, giving these students an introduction of some depth in these two fundamental areas and better preparing them for graduate study.

A main change to the curriculum is the condensing of linear algebra and differential equations into one course (Math 231). Linear algebra, one of the most important areas of mathematics and one that touches nearly every aspect of the subject, will now have its principles taught in three courses: Calculus II (124), which covers solution of systems of linear equations and introduces eigenvalues and eigenvectors, Linear Algebra and Differential Equations (231), which introduces real vector spaces with emphasis on spaces of solutions of differential equations, and Abstract Algebra I (332) which introduces abstract vector spaces. Calc II has done the above for some time, with success, and we

feel continued exposure at an increasing abstract level over a longer time has merit. The list of core courses remains the same: Calculus I, II and III (123, 124 and 222), Introduction to Proof Techniques (210), and Linear Algebra and Differential Equations (231). These are required of all majors and minors. The candidate for the B.A. degree must in addition take Introduction to Computer Science (CS 171), either Real Analysis I (321) or Abstract Algebra I (332), one course in the discrete area (D), Combinatorics (331) or Operations Research (339), one course in the



continuous area (C), Methods of Applied Mathematics (357) or Complex Analysis (329), and two additional courses chosen from Applied Statistics (242) and all 300-level courses. From time to time, we may offer topics courses that satisfy D or C, but we anticipate this to be sporadic. A possible schedule of courses is given below.

Introduction to Computer Science (CS 171) has been added to the requirements. An introduction to computer science, involving introductory programming and algorithm

development was, in fact, part of the major requirements years ago but was dropped when an extensive use of Maple was used in the introductory courses. The use of Maple has curtailed since then, leaving most of our math students with little or no knowledge in this important mathematical area. Programming and knowledge of algorithms is important not just for its own sake, but is useful in other courses where algorithmic methods are vital such as 331, 339, 357 and even 231. This course will enrich our students' experience.

The B.S. degree requires the core, CS 171, Real Analysis I and II (321, 322), Abstract Algebra I and II (332, 333) one D course, one C course and two additional courses from the same list as for the B.A. degree.

The minor in mathematics must take the core plus two additional courses at the 200-level or above.

Thus, a typical schedule for a student on the B.S. track may be the following:

| Year   | Fall                 | Spring        |
|--------|----------------------|---------------|
| First  | 124                  | 222           |
| Second | 210, CS 171          | 231, 242      |
| Third  | 321 or 332, elective | 322 or 333    |
| Fourth | 321 or 332, D        | 322 or 333, C |

If you have questions about how these changes affect you, talk to your advisor!

**WE'RE BACK!**

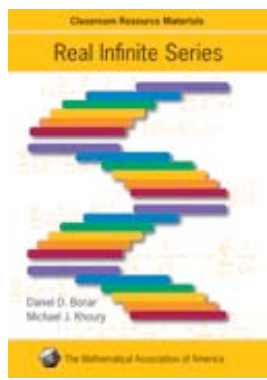
*The department newsletter is back with a new look. We hope you like it!*

*This newsletter has not been published since last spring, so in addition to current news and announcements of upcoming events, you will find some department news from last semester also.*

*You can send news or announcements that you would like to see in future newsletters to havill@denison.edu at any time.*

**Dr. Bonar and Michael Khoury '03 author new book**

Dr. Bonar and Michael Khoury are co-authors of the newly published book *Real*



*Infinite Series*. The book is January's Featured Book on the publisher's website ([www.MAA.org](http://www.MAA.org)). Michael graduated in 2003 from Denison with a double major in mathematics and education, and was one of six

seniors to be awarded the Presidential Medal that year. Michael is currently in his third year as a Ph.D. student at The Ohio State University and is working on a dissertation in the area of analytic number theory. The two authors are already underway with a second book.

**Faculty news**

**Faculty attend joint meetings**

The annual joint meeting of the American Mathematical Society and the Mathematical Association of America (AMS/MAA) was held Jan. 12-15, 2006 in San Antonio, TX. Professors Todd Feil, Matt Neal, Lew Ludwig, and Don Bonar attended the meeting. Also in attendance were Emeritus Professors Zaven Karian and Andy Sterrett.

**Dr. Hutson**

Dr. Hutson published *Bounding Distributions for the Weight of a Minimum Spanning Tree in Stochastic Networks* in the journal *Operations Research* (vol. 53 (5), pp. 879-886) in 2005. This was joint work with Douglas Shier of Clemson University.

Dr. Hutson gave a talk entitled *Tree Traversals and Permutations* at the 36th Annual Southeastern International Conference on Graph Theory, Combinatorics, and Computing. A paper by the same name (with coauthors Dr. Kretchmar and Dr. Feil) was accepted and is to appear in the upcoming issue of *Congressus Numerantium*.

Dr. Hutson gave another talk entitled *On Distributed Shortest Path Algorithms* at the 2005 INFORMS Conference in San Francisco.

**Dr. Krone**

Dr. Krone's and Dr. Westmoreland's paper, written with alumni Tony Fressola '04 and Stoyan Paunov '04 while they were students here, entitled *Characterization of Boolean Topological Logics*, will appear in the *Journal of Multi-Valued Logics* this spring.

The Mellon foundation has announced that Dr. Krone's proposal to hold a computer graphics workshop at Denison has been approved and funded. The workshop will feature as keynote speakers Ed Angel, New Mexico University, author of the most used text in computer graphics and Rick Parent, author and researcher at OSU. The workshop will be held June 5 and 6 at Denison.

Dr. Krone gave a talk entitled *Mathematical Foundations for Denotational Semantics for Relational Programming Languages* at Ohio State in September. The talk represents joint work with W. F. Ogden of OSU.

On March 2, Dr. Krone will be moderating a Birds of a Feather session at SIGCSE entitled *What is Research? Where does work with undergraduates fit in?*

**Dr. Ludwig**

Dr. Ludwig's paper *Nagata-Smirnov revisited: spaces with  $\sigma$ -wHCP bases* appeared in *Topology Proceedings* (volume 29, no. 2) in 2005. This was joint work with Dr. Chuan Liu of Ohio University, Zanesville.

Dr. Ludwig is on sabbatical this semester. He spent the month of January at Williams College in Massachusetts teaching a course and collaborating with a colleague. He will be back at Denison (but still on leave) in February.

**Dr. Havill**

Dr. Havill was recently awarded a Robert C. Goode Faculty Fellowship for Spring, 2007. He plans to use that time to further his research on finding an optimal online algorithm for packet routing on ring networks.

Dr. Havill will also take over as department chair in Fall, 2006.

**Dr. Neal**

Dr. Neal gave a talk entitled *A Classification of Contractively Complemented Hilbert Spaces* at the Universite de Franche-Compte in Besancon, France in June.

Dr. Neal gave two talks entitled *Ruining Baseball With Math* at Alumni Reunion weekend and URPA's summer retreat.

Dr. Neal gave a talk in August at the University of Houston functional analysis seminar on *Contractively Complemented Hilbert Spaces and Fermions*.

Dr. Neal had the paper *Classification of contractively complemented Hilbertian operator Spaces* accepted in the *Journal of Functional Analysis*. This is joint work with Bernard Russo and Eric Ricard.

**Mark your calendars!**

Another semester is upon us, and so is another round of **Faculty And Student (FAST)** talks. Featured will be the four "Best Talk" winners from last semester's Math 210 and CS 271 classes (see page 4). Here is the partial lineup for this semester:

| Date        | Speaker(s)                      |
|-------------|---------------------------------|
| February 1  | Dr. Westmoreland                |
| February 15 | TBA                             |
| March 1     | Nicole Scholtz and Matt Steinke |
| March 22    | TBA                             |
| April 5     | Jim Hartman                     |
| April 19    | TBA                             |

All talks start at 3:45 will be given in **Olin 114**. Refreshments will be available starting at 3:30, so be sure to come early!



The whole group upon arriving at Miami University in September.

## Student news

### Math 210 and CS 271 hit the road

On September 30, 19 students, accompanied by Drs. Ludwig, Havill, and Hutson, attended a day of the Thirty-Third Annual Mathematics & Statistics Conference at Miami University. After arrival in Oxford (and a tasty Chinese lunch), the group attended a host of interesting talks given by mathematics faculty from all around the region. After dinner (aka student pizza party), everyone listened to talks given by students as part of the annual Pi Mu Epsilon student conference, including three of our own: **Robey Holderith**, **David Nassar**, and **Jenny Swank**. See below for abstracts of their talks.

### Three students give talks at Miami U.

The following three students gave talks at the annual Pi Mu Epsilon student conference in September. Here are the titles of their talks with abstracts.

#### Robey Holderith

*Looks like a duck, quacks like a duck...but is it a duck?*

All possible quantum vector spaces which are the range of a norm-decreasing contractive projection are of a certain form, called  $H_n^K$ , as shown by Neal and Russo. But which  $H_n^K$ 's are actually different? In this talk, I will show that each  $H_n^K$  represents a unique quantum vector space.

#### David Nassar

*The quantum distance between matrix spaces*

Matrix spaces can be used to represent physical situations as demonstrated by Heisenberg. For my summer research project, I calculated the quantum distance between two matrix spaces to gain insight on the interaction between the two physical situations they represented.

#### Jenny Swank

*The bus driver's sanity problem*

This problem, proposed by Todd Will, attempts to determine the best bus route for returning children home from school. For the bus driver, the main goal is to minimize total exposure (i.e., kid minutes) spent with the little dears. We present research on heuristic solutions found last summer.

### Schmidt presents paper at MCURCSM

Nate Schmidt, a senior CS major, presented *Constructing an Efficient and Easily Distributable Virtual Tour* at the annual Midstates Conference on Undergraduate Research in Mathematics and Computer Science, held at the College of Wooster. His work was the result of his summer research with Dr. Krone.

### Mansukhani and Nassar give talks at University of Dayton

**Tarika Mansukhani** gave a talk entitled *Codes and Erasures* and **David Nassar** gave a talk entitled *Quantum Distance Between Vector Spaces* at the University of Dayton in October. Both talks were results of their

summer research projects with Dr. Neal.

### Summer Research Projects

Last summer, eight math and computer science students stuck around to do research. Here is a list of their interesting projects. For more information, take a look at their posters hanging in the hall between rooms 216 and 217.

#### Andrew Hoffman

*Automated Animation of the Human Hand Manipulating Deformable Objects*

#### Tarika Mansukhani

*Optimal Frames for Erasures*

#### David Nassar

*Quantum Distance Between Matrix Spaces*

#### Nathan Schmidt

*Constructing an Efficient and Easily Distributable Virtual Tour of Denison*

#### Kati O'Neill

*Alliances in Graphs*

#### Jennifer Swank

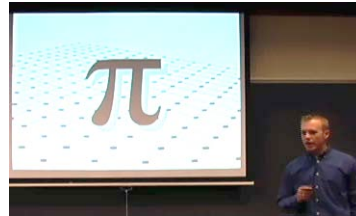
*The Bus Driver's Sanity Problem*

#### Dan Bucatanschi

*Dimensionality Reduction in Reinforcement Learning*

#### Mete Tuzcu

*Online Algorithms for Packet Routing on Rings*



**Katie Stehli, Nicole Scholtz, Matt Steinke, and Becky Weber giving their award-winning talks last semester.**

## Student news, continued

### “Best Talk” winners

The following four students in Math 210 and CS 271 were awarded “Best Talk” honors by their peers. Look for their talks later this semester as part of the FAST talk series. (See the schedule elsewhere in this newsletter.) Congratulations!

**Katie Stehli**  
*The Endless Stack of Dominoes*

**Nicole Scholtz**  
*Weighted Voting and the Electoral College*

**Matt Steinke**  
*The Monte Carlo Technique*

**Becky Weber**  
*Infinite Amounts of Fun*

### Donate your face to science!

**Dan Bucatanschi** is in the midst of a research project with **Dr. Kretchmar**. Dan is studying algorithms that use a technique called kernel methods to process digital photographs of people’s faces. The goal of the project is to automatically classify people according to mood based on their face -- a skill at which people excel. We need your help to make this project a success. Dan requires a database of several hundred photographs of people in various moods.



He is looking for volunteers who are willing to have 10 pictures taken, it should require less than 5 minutes of your time. Dan is photographing from Jan 25 through Feb 3 during the following times: Tuesday 11am-1pm, Wednesday 3:30-5:30, Thursday 11am-1pm, and Friday 11am-3pm. All pictures will be taken in Olin 217 (Mac lab). Any questions may be directed to Dan at *bucata\_d*.

## This summer ... not sure what to do? An REU might be the thing for you!

by Colleen Hughes

The National Science Foundation (NSF) sponsors Research Experiences for Undergraduates (REUs) at different universities around the country. Programs usually run around 2 months, and will pay a stipend of somewhere between \$2,000 and \$3,000. Many of you are qualified! The programs are geared around research in mathematics, but they also offer outside speakers and lecturers, and advice for graduate school. While Denison does offer “in-house” research opportunities, these REUs are an opportunity to get off campus, see and live in a different part of the country, and get to know other students well. (My roommate this past summer was the most entertaining person I’ve ever met.) The REUs also keep students entertained with social activities and outdoor adventures. (My group went hiking every weekend.) If you are interested in doing research in a specific area of mathematics, you can find an REU which caters to your interests. From personal experience, I highly recommend it. (Check out Brigham Young University’s REU.) It’s a guaranteed fulfilling way to spend the summer. REU application deadlines for this summer are quickly approaching (usually mid-February).

If you have questions about the REU experience and applying, e-mail *hughes\_c*.

## Announcements

### Spring tutor schedule is up

The tutor schedule for this semester is posted outside the department office, Olin 201.

### Summer research anyone?

The deadline for submitting an application for an Anderson Summer Research Fellowship is **February 6**. If you are a sophomore or junior and are interested in spending the summer at Denison doing research with a faculty member, talk to him or her soon! Take a look at the previous page for information on what students did last year.

### Four college mathematics contest

We are still looking for contestants for the 4 (formerly 5) College Mathematics Contest on **February 11**. The contest will take place at Kenyon College this year. If you are interested, contact Dr. Bonar or Dr. Hutson.

### Denison spring programming contest

Denison’s annual Spring Programming Contest will be held on **February 25**. If you are interested in being on a team, contact Dr. Feil. It’s fun!

### Alumni web page

As you seniors are looking around for something to do next year, keep in mind that we maintain a web page that contains current information about a number of mathematics and computer science alumni. While browsing their information, you may spot an alum who is doing something that interests you. Drop that person a note for advice or maybe even a job lead! You can reach the alumni page by clicking on the Alumni link on the department home page.