

## Career Column

**This is a collection of columns written by Professor Kay Smith in the Spring 2002 Math Mess.**

### **Actuary (February 28, 2002)**

An actuary evaluates the financial implications of uncertain future events. For example, actuaries determine how much a homeowner should pay for insurance or how much money a life insurance company should set aside to pay its anticipated claims in a given year. Actuaries are employed by companies that deal with insurance, employee benefits, and pensions. Their work involves mathematics, business issues and trends, law, and economics.

To be a fully accredited actuary, one must pass a series of eight exams. The first one covers calculus and probability and can be taken while you are at Saint Olaf. The next exam will be given on May 22, 2002. (Having one exam completed makes you more attractive to potential employers.)

Check out the website [www.beanactuary.org](http://www.beanactuary.org) for information on the exam system, preparation for an actuarial career, job listings, and the high job satisfaction reported by actuaries.

### **Cryptanalyst (March 07, 2002)**

A cryptanalyst solves cryptograms (writings in code) and designs cryptographic systems (methods for encoding and decoding messages). Traditionally, cryptanalysts dealt with understanding encoded messages sent by enemies and designing coding systems to keep their own country's communications secure. Modern cryptanalysis includes any type of hidden information such as telecommunication protocols. Cryptanalysts use mathematics, computer programming, engineering, and language skills.

Cryptanalysis is one of the job opportunities for mathematicians at the National Security Agency, the country's largest employer of mathematicians. For more information about job opportunities for mathematicians and computer scientists at NSA, visit [www.nsa.gov](http://www.nsa.gov). NSA also has summer internships for college students. Application deadlines for this year are past, but check program descriptions and deadlines for next year. While at the site, take a tour of the National Cryptologic Museum!

### **Mathematics Writer (March 14, 2002)**

Do you like to write? Would you enjoy talking to mathematicians about their discoveries? Then consider a career as a mathematics writer. Some math writers work as freelancers; others are employed by publications such as Science. All use their writing skills and knowledge of mathematics to explain mathematical ideas to people who are not experts in the field.

Barry Cipra, who describes himself as a mathematician and writer based in Northfield, Minnesota, sent the following description of his job:

The pay is lousy, but you can work at home - in your pajamas, if you like. And the hours are flexible, if you don't mind working all the time. (On the other hand, you can spend an afternoon reading magazines and call it "professional development.") There's no limit to the opportunities, so don't bother applying L'Hopital's rule. The best preparation is to marry well: Find a spouse who's willing to support you.

For some samples of Cipra's work, see the article entitled "Why Double Bubbles Form the Way They Do" (Science, March 17, 2000, p. 1910, available in the St. Olaf Science Library) or the SIAM News website. Cipra wrote four volumes on What's Happening in the Mathematical Sciences for the American Mathematical Society. Some of these articles appear on the AMS website ([www.ams.org/new-in-math/happening.html](http://www.ams.org/new-in-math/happening.html)).

### **Operations Researcher** (March 21, 2002)

Operations researchers help organizations plan and operate in the most efficient and effective manner. They use mathematics to forecast the implications of various choices and decide on the best alternatives. Types of models they use include simulation, linear programming, networks, and game theory. (Take Math 266 to find out more about the mathematics they use.) Examples of problems an operations researcher would investigate are: How can a dress manufacturer lay out its patterns to minimize wasted material? How many elevators should be installed in a new office building to cut waiting time? How could fire stations be relocated to reduce response time?

Many large companies such as Northwest Airlines, AT&T, and Merrill Lynch have an in-house staff of operations researchers. Other operations researchers are employed by consulting firms. The largest employer of operations researchers is the federal government.

For more information on careers in operations research, visit the website of the Institute for Operations Research and the Management Sciences (INFORMS), where you can find a Career Booklet, profiles of operations researchers, and information on educational programs in operations research.

### **Agricultural Statistician** (April 04, 2002)

An agricultural statistician works with scientists to study the natural environment and food production by developing research plans, designing experiments, analyzing experimental data, and interpreting research findings.

Sample problems an agricultural statistician would investigate include: If one bean plant is more resistant to disease than another, is it due to luck or genetics? What will be the effects on water quality of changes in pesticide use? How can a network of sensors on the ground be used to collect data on sunlight amounts? Agricultural statisticians also collect data on crops and livestock and on farm income and costs to aid farmers, agri-businesses, and state, federal, and foreign governments.

Many agricultural statisticians are employed by the National Agricultural Statistics Service (NASS) of the U. S. Department of Agriculture. For more information about this service, job opportunities, and summer internships, see [www.usda.gov/nass](http://www.usda.gov/nass).

### **Financial Engineer (April 11, 2002)**

Financial engineering uses mathematical tools to model and forecast financial markets and form financial products and strategies. In particular, financial engineers help corporations and financial institutions develop and use financial instruments to structure their transactions, increase earnings, and generate capital. They design strategies to ensure desired income streams and increase returns for investments and to manage risks for financial institutions. The mathematics used includes probability, statistics, differential equations, and linear algebra.

Financial engineers are employed by energy firms; financial data, software, and research firms; investment firms and banks; insurance companies; stock exchanges; and the Federal Reserve. College graduates can gain experience in the field by working as analysts for companies such as Morgan Stanley ([www.morganstanley.com](http://www.morganstanley.com)). A growing number of schools offer a Master's Degree in financial mathematics. For a list of programs see the education section of the website of the International Association of Financial Engineers ([www.iafe.org](http://www.iafe.org)).

### **Bioinformatician (April 18, 2002)**

Bioinformatics combines the tools of mathematics, computer science, and biology to uncover patterns and associations within and between sets of biological data. Computers are used to integrate, manage, analyze, and visualize genetic and biological information. This information is applied to study biological processes in organisms, determine how these processes go wrong in diseases, and discover and develop drugs to treat, cure, and prevent diseases.

Learn more about this field by attending a seminar sponsored by the Molecular Biology Concentration on April 29 at 4:00 in SC 278. Dr. Kyle Furge will talk on "Unraveling the Human Genome: Implications for Career Diagnosis and Treatment."

For more about careers in biotechnology visit [www.bhrc.ca/biotecareers](http://www.bhrc.ca/biotecareers) and [www.bioplanet.com](http://www.bioplanet.com). A few schools currently offer M.S. and Ph.D. programs in bioinformatics. Among these are Iowa State ([www.bcb.iastate.edu](http://www.bcb.iastate.edu)) and Boston University ([www.bu.edu/bioinformatics/](http://www.bu.edu/bioinformatics/)).

### **Mathematics Teacher (May 02, 2002)**

Have you considered a career as a junior high or high school mathematics teacher? The report of The National Commission on Mathematics and Science Teaching for the 21st Century recommended significantly increasing the number of mathematics teachers and improving the quality of their preparation. As the need for math teachers has grown, schools have assigned teachers trained in other areas to teach math. Currently in the U.S. about 86% of grades 9-12 math teachers and 66% of grades 7-8 math teachers are certified to teach math. The need for math teachers will increase in the next decade as many teachers retire. Nationally, 27% of math

teachers are age 50 or over (32% in Minnesota), while only 15% are under age 30 (18% in Minnesota).

Each state has licensure requirements for public school teachers. You can complete Minnesota licensure requirements while at Saint Olaf; see Martha Wallace in OMH 103 for more information. Alternatively, you can obtain licensure and a master's degree through a Master of Arts in Teaching program which combines courses in education and mathematics with an internship experience. For example, check out the programs at Duke ([www.duke.edu/web/MAT](http://www.duke.edu/web/MAT)), Earlham ([www.earlham.edu/mat](http://www.earlham.edu/mat)), and Hamline ([www.hamline.edu](http://www.hamline.edu)).

Some independent (private) schools do not require teachers to be licensed. See the website of the National Association of Independent Schools ([www.nais.org](http://www.nais.org)) for job listings. National and international organizations also are looking for math majors to serve as teachers. The Peace Corps ([www.peacecorps.gov](http://www.peacecorps.gov)) sends math teachers to schools in many countries. Teach for America ([www.teachforamerica.org](http://www.teachforamerica.org)) places recent college graduates in schools in low-income communities after a summer training institute.