# Augarithms

AUGSBURG COLLEGE

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Colloquium Series Dates for 2002-2003

Colloquia are held on Wednesdays from 3:40 to 4:40 p.m. in Science 108. Here is the tentative schedule for 2002-2003:

Wed.	Nov.	20	Michael Kac, University of Minnesota*
Wed.	Dec.	4	Loren Larson, Carleton College
Wed.	Jan.	29	Steve Morics, University of Redlands
Wed.	Feb.	12	David Molnar, St. Olaf College
Wed.	Feb.	26	Tracy Bibelnieks, Augsburg College
Wed.	Mar.	12	Laura Chihara, Carleton College
Wed.	Mar.	26	Nick Coult, Matt Haines, & Ken Kaminsky, Augsburg College
Wed.	Apr.	9	Augsburg Students
Wed.	Apr.	16	Augsburg Students

Mathematics and Language

Abstract of Prof. Kac's talk:

It is such a commonplace of our culture to think of the verbal and mathematical worlds as disjoint that it often comes as a surprise to learn of applications of mathematics to questions regarding language. In this talk, I will give a brief overview of a few of them and then a more detailed report on some work of my own in an area of linguistic research which mathematics has penetrated particularly deeply, namely semantic analysis. A quick overview follows.

There is a cluster of philosophical problems concerning singular terms -- i.e., names and singular definite descriptions -- which don't apply to anything (e.g., *Pegasus, the greatest prime*). One of these problems, going all the way back to Plato, can be illustrated as follows. I say 'Pegasus doesn't exist' and Plato asks: if I say of Pegasus that he doesn't exist, then must he not exist in order for me to say of him that he doesn't? Since it is possible to make true attributions of nonexistence, an adequate account of the semantics of sentences of the form singular term-predicate is needed which isn't derailed by Plato's query. This turns out to be a less than straightforward matter.

The solution that I advocate (Kac 1997) has something of the flavor of an earlier one, due to Frege, but eliminates its philosophically objectionable features. At its heart is a mathematical conception of the fundamental notions 'individual' and 'property' developed by Keenan and Faltz (1985) which can be applied in such a way as to overcome both the difficulty embodied in Plato's query and deficiencies of other approaches to the problem.

Augarithms is available on-line at augsburg.edu/math/augarithms/. Click on the date you want to see.

Mathcartoons.com is a website of old and new math and other cartoons by your editor. Visit at mathcartoons. com, and let us know what you think.

References:

Kac, M.B. (1997). "The proper treatment of singular terms in ordinary English." *Mind* 106, pp. 661-696.

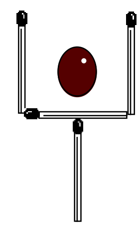
Keenan, E.L. and L.M. Faltz. (1985). "Boolean Semantics for Natural Language". Dordrecht: Reidel.

Puzzle & Problem of the week...

THE PUZZLE:

The chessboard puzzle from the last issue was correctly solved by **Washem Forst**, and **Tiny Hans Knekmek**. The correct answer is 225. The answer for the $n \times n$ chessboard is $({}_{n+1}C_2)^2$, where ${}_nC_r$ is the binomial coefficient giving the number of ways of choosing r objects from n objects.

The puzzle below is a rerun from some years ago: Form a 'glass' from four matches, as pictured. Now, rearrange exactly two of the matches so that the glass has exactly the same shape, but the olive ends up on outside of the glass.



THE PROBLEM:

Last issue's Problem has had no solvers, so we will try it one more time:

Shuffle an ordinary deck of playing cards. Now turn cards over, from the top, one at a time, until the first ace appears. On average, how many turnovers are required?

Send your Puzzles and/or Problem solutions to the editor. You can drop them in the Puzzles & Problems box just inside the math suite (Sci. 137), or you can *e*-mail them to him at kaminsky@augsburg.edu.

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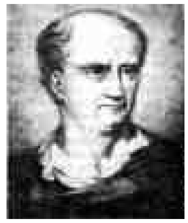
Mathematician Biography


Josef Hoëné de Wronski

Hoëné Wronski (1778-1853) was born Josef Hoëné but he adopted the name Wronski around 1810 just after he married. He had moved to France and become a French citizen in 1800 and then, in 1810 he moved to Paris.

His first memoir on the foundations of mathematics was published there in 1810 but, after it received less than good reviews from Lacroix and Lagrange, Wronski broke off relations with the Institute in Paris.

Among other things he did was design caterpillar vehicles to compete with the railways. However they were never manufactured.

His main work involved applying philosophy to mathematics, the philosophy taking precedence over rigorous mathematical proofs. He criticised Lagrange's use of infinite series and introduced his own ideas for series expansions of a function. The coefficients in this series are determinants now known as Wronskians (so named by Muir in 1882).

In 1812 he published a work claiming to show that every equation had an algebraic solution, contradicting Ruffini's results which were already published. Wronski's work here, although of course wrong, nevertheless still has important applications.

Wronski spent the years 1819 to 1822 in London. He came to England to try to obtain an award from the Board of Longitude but his instruments were detained by the Customs as he entered the country. He found himself in severe financial difficulties but, after his instruments had been returned to him, he was able to address the Board of Longitude. His address *On the Longitude* only contained generalities and did not impress.

His book *Introduction to a course in mathematics* was published in London in 1821.

For many years Wronski's work was dismissed as rubbish. However a closer examination of the work in more recent times shows that, although some is wrong and he has an incredibly high opinion of himself and his ideas, there is also some mathematical insights of great depth and brilliance hidden within the papers.

Article by: J J O'Connor and E F Robertson used with permission

Interested in an Actuarial Career?

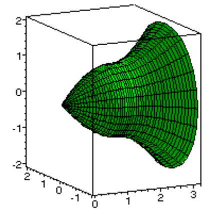
You are cordially invited to the fourth Annual University of Minnesota *Actuarial Career/Internship Fair!*

This is a great way to create network opportunities between actuarial students and business. We hope to provide a mutually beneficial experience to both students and the business community. Companies from around the Minneapolis and St. Paul metro area will be in attendance. Companies will be looking for students for full-time or internship opportunities, as well as informing about actuarial careers.

Date: November 21, 2002
Time: 2:00pm to 5:00pm
Location: Carlson School of Management on the University of Minnesota campus, Lower Level Private Dining Room
Address: 321 19th Avenue South Minneapolis, Minnesota 55455

Hors d'oeuvres will be provided by the companies. Please come with business professional dress, and be prepared with information about yourself. Any questions can be directed to **Caleb Johnson** (john4274@umn.edu) or **Nathan Baseman** (base0010@umn.edu).

Pretty graph of the week...



This week's graph is that of a surface of revolution. A certain function, $f(x)$, was revolved about the x-axis for $0 \le x \le 3$. The equation of the surface takes the form $\boldsymbol{r}(t) = x\boldsymbol{i} + f(x)\cos(\theta)\boldsymbol{j} + f(x)\sin(\theta)\boldsymbol{k}$, for $0 \le \theta \le 2\pi$.

Mathematics of DNA

Why is DNA packed into twisted, knotted shapes? What does this knotted structure have to do with how DNA functions? How does DNA ``undo" these complicated knots to transform itself into different structures? The mathematical theory of knots, links, and tangles is helping to find answers.

In order to perform such functions as replication and information transmission, DNA must transform itself from one form of knotting or coiling into another. The agent for these transformations are enzymes. Enzymes maintain the proper geometry and topology during the transformation and also ``cut" the DNA strands and recombine the loose ends. Mathematics can be used to model these complicated processes.

In an article published in the May 1995 issue of the Notices of the AMS, " Lifting the Curtain: Using Topology to Probe the Hidden Action of Enzymes," mathematician De Witt Sumners discusses these problems. Sumners has worked for a number of years with molecular biologists to help them unravel some of the mathematical problems presented by DNA structure.

“The description and quantization of the three-dimensional structure of DNA and the changes in DNA structure due to the action of these enzymes have required the serious use of geometry and topology," Sumners writes. ``This use of mathematics as an analytical tool is especially important because there is no experimental way to observe the dynamics of enzymatic action directly."

A key mathematical challenge is to deduce the enzyme mechanisms from observing the changes the enzymes bring about in the geometry and topology of the DNA. “This requires the construction of mathematical models for enzyme action and the use of these models to analyze the results of topological enzymology experiments," the article says. “The entangled form of the product DNA knots and links contains information about the enzymes that made them."

-Allyn Jackson
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Is Graduate Study in Mathematics for You?

Students interested in graduate study in mathematics, and mathematics faculty mentors and advisors, are welcome to the first annual Grad Program in Math's Fall Open House, Saturday November 23 from 10:00 a.m. to 5:00 p.m. in Vincent Hall 16. We are inviting students and faculty from colleges and universities in the region, and we hope that you will encourage interested students and faculty to come to our open house.

A pizza lunch will be served in Vincent 120. A more detailed schedule is at http://www.math.umn.edu/grad/open_house/.

Questions? Send email to Professor Paul Garrett at garrett@math.umn.edu. It would help our planning if you let us know if you intend to come.