Math Mess

This Week's Mathematics Colloquium

Title: Environmental Science, Math Modeling, and the Biosphere 2 Center

Speaker: Steve McKelvey and Fellow Biospherians

Time: Tuesday, April 22, 1:30 pm

Place: SC 182

This Week's Colloquium

Ever wonder how the mathematics you are learning in class actually gets used "out there?" The interim course Mathematical Modeling at the Biosphere devotes itself to exploring one area of mathematical application—the ongoing environmental science research projects at Columbia's Biosphere 2 Center outside Tucson, Arizona. This colloquium will feature students who have taken the course. They will discuss the projects they supported and how the experience has changed their understanding of the role of mathematics in the wider world. This interim program is currently accepting applicants for the January, 2004, offering. The student speakers will be happy to take questions about all aspects of the course.

A Fractal Perspective

Megan Kight's senior CIS project is showing April 25 through May 4 in Kelsey Gallery. The CIS (Center for Integrative Studies) allows students to design their own majors by mixing and matching similarly themed courses from a variety of departments. Megan's CIS major focuses on the interplay of mathematics and art. Her final project, "A Fractal Perspective" will intrigue mathematicians, artists, and anyone in between. The show opens at 4pm on April 25.

Last Math Contest

The last contest of the year will be the annual (since 2003!) Math Auction. In this competition, teams of three are given one week to work on a collection of problems. Then, an auction is held in which teams bid on the right to present their solutions. After a solution is presented, the remaining teams may continue to bid if they believe they can improve upon the solution presented, and thus steal the points for that problem. The problems will be released on April 28, and the auction itself will be held May 5, from 7 to 9pm. Fame and fortune (well, mostly fame) await the victors! To get in on the auction, contact Molnar (molnar@stolaf.edu).

Poincare Conjecture Proved?

A Russian mathematician is reporting that he has proved the Poincaré Conjecture, one of the most famous unsolved problems in mathematics. The mathematician, Dr. Grigori Perelman of the Steklov Institute of Mathematics in St. Petersburg, is describing his work in a series of papers, not yet completed. If his proof is accepted for publication in a refereed research journal and survives two years of scrutiny, Dr. Perelman could be eligible for a $1 million prize sponsored by the Clay Mathematics Institute in Cambridge, Mass., for solving what the institute identifies as one of the seven most important unsolved mathematics problems of the millennium.

Formulated by the French mathematician Henri Poincaré in 1904, the Poincaré Conjecture is a central question in topology. The hollow shell of the surface of the earth is a two-dimensional sphere. It has the property that every lasso of string encircling it can be pulled tight to one spot. On the surface of a doughnut, by contrast, a lasso passing through the hole in the center cannot be shrunk to a point without cutting through the surface. Since the 19th century, mathematicians have known that the sphere is the only bounded two-dimensional space with this property, but what about higher dimensions? The Poincaré Conjecture says, essentially, that the three-dimensional sphere is the only bounded three-dimensional space with no holes.

Last Week's Problem

The surface of an Easter egg is dyed in some number of colors. At some points, three colors meet, but never more than three. What can we say about the number of points at which three colors meet? For starters, can it be one?

The boundaries between colors form a graph on the surface of the egg. If every vertex is of degree three, then the number of points where three colors meet—"vertices"—can be seen to be even, using

the Euler Characteristic. (Consult http://www.math.hmc.edu/funfacts/ ffiles /10001.4-7.shtml for info on the Euler Characteristic.) Trying to avoid technical language, we inadvertently stated the problem in such a way as to allow one point at which three colors meet, as illustrated by Zane Buxton, who writes, "for simplicity's sake let's just dye the whole egg yellow. Then we dye two ovals on opposite sides of the bottom half with blue and red to give us our three colors meeting in exactly one point (if you have an incredibly steady hand)." The side and bottom views of Zane's egg are, respectively:

```
Side: YYY          Bottom:    YYYYY
   YYYYYYY                  GGYYYOO
  YYYYYYYYY                GGGGYOOOO
  YYYYYYYYY               GGGGGOOOOO
  GYYYYYYYO                GGGGYOOOO
  GGYYYYYOO                 GGYYYOO
   GGYYYOO                   YYYYY
      GYO
```

It seems as though, as written, any number of points where three colors meet is possible, although nobody offered a proof.

Problem of the Week

Any triangle can be cut into four equal pieces. (Connect the midpoints of its sides.) Is there a triangle which can be cut into five equal pieces?

** Please submit all solutions to **David Molnar** (molnar@stolaf.edu) by noon on Sunday.

If you would like to receive a copy of the Math Mess in your P.O. Box weekly, please e-mail **Donna Brakke** at brakke@stolaf.edu.