Abstracts and Biographies of Speakers

Michelle Hopkins Capozzoli
Framingham State College

Workshop: Using the Power of JMP to Teach Statistics

Abstract: SAS-JMP is a statistical software package produced by SAS. With its flexibility and easy interface, it can be a powerful teaching tool in the classroom. This workshop will give an introduction to the software, as well as how it can be used to further advance the teaching and learning of statistics. Specific examples will be presented.

Bio: Dr. Capozzoli is an assistant professor at Framingham State College. After receiving her Ph.D. from the University of New Hampshire, she worked at Bristol-Myers Squibb as a Biostatistician in their Non-Clinical Department. As a member of the Connecticut Chapter of the American Statistical Association, she has given presentations at several seminars for teaching AP statistics. Dr. Capozzoli has also published articles in the areas of interrater agreement, accelerated life testing, and Bayesian analysis.

Mary Ann Connors
Westfield State College

Workshop: Statistics with the TI-83 Plus (TI-83 Plus Silver Edition)

Abstract: The purpose of this workshop is to present several examples that illustrate how the use of a handheld TI-83 Plus can enrich and enhance the teaching and learning of statistics. Some of these examples will provide the opportunity for student active learning.

Workshop: Calculus with the TI-89/ TI-92 Plus/ Voyage 200

Abstract: The purpose of this workshop is to present several examples that illustrate how the use of a handheld computer algebra system (TI-89/ TI-92 Plus/ Voyage 200) can enrich and enhance the teaching and learning of calculus. Some of these examples will provide the opportunity for student active learning.

Bio: Mary Ann Connors is a faculty member in the Department of Mathematics and Program Director of Secondary Mathematics Certification at Westfield State College http://www.wsc.ma.edu/math/faculty/connors/mconnors.asp. She is a former member of the Department of Mathematical Sciences at the United States Military Academy at West Point.

She is a faculty consultant for the College Board and Educational Testing Service and a Texas Instruments College Short Course Instructor. She served as a member of the AP Calculus Development and Test Writing Committee. She is a member of the Phi Delta Kappa Fraternity in Education and several national, regional and local mathematical organizations. She is a member of the Editorial Panel of the 2005 Yearbook of the National Council of Teachers of Mathematics, *Technology-Supported Mathematics Learning Environments* (http://www.nctm.org/publications/yearbook.htm).

Dr. Connors has presented Advanced Placement (AP) Calculus Calculator Workshops, National Science Foundation Funded workshops on Calculus Reform using appropriate technology, and the Texas Instruments/Ohio State Technology Short Courses. She has also presented workshops on fractals at national and international meetings. Her publications include numerous articles, papers, and a fractal project on the World Wide Web (http://www.math.umass.edu/~mconnors/fractal/fractal.html). She was the guest on the call-in talk radio show *Math Medley* entitled "Using Technology to Teach Mathematics" (http://www.csam.montclair.edu/~kenschaft/WALEsched.html).

Dr. Connors is married to Edward Connors, Professor Emeritus of Mathematics at the University of Massachusetts Amherst. They have two children.

Bonnie Gold
Monmouth University

Title: Assessment of Student Learning in Undergraduate Mathematics

Abstract: The SAUM Project ("Supporting Assessment in Undergraduate Mathematics"), sponsored jointly by the NSF and the MAA, has as its goal the improvement of student learning in mathematics through an increased understanding and use of effective assessment methods. This session will introduce you to the SAUM project, give an overview of assessment, share some assessment activities departments in the section are engaging in, and give you a chance to ask questions you have about assessment, as well as to share with others what you are doing.

Bio: Bonnie Gold is chair of the Mathematics Department at Monmouth University in New Jersey. She has helped the two departments she has been part of develop their assessment programs, and is the editor, with Sandra Keith and William Marion, of Assessment Practices in Undergraduate Mathematics, MAA Notes # 49. She has helped run several workshops on assessment. More generally, she has been involved with the MAA's efforts to improve teaching at the college level in a variety of ways, including chairing the Committee on the Teaching of Undergraduate Mathematics and editing MAA Online's Innovative Teaching Exchange.

Ray Griffin
Framingham State College

Title: *Mission Mathematics:* Linking Aerospace and the NCTM Standards

Abstract: Mission Mathematics is a collaborative project of the National Aeronautics and Space Administration and the National Council Teachers of Mathematics. The project links the science of aeronautics to the standards NCTM has developed for all aspects of mathematics education. The mathematics in the different activities in this K to 12 program does not represent the entirety of an elementary, middle school or high mathematics program. Rather, the program involves strategically selected aerospace topics that illustrate how this important science context can develop mathematical thinking using instruction based upon the NCTM Standards documents: *Curriculum Mathematics, Professional Standards for Teaching Mathematics,* and *Assessment Standards for School Mathematics.*
The *Mission Mathematics* presentation will provide participants with an overview of this program with selected examples from each of the three grade division: elementary, middle school and high school.
Bio: Ray Griffin is the Director of the *Christa Corrigan McAuliffe Center for Education and Teaching Excellence.* Prior to Framingham State College, Ray taught mathematics in Massachusetts, the Philippine Islands and the United Kingdom. Ray's career also includes employment at System Engineering Laboratories and Digital Equipment Corporation as a mathematics software application Senior Product Manager.

Laura L. Kelleher
Massachusetts Maritime Academy
Title: Discrete Mathematics In The Schools
Abstract: In *Principles and Standards for School Mathematics* the National Council of Teachers of Mathematics recommends including combinatorics, iteration and recursion, and vertex-edge graphs as an integral part of the school mathematics curriculum. Many teachers of school mathematics have not previously studied these topics or have not considered ways of presenting this material to students in K-12 classrooms. Examples from *The Leadership Program in Discrete Mathematics* will be used to demonstrate ways of reformulating these topics to instill in both teachers and their students an understanding of concepts and applications of discrete mathematics.
Bio: Laura Kelleher is the recipient of the *Award for Distinguished College or University Teaching of Mathematics* from the NES/MAA for 2002. She received her Ph.D. in mathematics from Northeastern University, writing her dissertation in the field of graph Theory. She teaches mathematics and chairs the Department of Science and Mathematics at Massachusetts Maritime Academy where she received the Academy's first *Award for Teaching Excellence*. She served as Chairperson and as Secretary/Treasurer for the Northeastern Section of the MAA and has been a member of several national MAA committees. In 1997 she was a co-recipient of the *Certificate for Meritorious Service* from the NES/MAA. She enjoys exploring applications of graph theory and combinatorics with K-8 teachers through Rutgers University's *Leadership Program in Discrete Mathematics*.

Thomas Koshy
Framingham State College
Title: Fibonacci, Lucas, and Graphs
Abstract: The palindromic year 2002 marks the 800th anniversary of the well-known rabbit problem by Fibonacci. Closely related to Fibonacci numbers, which occur in such diverse areas as art, architecture, biology, chemistry, electrical engineering, geometry, graph theory, music, origami, poetry, physics, physiology, psychology, and neurophysiology, are the Lucas numbers. Fibonacci and Lucas numbers are a source of great fun and excitement; they stimulate intellectual curiosity and sharpen mathematical skills, such as pattern recognition, conjecturing, proof techniques, and problem-solving; and they continue to be a fertile ground for creative amateurs and mathematicians alike.
This talk presents a few delightful applications of Fibonacci and Lucas numbers to combinatorics and graph theory. A minimal exposure to graph theory would be helpful, but not required.
Bio: Thomas Koshy received his B.Sc. in Mathematics and Physics and his M.Sc. in Mathematics from the University of Kerala, India and his Ph.D. with specialization in Algebraic Coding Theory at Boston University under the direction of Edwin Weiss. Tom has written numerous journal and newspaper articles and five textbooks. His most recent textbooks are *Elementary Number Theory With Applications* published by Academic Press and *Fibonacci And Lucas Numbers With Applications* published by John Wiley & Sons. Tom is a frequent invited speaker for the National Council of Teachers of Mathematics (NCTM) and the New England Mathematical Association of Two Year Colleges (NEMATYC). He has given numerous presentations to high schools, colleges, and universities in the United States and in India. Tom has taught at Framingham State College for thirty years, serving on a variety of committees as well as serving as Chair of the Mathematics Department. His honors and awards include the College's Distinguished Service Award and the College Citation for Meritorious Service Award. Tom has been an active volunteer at the Salvation Army Miracle Kitchen in Framingham for sixteen years, done the Walk For Hunger in Boston for seventeen years, and volunteered for the WGBH Phonathon for five years.

John A. Lutts
University of Massachusetts – Boston
Title: *The Geometer's SketchPad (GSP4)*: A Tool for Exploration, Conjecture and Experiment in High School Geometry
Abstract: NCTM in the several versions of its *Standards* has repeatedly called for changes in the way geometry is taught in high school. It has asked for a decreased emphasis on the presentation of geometry as a complete deductive system and an increase in fostering both open exploration and conjecturing and an increase in attention to transformation geometry. The *Geometer's SketchPad* is an ideal tool to use in pursuing such interests. In this

presentation I shall introduce the basics of GSP4 and outline several explorations on which students could embark and invite the audience to try the software out for themselves and/or to share their own experiences with it. (If there is time, I shall also hint as to how this software might be used at the college level.)
Bio: John Lutts received his BS in mathematics from Spring Hill College, Mobile , Alabama in 1957, his MA in mathematics from the University of Pennsylvania in 1959 and his PhD in mathematics from the University of Pennsylvania in 1961. He was a lecturer in mathematics at Loyola College, Baltimore, Maryland from 1964 to1966. He was an Asst. Prof. in mathematics at the University of Massachusetts at Boston from 1966 to 1970. Since 1970, he have been an Assoc. Prof. in mathematics at the University of Massachusetts at Boston. He has been a member of MAA since 1957. His fields of interest are: approximation theory, Lie Groups, history of mathematics, and the training of future high school teachers in mathematics.
His interest in *The Geometer's SketchPad* came about while working on sabbatical in Fall 2001 with the mathematics faculty at Dorchester High School, an inner city high school in Boston. While there, he was asked to provide a series of workshops on the use of this software as part of the professional development efforts of that faculty.

Jeff A. Libby
United States Military Academy
Bart D. Stewart
United States Military Academy
Workshop: **Promoting Visual Cues with "*EXCEL*"lent Tools**
Abstract: With modern advances, technology continues to weave itself within our classrooms. Such advances, while certainly able to enhance a student's ability to learn objectives and concepts, come with an associated cost – specifically, the responsibility of learning some non-user friendly computer software. In an effort to reduce the software learning curve, it is possible to create a totally interactive environment that rivals some popular Java Applets in mere minutes using nothing more than Microsoft Office. In this talk, we intend to share the interactive tool building process and its effect in and outside the classroom.
Why an interactive environment? Our main reason was the fact that students learn through repetition, taking notes, and audio and visual cues. The challenge for us, as instructors, was to prepare lessons that incorporate each of these methods. Rather than observing static charts/graphs and listening to the instructor, students can enter a dynamic environment that promotes opportunity for self-exploration and discovery. The exploration fosters a deeper understanding of material rather than simply resting on the periphery.
With the "point and click" technology, our students are able to investigate a myriad of Discrete Dynamical System behaviors, both linear and nonlinear, through observing the effect of varying parameters in a numerical and graphical fashion simultaneously. Add-ins also exist for analytic solutions as well. Creating this type of environment not only adds new dimension to students' focus, creativity, and willingness to explore, but it also presents an easy, adaptable tool for all of us that remains only a "point and click" away. You may view samples at http://www.dean.usma.edu/math/people/stewart/interactive_tools.htm.
Bios: Captain Bart Stewart teaches undergraduate courses in discrete dynamical systems, freshman calculus, and introduction to differential equations. He is a junior faculty member of the Department of Mathematics Sciences at the United States Military Academy. He served for nine years as a personnel officer in the United States Army. He holds a Bachelor of Science degree in Mathematics from the United States Military academy, and a masters in Management, Troy State university, and Applied Mathematics, Naval Postgraduate School. His research interests include applied numerical methods, chaos, math modeling, and applications of innovative technology to education.
Major Jeff Libby teaches undergraduate courses in advanced discrete dynamical systems, freshman calculus, introduction to differential equations, and will be teaching the advanced sections next year. He is a junior faculty member of the Department of Mathematics Sciences at the United States Military Academy. He served for eleven years as an aviation officer in the United States Army. He holds a Bachelor of Science degree in civil engineering from the United States Military academy, and a masters in Applied Mathematics from the Naval postgraduate School. His research interests include finite element modeling and applications of innovative technology to education.

Carl Pomerance
Bell Laboratories
Title: Primal Screens
Abstract: In August of this year a sensational paper appeared out of India giving a fast test for determining if a given number is prime or composite. This test of Manindra Agrawal and his two students, Neeraj Kayal and Nitin Saxena, has caught the imagination of a far wider public than is usually the case in mathematics. Articles have appeared in newspapers all over the world, as well as news magazines such as US News and World Report, and the major scientific magazines. Come and find out what all the excitement is about.
Bio: Carl Pomerance received his B.A. from Brown University in 1966 and his Ph.D. from Harvard University in 1972 under the direction of John Tate. During the period 1972—99 he was a professor at the University of Georgia, with visiting positions at the University of Illinois at Urbana-Champaign, the University of Limoges, Bell Communications

Research, and the Institute for Advanced Study. Currently, he is a Member of Technical Staff at Bell Laboratories and a Research Professor Emeritus at the University of Georgia.
A number theorist, Pomerance specializes in analytic, combinatorial, and computational number theory. He considers the late Paul Erdos as his greatest influence.
Pomerance was an invited speaker at the 1994 International Congress of Mathematicians, the Mathematical Association of America Polya Lecturer in 1993--95, and the MAA Hedrick Lecturer in 1999. He has won the Chauvenet Prize (1985), the Haimo Award for Distinguished Teaching in the USA (1997), and the Conant Prize (2001). In addition he is the co-author with Richard Crandall of the new book, Prime Numbers: A Computational Perspective.

Emma Previato
Institute For Advanced Study
Title: Algebra, Geometry and Physics: The Dynamics of Adding and Multiplying
Abstract: The nature of algebraic objects, curves and moduli, turned out to have important physical meaning, at least since the times of Fermat. In the latest third of the twentieth century, this connection soared to infinite dimensions. At present, mathematicians and physicists together are exploring the properties of the dynamical solutions attached to special loci in moduli spaces. This talk will focus on examples such as billiards and bundles over elliptic and hyperelliptic curves.
Bio: Emma Previato received her PhD from Harvard University in 1983. Her advisor, David Mumford, was awarded a Fields Medal for his advancement of modern Algebraic Geometry; Emma's dissertation concerned applications of algebraic geometry to non-linear wave equations and other dynamical systems. In 1983 Emma became an assistant professor at Boston University, where she is now a full professor having left her post at times to pursue her research as a visitor, among other places, at the Institute for Advanced Studies (Princeton, NJ); the Mittag-Leffler Institute (Royal Academy of Sweden); the Bunting Institute (Radcliffe College); the Mathematical Sciences Research Institute (Berkeley, CA). She is editor and writer of two books and some 40 technical articles. Emma supervised two doctoral and several undergraduate dissertations and is currently nurturing four graduate students, in areas as diverse as classical projective geometry and coding theory.

Gilbert Strang
Massachusetts Institute of Technology
Title: Pascal Matrices
Abstract: This is joint work with Alan Edelman at MIT and a little bit with Pascal. They had all the ideas.
Put the famous Pascal triangle into a matrix. It could go into a lower triangular L or its transpose L' or a symmetric matrix S:

$$L = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 2 & 1 & 0 \\ 1 & 3 & 3 & 1 \end{bmatrix} \qquad L' = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad S = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 \\ 1 & 3 & 6 & 10 \\ 1 & 4 & 10 & 20 \end{bmatrix}$$

These binomial numbers come from a recursion, or from the formula for i choose j, or functionally from the coefficients of $(1+x)^i$.

The amazing thing is that L times L' equals S. (OK for 4 by 4) It follows that S has determinant 1. The matrices have other unexpected properties too, that give beautiful examples in teaching linear algebra. The proof of $LL' = S$ comes 3 ways, I don't know which you will prefer:

1. By induction using the recursion formula for the matrix entries.
2. By an identity for the coefficients $i+j$ choose j in S.
3. By applying both sides to the column vector $\begin{bmatrix} 1 & x & x^2 & x^3 & \dots \end{bmatrix}'$.

The third way also gives a proof that $S^3 = -I$ but we doubt that result.

Bio: Gilbert Strang was an undergraduate at MIT and a Rhodes Scholar at Balliol College, Oxford. His doctorate was from UCLA and since then he has taught at MIT. He has been a Sloan Fellow and a Fairchild Scholar and is a Fellow of the American Academy of Arts and Sciences. He is a Professor of Mathematics at MIT and an Honorary Fellow of Balliol College.
Professor Strang has published a monograph with George Fix, "An Analysis of the Finite Element Method", and six textbooks: Introduction to Linear Algebra (1993, 1998, 2003 to come), Linear Algebra and Its Applications (1976, 1980, 1988), Introduction to Applied Mathematics (1986), Calculus (1991), Wavelets and Filter Banks, with Truong Nguyen (1996), Linear Algebra, Geodesy, and GPS, with Kai Borre (1997)
He served as President of SIAM during 1999 and 2000. His home page is http://math.mit.edu/~gs.

Dorothy Wallace
Dartmouth College
Title: Sharing Uncommon Ground: How Will The Case For Numeracy Affect The Mathematics Community
Abstract: The volume "Mathematics and Democracy" has sparked a one sided debate about the undebatable value of a quantitatively literate population. In this talk we will outline how the call for numeracy overlaps with the goals of mathematics education and how various institutions have approached the issue. We will touch on both large scale issues and also particular interventions in mathematics education that target goals of numeracy. We will open a conversation on how to improve the numeracy of students at our institutions without sacrificing the mission of traditional mathematics education.
Bio: Professor Wallace grew up in San Mateo, California. She received her Bachelor of Science from Yale University and her Ph.D. in Mathematics from the University of California at San Diego. Before coming to Dartmouth 15 years ago she held positions at Florida International University, the University of California at Berkeley and Stanford University. She works primarily in number theory, although she has also published papers in applied mathematics and mathematics education as well. Her work with the Math Across the Curriculum project at Dartmouth included the development of several interdisciplinary courses in mathematics and art and literature. She was designated CASE New Hampshire Professor of the Year for 2000.

Student Panel Discussion: What Can I Do With A Mathematics Major?
Abstract: Mathematics is fun and intellectually stimulating to study. Studying mathematics helps one to develop skills that will be beneficial in the workplace. Join area college graduates and college students for a panel discussion of the benefits of a mathematics major workplace.

Student Panel Discussion: Why Should I Go To Graduate School?
Abstract: Graduating from college and you cannot decide if you want to work or if you want to go to graduate school? Join area graduate students for a discussion of the benefits of graduate study. Find out what it is like to go to graduate school to pursue a Master's degree or a Doctorate.