# *Augarithms*

## Mathematics Colloquium SPRING Lineup

Colloquia are now typically held Wednesdays 3:40—4:40 in Oren 111. Refreshments are always provided.

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| Feb. | 27 | Matt Haines, Augsburg College |
| Mar.→ | 12 | Michael Weimerskirsh, St. Olaf College[1] |
| Apr. | 2 | Student talks |
| Apr. | 16 | Michael Conklin, Advanced Analytics |

## [1]This Week's Colloquium...

### How to Bake the Real Numbers from Scratch:
An Introduction to Surreal Analysis

Michael Weimerskirch, St. Olaf College

Based on the work of John H. Conway "On Numbers and Games". The talk describes the construction of the partially ordered field of games (of which the real numbers are a subfield). The construction combines the ideas employed by Dedekind in constructing the real numbers from the rationals, and by Cantor and von Neumann in constructing the ordinal numbers from sets. The elegance of the theory is that the real numbers (and much more) are created with out any assumptions.

Mike's summertime passion is the sport of croquet. He has played competitively since 1987 and served as the Director of Croquet for the United States Croquet Association from 1995 to 1998. His tournament victories include the Midwest Regional (1992 and 1994), Southwest Regional (1997), Country Boys (1996), Minnesota Open (1997), Champion Ford Owensboro Open (2000) Prairie Lights Open (2001) and Windy City Classic (2006).

Photo at right: Then United States Croquet Association Director Mike Weimerskirch makes a point during his One-Day school in the rain at Golden Gate Park.

## Problem of the week...

Solvers of the puzzle from vol 21.06 were **Michael Janas** and **Jim Dixon**.

The new POTW: It's your birthday and you want to have a big birthday party. You invite 100 people to your fête. Each of them invites 99 people, each of whom invite 98 people, each of whom invite 97 people, and so on...

Assuming that no one is invited by more than one person, and that everyone who is invited attends your gala, how many people will be there to wish you a happy birthday?

Your answer should be expressed in a simple closed form.

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## Puzzle of the week...

Solvers of the puzzle from vol 21.06 were **Brian Jungwirth**, **Brietta Schluender**, **Evan Fuhs**, **Brian Bocklund**, **Michael Janas**, **Hannah Glusenkamp**, **Whitney Anderson**, **Billy Helm**, **Kyle Willett,** University of Colorado (**with a nice extension**)**,** and **Jim Dixon**.

The new PuOWTW: An *Egyptian fraction* is a fraction whose numerator is 1 and whose denominator is a whole number. Express 19/94 as the sum of two Egyptian fractions.

Submit solutions to kaminsky@augsburg.edu., or under Ken Kaminsky's door at SCI 137E, or in the puzzles and problems box just outside of Su's office.

# You got a problem?

Math major Michael Janas is looking to form a problem solving group at Augsburg College. The purpose would be to find, solve, and submit solutions to problems featured in such journals as *The College Mathematics Journal* and *Math Horizons*. Interested students should contact Michael at janas@augsburg.edu

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# Died on this day, March 12, 1834...[2]



**Karl Wilhelm Feuerbach** was born May 30, 1800 in Jena, Germany, His father Paul J A Ritter von Feuerbach was a professor of law and wrote the Bavarian criminal code. Of his 8 children 5 sons were to be awarded doctorates, 3 becoming professors, the most famous being the philosopher Ludwig A Feuerbach (1804-72) (He was one of the very influential critics of religion and thus of great importance for Marx and marxism.) Karl Feuerbach was a brilliant student. By the age of 22 he had been awarded his doctorate, been appointed to a professorship at the Gymnasium at Erlangen and had published an extremely important mathematics paper.

His life, however, did not go well. His career as a teacher only lasted six years and even these were years of great difficulty due to ill health. In 1828 Feuerbach retired from teaching, unable to cope any longer with teaching given his state of health. He only lived another six years and these he spent in Erlangen living as a recluse.

Feuerbach was a geometer who discovered the nine point circle of a triangle. This is sometimes called the Euler circle but this incorrectly attributes the result. Feuerbach also proved that the nine point circle touches the inscribed and three escribed circles of the triangle. These results appear in his 1822 paper, and it is on the strength of this one paper that Feuerbach's fame is based. He wrote in that paper:

*The circle which passes through the feet of the altitudes of a triangle touches all four of the circles which are tangent to the three sides of the triangle; it is internally tangent to the inscribed circle and externally tangent to each of the circles which touch the sides of the triangle externally.*

The nine point circle which is described here had also been described in work of Brianchon and Poncelet the year before Feuerbach's paper appeared. The point where the incircle and the nine point circle touch is now called the Feuerbach point.

Feuerbach did publish a further work in 1827. This is a second major work and was studied carefully by Moritz Cantor. In this work, Moritz Cantor has discovered, Feuerbach introduces homogeneous coordinates. He must therefore be considered as the joint inventor of homogeneous coordinates since Möbius, in his work Der barycentrische Calcul also published in 1827, introduced homogeneous coordinates into analytic geometry. Feuerbach died March 12, 1834 in Erlangen, Germany.

[2]Article by J J O'Connor and E F Robertson—Reprinted with permission.

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# From the Dictionary of Theories[3]

**The Central Limit Theorem**

The first version is called the Laplace theorem and was proved by French mathematician Pierre Simon, Marquis de Laplace (1749-1827). A special case was studied by French mathematician Abraham de Moivre (1667-1754) in 1730.

A fundamental result of Probability Theory, this states that the sum or mean of a sufficiently large sequence of independent identically distributed random variables having finite expectations and variances has a probability distribution that is approximately normal. Therefore, in particular, if a large enough sample is drawn from a population the sum or mean of the sample values can be treated as if they came from a normally distributed random variable.

[3]Reprinted with permission from the *Dictionary of Theories*, by Jennifer Bothamley.

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# On this day...March 12[4]

**In 1859**

Birthdate of Ernesto Cesaro whose more than 250 publications range over much of mathematics

**In 1926**

John von Neumann, 22, received his doctorate summa cum laude in mathematics ,with minors in experimental physics and chemistry, from the University of Budapest.

[4]"Convergence" is edited by Victor Katz of the Mathematical Association of America.

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**30th Annual Pi Mu Epsilon Conference**

The Thirtieth Annual Pi Mu Epsilon undergraduate mathematics research conference will be held on Friday, April 11 and Saturday, April 12. The invited speaker is **Joe Gallian**.

All interested faculty and students in the upper Midwest are invited to attend this conference, held in P. Engel Hall on the campus of St. John's University. The conference will feature papers presented by undergraduate mathematics students.

For further information, contact Su Dorée or John Zobitz.