Mathematics, Music to My Ears

Jason Brown (Dalhousie University) is in the news for his work analyzing the opening chord of the Beatles’ song “A Hard Day’s Night.” The exact nature of the chord, played by George Harrison, was a mystery for 40 years, but Brown used a Fourier transform to analyze the frequencies and solve the mystery. He found an F note in the opening sound that could not be played on Harrison's 12-string guitar and deduced that the note was part of a piano chord played along with the guitar. On math and music, Brown says, “Music and math are not really that far apart... The best music is analytical and pattern-filled and mathematics has a lot of aesthetics to it. They complement each other well.” The Halifax Chronicle Herald has more about Brown and his research at: http://thechronicleherald.ca/Front/1087119.html.

In other news, a team including musician/mathematician Paul Du Gre worked on “The Civic Project: Musical Road”—a project that developed a rumble strip on a road in Lancaster, CA that when driven over (at 55 mph) sounded like the “William Tell Overture.” Du Gre notes that the measured slits in the road (varying grooves) became data to create the tones. The road was paved over so the strip no longer exists, but you can view videos of the Honda commercials that describe the process at: http://automobiles.honda.com/civic-sedan/videos.aspx.

Undergraduate Student Poster Session

The Undergraduate Student Poster Session will be held on January 7, 2009, at the Joint Mathematics Meetings in Washington DC. Purely expository posters cannot be accepted. Prizes will be awarded to the top-rated posters. Questions regarding the session may be directed to thomasdia@mail.montclair.edu. The deadline for proposals is today Friday, November 7. For more information go to: http://www.ams.org/amsmtgs/2110_intro.html

Send in your papers!

SIAM Undergraduate Research Online (SIURO) is a web-based publication devoted to undergraduate research in applied and computational mathematics. Topics include analysis, discrete mathematics, statistics, operations research, optimization, dynamical systems, modeling, and computation. Papers written by undergraduate students -or teams of students- are being accepted on an ongoing basis, and will be posted online as they are accepted. The SIURO web site lists the editorial board and has instructions for authors, review policies, etc. Check it out at: http://www.siam.org/students/siuro/

Friday Night Flicks

This week Russ will be showing the 1993 documentary about Paul Erdős titled “N is a Number”. Come see this math classic 7:30 p.m. in CMC 206.

Opportunities for Carls

What are you doing winter break? Next year? After you graduate? Now is the time to start exploring your opportunities:

Teach for America

Teach For America is looking for individuals to make a difference teaching in one of our country’s high-need public schools. The program offers full salary and benefits. The upcoming application deadline is January 7, 2009. For more information, and an online application go
to the Teach for America website at: http://www.teachforamerica.org/

**The U.S. Census Bureau**

Heads up statisticians, the U.S. Census Bureau wants you to consider their careers in mathematical statistics. They have opportunities ranging from the development and implementation of complex statistical models, to setting up sampling for large scale surveys. Interested? See the flyers posted in the 2nd floor hallway.

**DIMACS/DIMATIA**

Quite the initialism, yes? The Center for Discrete Mathematics and Theoretical Computer Science wants you to consider their summer REU at Rutgers University. There is also an opportunity to travel to the Center for Discrete Mathematics, Theoretical Informatics and Applications in Prague. Applications are due January 31. See http://dimacs.rutgers.edu/REU.

**Congratulations to Carls**

The Math Department recognizes the great work and achievements of a number of its majors by awarding them memberships in national math associations. **American Mathematical Society**: Hannah Breckbill, Christine Donovan, David Lonoff, Daniel McDonald, Tyler Mitchell, Haggai Nuchi, Ryan Smith, Yuan Tian; **American Statistical Association**: Christina Knudson, Ted Kuhn, Joe Linder, Samantha Morin, Khanh Nguyen, Max Olivier, Bassirou Sarr; **Association for Women in Mathematics**: Hannah Breckbill, Christine Knudson, Elissa Brown, Samantha Morin, Christine Donovan, Kiva Oken, Aparna Dua, Rebecca Patrias, Sarah Halls, Rosemary Phelps, Emma Turetsky, Beatrice White, Emma Zhou; **Mathematical Association of America**: Francis Adams, Daniel Bernal, Matthew Cordes, Alex Fisher, Heung Jin Kwon, Kiva Oken, Rebecca Patrias, Rosemary Phelps, Nathaniel Snell, Eric Tiede, Danny Wells, Beatrice White; **Sigma Xi**: Hannah Breckbill, David Lonoff, Daniel McDonald, Christina Knutson, Bassirou Sarr, Tyler Mitchell, Haggai Nuchi, Ryan Smith, Christine Donovan. Congratulations to all!

**Problems of the Week**

1. a) Given a triangle $ABC$ (in the plane), show that there is exactly one triangle $PQR$ such that $A$ is the midpoint of $PQ$, $B$ is the midpoint of $QR$, and $C$ is the midpoint of $RP$.

   b) Now suppose we have, instead, a quadrilateral (four-sided figure) $ABCD$. Under what conditions (if any) does there exist a quadrilateral $PQRS$ such that $A$ is the midpoint of $PQ$, $B$ is the midpoint of $QR$, $C$ is the midpoint of $RS$, and $D$ is the midpoint of $SP$? If such a quadrilateral $PQRS$ exists, is it unique?

2. Let $A_n$ be the $(n+1) \times (n+1)$ matrix such that all entries in any northeast-southwest diagonal of $A_n$ are equal to each other and such that the “values” of these diagonals, in order, are $0, 1, \ldots, n-1, n, n-1, \ldots, 1, 0$.

   For example,

   $$A_2 = \begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 1 \\ 2 & 1 & 0 \end{pmatrix}.$$

   Find $\det(A_n)$ as a function of $n$.

Essentially correct solutions to last week’s problems arrived from Danny Chen, who should pick up a “C” block or B.B.O.P. item from CMC 217. I haven’t had a chance to post any more solutions, and given the sizable stacks of green books to be graded, that probably won’t change for another week or so. So if you were thinking of submitting a solution to an earlier problem, or one of last week’s, there’s still time.

- Mark Krusemeyer

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