FOCUS

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In this Issue

Enthusiasm for Research in Collegiate Mathematics Education Grows

Annie and John Selden

Spurred on by the calculus reform movement, the Humanistic Mathematics Network, the Linear Algebra Study Group, the MER Forum, the AMS–MAA Joint Committee for Research in Undergraduate Mathematics Education, and *UME Trends*, there appears to be a groundswell of interest in knowing more about how college students learn mathematics and how that learning might be fostered. This manifested itself at a September Exxon-sponsored conference, Research in Collegiate Mathematics Education, attended by some 150 mathematicians, mathematics educators, and mathematics education researchers at Central Michigan University.

An opening panel discussed the relationship between educational research and teaching practice. Lida Barrett, former president of the MAA, reported that this issue had been the subject of a working group at the International Congress on Mathematical Education, which stressed the need for cooperation between researchers and practitioners. Hyman Bass, chair of the MSEB, focused on the educational dilemma posed by the great linguistic compression of mathematics, e.g., in its symbolism, which is both difficult for initiates to comprehend and necessary for the practice of contemporary mathematics.

Another panel considered the kinds of knowledge required of K–12 teachers if they are to encourage the development of genuine mathematical thinking in their students. To demonstrate how easily open-ended discussions can develop in directions that challenge teachers' mathematical knowledge, participants were invited to view a video of a third grade class discussing "odd" and "even." In it, one student, Shea, proposed that 6 is both "odd-and-even" because it can be split evenly with nothing left over, but also has three groups of two—a fact he found exceedingly interesting. His teacher, panelist Deborah Ball of the University of Michigan, had to decide, on the spot, whether to pursue this issue with the class. A lively discussion of conference participants ensued. What did Shea understand? A remarkable variety of ideas were proffered, illustrating how much more one can "read" into a video clip than can be justified.

In his invited address on constructing meanings, Richard Noss, University of London, offered three fundamental dilemmas:

• **Cognitive** You can't use a mathematical idea until you understand it. You can't understand an idea until you've used it.

• **Epistemological** Mathematical definitions, by themselves, supply few meanings. Meanings derive from properties. Properties depend on definitions.

See *Math Ed* on page 3

Editor search for FOCUS and the *College Mathematics Journal*

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Editorial

The End of Mathematics

In 1969, in his book *The Coming of the Golden Age: A View of the End of Progress*, UC Berkeley biologist Gunther Stent wrote of science, "...the dizzy rate at which progress is now proceeding makes it seem very likely that progress must come to a stop soon, perhaps in our lifetime, perhaps in a generation or two."

In a nutshell, Stent's argument was essentially this: The aim of a science, any science, is to understand a particular aspect of the world or the universe we live in. In chemistry, for instance, the goal is to understand the molecular structure of the stuff of which we and our world are made, what the basic constituents are and the laws by which they combine. Once the chemical elements had been identified—largely achieved in the last century—it only remained to understand the principles that governed the ways they combined. That task was largely completed in the 1930s when Linus Pauling showed how to understand all chemical reactions in terms of quantum mechanics.

According to Stent's logic then, chemistry ended in the 1930s. Of course that does not mean that people have stopped doing chemistry. A glance through the door of your nearest chemical laboratory will reveal any number of white-coated chemists peering into test tubes (or, just as often these days, gazing at computer screens). Not even the most ardent "the end is nigh" scientist suggests that all progress will come to an end, that there will be quite literally nothing left to do. There will always be further advances, more knowledge to be had. But the *major* discoveries have all been made, the basic understanding has been achieved. What is left to be done consists of tidying up the loose ends, increasing our understanding of the basic principles, and deducing useful consequences of those principles. Since some of those consequences may well turn out to be highly beneficial to humankind, it makes sense for society to continue to support the enterprise. But with no further big breakthroughs likely, genuine scientific advances will become increasingly "marginal," and made at increasing cost.

Sounding a similar note to Stent, the Nobel prize-winning physicist Richard Feynman wrote in his 1967 book *The Character of Physical Law*, "We are lucky to live in an age in which we are still making discoveries. It is like the discovery of America—you only discover it once. The age in which we live is the age in which we are discovering the fundamental laws of nature, and that day will never come again."

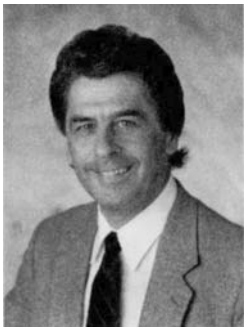
Can the same be said of mathematics? Is mathematics, too, destined to come to an end?

If we are careful to frame the question in the same way that Stent and Feynman posed it for the natural sciences, I think the answer is almost certainly yes.

Having started out as the study of patterns of counting and number, in two thousand years mathematics has grown into the science of patterns of many different kinds. For instance, study of the patterns of motion led to calculus, study of perspective led to projective geometry, study of the patterns of waves led to Fourier theory, study of the patterns of position and continuous transformation led to topology, study of the patterns in human conflict gave rise to game theory, and study of the patterns of information flow led to information theory. Each such extension marked a new domain to which mathematics could be applied, and thereby increase our understanding of our world.

This period of expansion is, it seems to me, not going to continue indefinitely. That there will continue to be problems to attack seems beyond any doubt. And if that is what you mean by mathematics, then it surely has a long and healthy life ahead. But in terms of enlarging our fundamental understanding of our universe, I think the appropriate model is the exploration of America. You do it once, and the rest consists of acquiring more detailed knowledge about the places you have already discovered.

But there is, it seems to me, one area that neither science nor mathematics has penetrated very far at all: ourselves. Mathematics and science have proved remarkably successful at helping us to make sense of our physical environment. But our understanding of the human mind is still in its infancy. You don't need a powerful microscope or a huge telescope to see the limits of modern science. All you need is a mirror.



The world of the human mind is the world in which the so-called 'soft' sciences have sprung up—psychology, sociology, and linguistics. Since the very phrase 'hard science' is more or less synonymous with 'mathematically-based science,' it seems to be an accepted given that these newer and social sciences are intrinsically non mathematical.

But does that mean that mathematics can have no role to play in our quest to understand the human mind? If we restrict ourselves to the kinds of mathematics you will find in today's libraries, the answer is probably yes. But mathematics has extended its borders many times in the past. It could do so again. Not enough to provide a mathematical account of mind, I suspect. I don't think mathematics on its own is the right tool for that job. But I see no reason why a suitable "new math" coupled with other kinds of analysis cannot lead to an increased understanding of mind. The Golden Age of mathematical expansion may well be over. But as one part of an exploration of what it is to be human, its greatest days may still be ahead.

Keith Devlin pursues the above theme in his latest book, Goodbye, Descartes: The End of Logic and the Search for a New Cosmology of Mind, *just published by John Wiley and Sons.*

The above opinions are those of the FOCUS editor and do not necessarily represent the official view of the MAA.

Math Ed from page 1

• **Pedagogical** Concrete thinking is both a prerequisite for abstract thinking and an impediment to abstract thinking.

Ed Dubinsky of Georgia State University, in an invited address, presented his action-process-object-schema (APOS) theoretical framework for research, illustrating it with transcripts of abstract algebra students' problem-solving attempts. He listed the characteristics of a good theory—it should be coherent and parsimonious, generalizable and predictive, applicable and effective. While a teacher might ask, "Did the students learn the math?" a researcher employing this theory would first perform an analysis (genetic decomposition) of a concept such as group, collect data, and ask, "Does the data suggest the students constructed the expected actions, processes, and objects?" If not, one revises the analysis and repeats the process.

Brad Findell, University of New Hampshire, presented a "map of the territory," based on an Exxon-funded Education Development Center study which surveyed research in undergraduate mathematics education from 1985 through 1994. There were 313 research articles, with just sixteen at the post-calculus level—only ten researchers published five or more articles. More information, including a database which can be downloaded, can be found at http://www.edu.org/LTT/RUME.

Anna Sierpinska of Concordia University, in her invited address, considered some epistemological issues in the design of introductory linear algebra courses. What is the epistemological status of examples there? In introducing concepts, textbook authors go either the synthetic or the analytic route—in the former, one describes an object which already exists, whereas in the latter, one creates an object via the definition. The status of these two kinds of objects is very different. Some authors follow the didactic principle of going from the "concrete to the abstract" when giving introductory examples. Such authors are in the analytic mode from the beginning—that's why they speak of "examples." However, the typical North American student operates in the synthetic mode and is "taken for a ride." Sierpinska suggested replacing examples with activities and indicated various possible (mental) constructions students might make as a result. She noted that historically, linear algebra evolved as a way to organize general methods, but students are unaware of this. They only see "a kit of tools."

In her invited address, M. Kathleen Heid of Penn State noted that math ed researchers are changing what they are looking at. Theoretical ideas such as constructivism, procepts, APOS, Perry levels, and Kieren and Pirie's dynamic levels of personal knowledge growth are becoming more important. In addition to investigating students' understandings of topics such as the Chain Rule, groups, or logic, mathematical ways of knowing such as symbol sense, mental imagery, proofs, and sources of conviction are being investigated. Additional research areas include the role of technology, equity and affective issues, teacher subject matter knowledge, and various pedagogical approaches, from cooperative learning to apprenticeships and portfolios. What does such research require? (1) Grappling with what it means to teach/learn mathematics; (2) understanding what prior research/theory tells us; (3) asking questions well situated in the literature and relevant to current problems; (4) designing a way to address these questions; (5) gathering data appropriately; (6) accounting for and analyzing all relevant data both qualitatively and quantitatively; and (7) sharing the results, i.e., publication. However, such research is not quick. She also warned that research in undergraduate mathematics education, which started later, should not be thought of as separate from other research in math ed.

More people are needed to do this time-consuming research. In response to an "interest session" called by Ed Dubinsky, at least twenty-five participants expressed a desire to be mentored into the field, and a group of mentors is now assisting them. A second Research Conference in Collegiate Mathematics Education is being planned for September 1997 at Central Michigan University. For information, contact David.M.Mathews@cmich.edu.

Annie Selden is a professor of mathematics at Tennessee Technological University in Cooksville. John Selden is the president of Math Ed Resources Company (MERC). They can be reached at JS9484@tntech.edu.

MAA Seeks Editors

FOCUS

Nominations are open for the editorship of FOCUS. The five-year term begins in January 1998 and is renewable after the first and third year. The editor of Focus reports to the Associate Director for Publications and Electronic Services and works closely with the editor of *MAA OnLine* and the Joint FOCUS/*MAA OnLine* Advisory Committee to disseminate MAA information and items of interest to MAA members. Access to email and the web are essential. In addition, the editor should have editorial experience and should be familiar with the workings and organization of the MAA. Mathematics teaching at a two-year college, four-year college, or university is desirable. Nominations and applications are welcome from any member of the MAA and should be sent to the chair of the search committee, Bill Watkins (bill.watkins@csun.edu). The committee will begin its deliberations in early March and expects to make a recommendation before the summer meeting in August.

College Mathematics Journal

Nominations are open for the editorship of *The College Mathematics Journal* (CMJ). The five-year term is to begin in January 1999. The CMJ emphasizes the first two years of the college curriculum and its readership comprises undergraduate faculty and students. The Nominating Committee is seeking candidates who possess good writing and editing skills, good interpersonal skills, the ability to meet deadlines, and a vision of the purpose of the CMJ. Experience teaching lower-division mathematics at a two-year college, four-year college, or university is desirable. Nominations and applications are welcome from any member of the MAA and should be sent to the chair of the search committee, Susan Forman (sforman@dana.org). Applicants will be asked for copies of their CV and a letter stating their vision for the CMJ. The committee will begin its deliberations in early March and expects to make a recommendation by April so that the name of the editor-designate can be voted on by the Board of Governors in August.

1996 Undergraduate Research Prizes Awarded

1997 Nominations Now Open

Two undergraduates were honored at the Joint Mathematics Meetings for their extensive mathematical research activities. Manjul Bhargava, a 1996 graduate of Harvard University, was awarded the prestigious AMS–MAA–SIAM Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student. Bhargava is now a graduate student at Princeton University. Honorable Mention was awarded to Lenhard L. Ng, who recently graduated from Harvard University and is now enrolled at MIT. The Morgan Prize Committee noted that Bhargava's work in polynomial functions "unifies and generalizes the results of about twenty previous papers, many by well known mathematicians. In addition, he has settled several longstanding conjectures in the theory of polynomial functions on various types of rings." Ng was cited for his work in graph theory—some of which he did when he was seventeen years old—and work in quantum mechanics, group theory, and probability.

Begun in 1995, the Morgan Prize is an annual award of $1000 which was endowed by a gift from Mrs. Brennie Morgan of Allentown, Pennsylvania. To be eligible for the 1997 award, nominees must be undergraduate students (individuals or groups) in December 1996 at any college or university in the U.S., its possessions, Canada, or Mexico. To apply, undergraduates submit one or more published or unpublished papers that represent their work. Professors can also nominate students. Details on the Morgan Prize and application procedures are available on *MAA Online*, http://www.maa.org.

San Diego '97

Warm weather, sunny skies, and a sparkling Pacific Ocean formed the backdrop for the Joint Mathematics Meetings held in San Diego, California, January 8–11. Life inside the cavernous San Diego Convention Center, our home for four days, was just as warm and sparkling as the views outside, as 3500 mathematicians gathered together to do what they like to do most of all: talk about mathematics. It would take a whole book to describe all the events—indeed, the meetings program alone *is* a book, weighing in at 120 pages. If you were not there, plan to attend next year and see for yourself. We hope to see you in Atlanta in August for the MAA MathFest, and then in Baltimore next January for the 1998 Joint Meetings.

MAA Awards Made in San Diego

As in years past, the Awards Ceremony was one of the highlights of the Joint Mathematics Meetings, when the MAA, AMS, and AWM recognize outstanding contributions made by some of their members.

Chauvenet Prize

The Chauvenet Prize for expository writing is given for an outstanding expository article on a mathematical topic by a member of the Association. This year the prize was awarded to Tom Hawkins of Boston University for his article "The Birth of Lie's Theory of Groups," published in *The Mathematical Intelligencer* 16 (1994), 6–17. The citation for the award reads, "...the article reminds us of the invariance, over time and over culture, of the thrill involved in doing mathematics, and of the fun of finding someone on the same wavelength with whom to talk mathematics. But most importantly, it makes accessible the fascinating story of the development of an important part of mathematics, as is told by Hawkins in a beautiful and compelling manner."

Tom Hawkins has been a professor of mathematics at Boston University since 1972.

Deborah and Franklin Tepper Haimo Awards for Distinguished College or University Teaching of Mathematics

In 1991 the MAA instituted these awards to honor teachers who have been widely recognized as extraordinarily successful and whose teaching effectiveness has been shown to have had influence beyond their own institutions. In 1993 the MAA Board of Governors renamed the award to honor Deborah and Franklin Tepper Haimo. Deborah Tepper Haimo was president of the MAA, 1991–92. This year's awards went to Carl C. Cowen, Jr., Carl Pomerance, and T. Christine Stevens.

Professor Cowen has been at Purdue University since 1978, serving as director of the Actuarial Science Program since 1992. He is currently the governor of the Indiana Section of the MAA.

At the University of Georgia since 1972, Professor Pomerance was the MAA's Pólya Lecturer, 1993–95, and won the 1985 Chauvenet Prize for his paper "Recent Results in Primality Testing" (*Mathematical Intelligencer*, 1981).

Professor Stevens is currently chair of the Department of Mathematics and Computer Science at Saint Louis University and codirector of the MAA's Project NExT.

Yueh-gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics

This is the most prestigious award made by the Association. First given in 1990, the award is made possible by the late Dr. Hu and his wife, Yueh-gin Gung. Dr. Hu was a retired professor of geology at the University of Maryland. He had such strong feelings about the basic nature of mathematics and its importance in all human endeavors that he felt impelled to contribute generously to the discipline.

This year the award went to MAA former President Deborah Tepper Haimo, professor emerita at the University of Missouri–St. Louis and presently based at the University of California, San Diego. The citation accompanying this award, the full text of which will be published in the *American Mathematical Monthly*, reads in part:

"All presidents of the MAA are called upon to provide a heavy service effort. But Professor Haimo has gone beyond the normal presidential service by her reorganization of the cumbersome MAA committee structure, by her personal devotion to obtaining the recognition of outstanding teaching in each MAA section of the country, by creating the national awards bearing the name of her late husband and herself, and by encouraging the participation of women in mathematics at every level and in the Association. These are tremendously valuable achievements, worthy of the Gung–Hu Award."

Prior to her presidency, Professor Haimo served the Association for many years on a number of important committees and as a member-at-large of the Board of Governors (1974–76). During 1986–87 she was first vice-president and 1988–89 she served as chair of the search committee for an executive director. She is currently chair of both the Nominating Committee and the Development Committee. Outside the MAA, she has served on numerous national and international panels and committees.

Certificates of Meritorious Service

Certificates of Meritorious Service are presented for service to the MAA at the national level or for service to a section of the Association. This year's awardees follow.

Professor Don R. Lick, Michigan Section, is professor and head of the Department of Mathematics at Eastern Michigan University. He was governor of his section, 1986–89, and chair of the Committee on the Teaching of Undergraduate Mathematics, 1989–92.

Frank P. Battles and Laura L. Kelleher, Northeastern Section, are both on the faculty at the Massachusetts Maritime Academy. Professor Battles has served as editor of the section newsletter for many years. Professor Kelleher has served as section officer, including secretary/treasurer and chair.

Professor William C. Ramaley, Rocky Mountain Section, is on the faculty at Fort Lewis College in Colorado. He was chair of his section in 1981 and has been secretary/treasurer from 1990 to the present.

Professor Glen Mattingly, Texas Section, has been chair of the Department of Mathematical and Information Sciences at Sam Houston State University since 1967 and governor of his section in 1995.

Professor Ernest Ross, Florida Section, was assistant vice-president and academic dean of the Clearwater campus of St. Petersburg Junior College until his retirement in 1995.

More details on each of the above MAA awards can be found on MAA Online.

Ohio Section Summer Short Course

Topics in Discrete Mathematics
Wittenberg University, June 5–7

This short course will include lectures on check digits, coding theory, group theory, Cayley graphs of groups, and repeating Escher-type patterns. The goal of the course is to provide some interesting nonstandard material that can be incorporated into a course in discrete math or abstract algebra. The course will be accessible to all college mathematics instructors. The presenter is Joe Gallian (University of Minnesota–Duluth).

The registration fee is $100. Registration is open until thirty-eight deposits are received or May 5, whichever is earlier.

For more information or to register, contact Bill Higgins, Dept. of Math and CS, Wittenberg University, PO Box 720, Springfield, OH 45501; (937) 327-7859; fax: (937)-327-6340; e-mail: higgins@ wittenberg.edu. This announcement and any updates will be posted on the MAA Ohio Section home page.

Conference on the Teaching of Mathematics

June 20–21, 1997

Sponsored by the Calculus Consortium based at Harvard, John Wiley & Sons, Inc., and the National Science Foundation, the conference will address a broad range of issues relating to mathematics education reform. Topics include calculus reform in colleges and secondary schools, changes in pre- and post-calculus courses, integrated science and mathematics curricula, the impact of reform on client disciplines (engineering, physics, chemistry, and business), and student reactions to reform.

An impressive group of speakers and panelists will address these topics. Contributed papers, a poster session, and several hands-on workshops are also being planned.

Contributed papers (fifteen minutes each) are an important part of the conference each year. They are being accepted for a range of topics, including changing pedagogy, evaluation, using technology, assessing students' knowledge, and topics in transition (in calculus as well as before and after).

If you have a presentation, panel, workshop, or poster you would like to propose, send a twenty-five-word abstract to math@wiley.com.

If you have a contributed paper you would like to present, please send the title, category, and a twenty-five-word abstract of the paper by April 1, 1997 to:

Karen and Joe Thrash
Mathematics Department
University of Southern Mississippi
720 East Beach Blvd.
Long Beach, MS 39560
calculus@bull.cc.usm.edu

Attendance is welcome from any two-year and four-year college or university as well as secondary schools. Registration fees are $65 for faculty and $25 for graduate students. To register or for more information, contact: vwanner@wiley.com; (212) 850-6132; fax: (212) 850-6188.

MAA Joins MCM

In November 1996 the Executive and Finance Committee approved an expense budget for two MAA judges for the Mathematical Contest in Modeling. The "two" is important because the MCM is, in practice, a dual competition. Each team of three undergraduates gets to choose between two problems—one discrete, the other continuous. The set of "discrete" judges and the set of "continuous" judges work independently of each other. It has taken a few years (the MCM started in 1985), but the MAA joins SIAM and INFORMS (nee ORSA–TIMS) as a sponsor of the MCM.

The task of choosing MAA judges falls on the Coordinating Council for Competitions, currently chaired by Tom Tucker (Colgate University). The incoming chair is Lida Barrett (USMA). Basic criteria for appointment are: active in the MAA; engaged in undergraduate education; and a strong background in modeling.

Each judge will designate an MAA "winner" from among the final roster of outstanding teams. This roster usually has three to four continuous teams and five to six discrete teams. The two winning teams will receive certificates and will be invited to make presentations at the MAA's national meeting. MCM teams have been invited to meetings for several years, but there has been no official MAA policy for choosing which teams.

The council chose Jack Robertson (Georgia College) for continuous judge and Kathleen Shannon (Salisbury State University) for discrete judge. The contest will be held the weekend of February 7. For further information, call COMAP at (617) 862-7878, or e-mail the founder of the MCM, Ben Fusaro, fusaro@math.fsu.edu.

Knuth, Quine Awarded Kyoto Prizes

Computer scientist and mathematician Donald Knuth of Stanford University, and logician and philosopher Willard Van Orman Quine of Harvard University were two of the three recipients of the 1996 Kyoto Prizes for lifetime achievement in the arts and sciences. With the third award going to geneticist Mario Renato Capecchi of the University of Utah, this was the first time all three laureates were from the United States.

Knuth, author of the three-volume work *The Art of Computer Programming* and the creator of TeX, was awarded the prize for advanced technology. Quine, known to mathematicians for his highly influential work in logic, won the prize in creative arts and moral sciences. Capecchi won the award in basic science.

Knuth, 58, was cited for his work in the development of 20th century information sciences. "His enormous contributions...have established him as a giant in the field," said the nonprofit Inamori Foundation, which sponsors the prizes.

Each received a cash award of 50 million yen, or $460,000, at the November ceremonies in Kyoto, 232 miles southwest of Tokyo.

Project NExT: New Jobs, New Responsibilities, New Ideas

Project NExT (New Experiences in Teaching) is a program for new or recent Ph.D.s in the mathematical sciences who are interested in improving the teaching and learning of undergraduate mathematics. Faculty who are just beginning or just completing their first year of full-time teaching at the college/university level are invited to apply to become Project NExT fellows. Approximately sixty fellows will be selected. They will participate in a yearlong program of activities, including

- a two-and-a-half day workshop just prior to the summer 1997 MAA meeting (MathFest)
- a network that links Project NExT fellows with one another and with distinguished teachers of mathematics
- special events at the winter 1998 Joint Mathematics Meetings
- a second workshop in the summer of 1998.

The opening workshop will feature discussions of new approaches to teaching calculus and pre-calculus, alternative methods of assessment, using technology in the classroom, applying the results of pedagogical research, and faculty roles as teacher and scholar. Invited speakers include MAA President Gerald Alexanderson (Santa Clara University), Sylvia Bozeman (Spelman College), Joseph Gallian (University of Minnesota–Duluth), Anita Solow (DePauw University), and M. Kathleen Heid (The Pennsylvania State University).

Fellows receive support from Project NExT for room and board at the summer 1997 workshop and for special short courses at the MathFest. Institutions employing Project NExT fellows are expected to provide financial assistance for travel to and attendance at the national meetings. Limited funds are available to assist those institutions that are unable to afford support.

More detailed information about the program and application materials are available on the Project NExT home page (http://archives.math.utk.edu/projnext/). The deadline for applications is April 25, 1997. Those received after that date will be considered if space is still available. Applicants will be notified of the decision by June 1. For further information, contact either of the project codirectors: James R. C. Leitzel, Dept. of Math, University of New Hampshire, Kingsbury Hall, 33 College Rd., Durham, NH 03824; (603) 862-4546; e-mail: jrcl@christa.unh.edu; T. Christine Stevens, Dept. of Math and Computer Science, Saint Louis University, 221 N. Grand Blvd., St. Louis, MO 63103; (314) 977-2444; e-mail: stevensc@slu.edu.

Project NExT is sponsored by the Mathematical Association of America. Funding is pending.

Calculus Workshop

Dickinson College, June 15–21, 1997

This NSF/UFE summer seminar, Using Interactive Pedagogies and Technology to Teach Fundamental Concepts, will include

- **immersion in an interactive learning environment**
- **experience using MBL/CBL tolls, computer algebra systems, and ISETL**
- **and opportunity to customize curricular and assessment materials for use at home institutions.**

Instructors include Seminar Director Nancy Baxter Hastings (Dickinson College), Kevin Callahan (Cal State Hayward), David Hastings (Shippensburg University), and Christa Fratto (Suffield Academy). For more information, contact Joanne Weissman, Dept. of Math, Dickinson College, PO Box 1773, Carlisle PA 17013; (717) 245-1857; e-mail: weissman@dickinson.edu.

Project CLUME

1997 Faculty Development Workshop

June 12–25, 1997

If you are a caring and dedicated undergraduate mathematics instructor at any post-secondary institution, trying to make your courses stimulating and effective, and interested in innovative pedagogical strategies...**but** you have been disappointed with past results and feel the need for help in learning to use new teaching methods...**if** your students feel stuck and frustrated despite your best efforts and excellent explanations, show poor understanding of the important ideas, often fail to reconstruct the meanings your words are trying to convey, and don't seem to like mathematics as much as you do...**we invite you** to join us in a workshop dedicated to learning how to use cooperative learning.

In this program, you will discuss the nuts and bolts of using cooperative learning in your classroom, talk about all the things that can go wrong when students work in groups, discuss ways of avoiding or overcoming these pitfalls, read and hear about experiences of faculty who have been using cooperative learning for years in classes ranging from developmental mathematics to abstract algebra, look at learning theory to see why this method is so promising, and read about studies of the effectiveness of cooperative learning.

Support for living expenses will be provided by anticipated NSF funding. Books and other written material will be available at nominal cost. For information and application forms, contact Jakki Gaither, Dept. of Math and Computer Science, Georgia State University, Atlanta, GA 30303-3083; (404) 651-2245; fax: (404) 651-2246; e-mail: matjjg@mathcsc.cs.gsu.edu. Completed application forms must be received by March 14, 1997.

Statistical Physics Methods in Discrete Probability, Combinatorics, and Theoretical Computer Science

DIMACS Center, Rutgers University, Piscataway, NJ, March 23–27, 1997

This workshop will focus on new developments and directions at the interface between statistical physics and the fields of discrete probability, combinatorics, information theory, and theoretical computer science. The workshop will bring together both established and young researchers in the various fields with the intention of developing a common language and recognizing parallels among the fundamental problems being addressed by these researchers.

For more information, contact Jennifer T. Chayes, UCLA; e-mail: jchayes@math.ucla.edu; or Dana Randall, Princeton University; (609) 258-1749 or (908) 445-4576; e-mail: randall@ cs.princeton.edu. For local arrangements, contact Pat Pravato, DIMACS Center; (908) 445-5929; e-mail: pravato@dimacs.rutgers.edu; WWW: http://dimacs.rutgers.edu/Workshops/index.html

NSF Undergraduate Faculty Enhancement Workshop

Elementary Statistics Lab Workshop

University of South Carolina, June 24–28, 1997

Participants will take part in hands-on experiences illustrating important concepts of applied statistics and discuss strategies for leading a lab session, using student teams, having students produce written reports, obtaining equipment, scheduling, constructing new lab exercises, generating enrollments, and training lab assistants. Contact John Spurrier, Dept. of Statistics, University of South Carolina, Columbia, SC 29208; (803) 777-5072; e-mail: spurrier@stat.sc.edu.

IAS/Park City Mathematics Institute

Summer Session 1997: Symplectic Geometry and Topology

Park City, Utah, June 29–July 19, 1997

The IAS/Park City Mathematics Institute (PCMI) is a multi-level mathematics program built on the premise that interaction among researchers, graduate students, undergraduates, and high school teachers is essential to the optimal functioning of the mathematical enterprise. It is sponsored by the Institute for Advanced Study in Princeton, New Jersey, receives major funding from the NSF, and additional support from the Geraldine R. Dodge Foundation.

The Summer Session will be held at the Inn at Prospector Square, Park City, Utah and will include graduate summer school lecturers, undergraduate program lecturers, and high school teacher program lecturers. All applicants are invited to apply for financial support. For applications and information, contact IAS/PCMI, Institute for Advanced Study, Olden Ln., Princeton, NJ 08540; (800) 726-4427; e-mail: pcmi@math.ias.edu; URL: http://www.ias.edu/. Application deadline is February 15, 1997.

Calculus Reform Workshop Program

The purpose of these NSF-sponsored workshops is to disseminate the fruits of the reformed programs on a national level wherever calculus is taught: high schools, community colleges, four-year colleges, and universities. Eight five-day workshops will be offered in the summer of 1997 at sites geographically distributed throughout the country. Each workshop will have twenty-four participants, chosen not only because they teach calculus, but because they exercise leadership in the high schools, community and four-years colleges, and universities of the areas from which they come. All expenses, except for participant travel, will be paid by the NSF grant.

The following five threads will be woven through each of the workshops.

1. History and present state of the calculus reform movement
2. Participant involvement as a student under the pedagogy being promoted by the calculus reform movement
3. In-depth experience in the reform program associated with the workshop instructors and a general overview of the major reform programs
4. Experience in the use of technology for teaching mathematics
5. Participant input ("My favorite problem," development of a curriculum topic, etc.)

As a follow-up to the workshop, participants are expected to formulate and implement an action plan suitable in their home institutions.

For more information, contact the local coordinator for the workshop of interest or Don Small, Dept. of Mathematical Sciences, USMA, West Point, NY 10996; (914) 938-2227; fax: (914) 938-2409; e-mail: small@euler.math.usma.edu.

1997 NSF Calculus Reform Workshops

June 1–6 Integrated/Core Approach to Calculus
Local Coordinator: Jerry Wilkerson, Missouri Western State University, St. Joseph, MO; (816) 271-4374

June 8–13 Calculus Reform: Activities & Projects
Local Coordinator: Alexander Fluellen, Clark Atlanta University, Atlanta, GA; (404) 880-8007

June 22–27 An Active Approach with Projects
Local Coordinator: Marie Vanisko, Carroll College, Helena, MT; (406) 447-4451

June 15–20 Calculus in Context
Local Coordinator: Kalpana Godbole, Michigan Technological University, Houghton, MI; (906) 487-2938

June 15–20 Calculus with *Mathematica*
Local Coordinator: Tom Ralley, Ohio State University, Columbus, OH; (614) 292-2254

July 20–25 Calculus Resources
Local Coordinator: Meridy Amsden, Macalester College, St. Paul, MN; (612) 696-6337

August 3–8 Oregon State Project
Local Coordinator: Ruth Edidin, Morgan State University, Baltimore, MD; (410) 319-3952

August 5–9 Harvard Consortium Project
Local Coordinator: Dave Lomen, University of Arizona, Tucson, AZ; (602) 621-6893

MAA Undergraduate Student Paper Sessions at Atlanta MathFest

The MAA summer meeting will include the tenth annual MAA Undergraduate Student Paper Sessions. MAA Student Chapter members presenting papers may be eligible for partial travel support. Complete details on submission procedures and applications for travel support will be published in the April issue of FOCUS. This information will also be available on *MAA Online* (www.maa.org). Students are advised to begin making plans now regarding participation. The deadline for submissions is June 27.

FOCUS

FOCUS is published by the Mathematical Association of America six times a year: February, April, June, August, October, and December.

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Jerry Alexanderson on Mathematics, Music, and Bow Ties

Gerald L. (Jerry) Alexanderson became the MAA's forty–sixth president in January 1997. Prior to being elected to the presidency, Jerry served the MAA as secretary and editor of *Mathematics Magazine*. Professor Alexanderson is the co-author of many research papers on combinatorial geometry and several books, including the best–selling *A First Undergraduate Course in Abstract Algebra*, fifth edition (with Hillman).

Jerry brings to the presidency a love of mathematics, teaching, music, art, bow ties, and dogs. He was interviewed in his book–filled office at Santa Clara University in August 1996 by Don Albers.

D. ALBERS: Let's start with your roots.

G. ALEXANDERSON: I was born in Idaho and I'm an only child. But my family was really from Northern (*really* northern) California and we moved back there when I was seven.

D.A. : How about your parents?

G.A. : My father was not much interested in academic matters. My mother majored in English at the College of Idaho, and she gave me some good advice when it came time to go to college. She said don't take history courses, they're boring; take mathematics, it's fun. So that's what I ended up in. Had she told me that history is fun, I might be an historian. She was interested in literary things.

D.A. : So you moved to Eureka, California when you were seven years old.

G.A. : Yes, and I went to high school at Fortuna Union High School. It was there that I encountered Helen Crozier, who was a very good mathematics teacher. I was lucky in the sense that she had a master's degree in mathematics from the University of Oregon. She knew some interesting mathematics and passed along her enthusiasm for the subject. But I suffered rheumatic fever during my sophomore year in high school, so I was at home for a year. I studied geometry on my own and never formally took the course. She would occasionally stop by the house to check on my progress, pick up problems, etc. So I was only in high school for three years, but I used four years of my life to do it. I've remained in touch with her all these many years. She was a great fan of Pólya, but there was no connection between the fact that she was a Pólya fan and that I ended up at Stanford and studied with him. She was impressed and enthusiastic when she found out that Pólya became my teacher. I remember when I was given an endowed chair here at Santa Clara, there was a nice party. The Pólyas attended, and she did too.

D.A. : So Helen Crozier certainly helped to develop the natural interest that you already had in mathematics.

G.A. : Yes. I have to go back to Hardy's remark, though, that he became a mathematician because he was good at it in school. In fact, he was *really* good at it in school! I wasn't that good at it in school, but, nevertheless, I think that really matters a lot. You tend to drift into what you're successful at. I like foreign languages and I like mathematics. I had to make a decision in college to go the route of French or of mathematics, and I decided it would be easier to get a job in mathematics.

D.A. : Do you have any other special memories of high school?

G.A. : I was not a football player, and there is some sort of a pop sociology book that says that if you're in high school, you're only a success if you're a football player or a cheerleader, and those of us who were not will spend the rest of our lives overachieving in order to show that we're as good as the football players and the cheerleaders.

A Defining Moment

D.A. : How did you choose the University of Oregon?

G.A. : I don't know. It had a pretty campus.

[Laughter.]

D.A. : But it meant paying out–of–state tuition.

G.A. : Yes, but just because one is in mathematics, it should not be assumed that one is rational, and many decisions get made on a rather irrational basis. I really did think Oregon had a beautiful campus, and of course it may not have been entirely irrelevant that my high school mathematics teacher attended Oregon. But the mathematics department was good and had Ivan Niven, a real star. The chair at that time was Andrew Moursund who was a legendary chair and a wonderful man. I always went to see him when he was still alive. And there was one teacher, Robert San Soucie, who liked teaching and gave a terrific course in abstract algebra. I remember one defining moment in my sophomore year. It was a small class, and he would have us go to the board and prove things. He gave me a theorem to prove, and I now would be embarrassed to tell you what theorem it was because it's so easy, but it didn't seem so easy at the time. I proved it within minutes and impressed him, and my impressing him impressed me. At that point, I decided, well, maybe I have a future in this business. That clinched it, and I decided not to bother about French anymore.

President Alexanderson in his youth.

D.A. : Your interest in abstract algebra continues. Your book with Hillman is now in its fifth edition.

G.A. : Yes, well I do have some interest in abstract algebra.

D.A. : I understand you once had a little problem in the chemistry laboratory.

G.A. : In high school, yes. It was just enough to discourage me, but I won't say what I was doing. It was very stupid, and I still have scars to show for it. An experiment went wrong, and I decided I had no

future in experimental science.

The Church Organist

D.A. : You have strong interests in nearly all of the arts. You mentioned that your mother had very strong literary interests. Did she also have interests in the arts? Where do your interests come from?

G.A. : I don't know. I started taking the usual piano lessons at an early age. My music teacher, of course, thought that I should go into music, but again, I assumed that there was no chance of earning a living at that. I did earn money for a while as a church organist during my high school years. Helen Crozier was also a church organist.

D.A. : So you were pretty good.

G.A. : Well, I wasn't very good, but they were not very discriminating.
[Laughter.]

G.A. : It helps to have a naive congregation.

D.A. : Well, at least it got you to church.

G.A. : Well, that it did. So I've heard a lot of sermons in my time. I don't hear as many anymore.

D.A. : I don't think we should pursue this much further.
[Laughter.]

G.A. : But at any rate, I have retained a strong interest in music. But I don't try to perform anymore. It's too frustrating. If one plays badly, it's awful, and to play well, one has to find time to practice and that's just too difficult.

D.A. : How about some of your other interests – the ballet, opera, art ?

G.A. : Well, that followed my interest in music. I recall an occasion when a group of us came down to San Francisco to see the Royal Ballet on their first post–war appearance in the United States. Margot Fonteyn danced in Swan Lake, and that did it.

Years later I had lunch with Fonteyn here when we gave her an honorary degree.

Pólya and Stanford

D.A. : How did you choose Stanford for graduate school?

G.A. : I did it against everyone's good advice. I had offers at the University of Washington and Oregon, of course. But I had decided that I wanted to go to Stanford, and I realized at the time that it was not a good choice because Stanford at that time was so heavily committed to applied mathematics and mathematical physics. But I had family in the Bay Area, and I thought it would be nice to be here. So I came to Stanford, and it was a mixed experience because I was immediately thrown into classes in hydrodynamics and potential theory. And that didn't agree with me. I remember going in after one year and talking with Halsey Royden and saying, "I think I'm at the wrong place. I really would like to study some algebra, and he said, "Oh, well, we have algebra," and he sent me off to read about normed rings, which was really analysis. It was a department made up of stars– Schiffer, Loewner, Bergman, Pólya, Szego. All of them had made their reputations in classical analysis and mathematical physics. So I didn't feel very much at home.

During my first quarter, I met Pólya. Somehow we hit it off right away. I took a pro seminar from him and Loewner. At Stanford at that time, the system seemed to be that beginning graduate students took a seminar, and your future at Stanford was sort of determined by how you did in that problem seminar. If you impressed faculty in the problem seminar, you were kept on with financial support, and if you didn't impress them, out you went. I must have done enough problems to stay on because I was given continued support and got to study with Pólya. I first heard him lecture when I was an undergraduate at Oregon. Pólya was a traveling NSF lecturer and had spent several days at Oregon when I was a senior. I was impressed by his lectures and warmth, and that might have influenced me to some extent to come to Stanford, although he retired, technically, from Stanford in '52, and I came in '55. So I really shouldn't have expected to see all that much of him. As it turns out, I saw a great deal of him over many years, and up until the time he died. In my second and third years at Stanford, I was his assistant in a lot of different things.

D.A. : You certainly got to know Pólya over the years, to the point that you've written about him. You interviewed him for that famous book, *Mathematical People*, and are in the process of preparing a full–scale biography. Can you summarize Pólya in a short paragraph?

L to R: Stella Pólya, Helen Crozier, Jerry Alexanderson, and George Pólya

G.A. : Well, I think the thing that so impressed me about Pólya was his consummate taste in problems. He could zero in on wonderfully natural problems, and in that sense, I thought that he was the closest thing to a successor to Euler, my all–time hero in mathematics. I did not, however, have an opportunity to meet Euler.

D.A. : Nor did Pólya. I'm afraid there was a gap of over a hundred years.

[Laughter.]

D.A. : What has Pólya meant to you?

G.A. : Les Lange wrote at some point that Pólya had a large intellectual following. I was influenced by him enormously on just about all counts in his dealing with people very humanely, in his wide interests– much wider than mine– the arts, politics.

D.A. : So he was clearly a powerful influence on you, and you developed a very close, personal relationship with him and his wife, Stella, almost to the point that some people have said that Jerry G.A. is, to a large extent, the son they never had.

G.A. : Well, yes, I've heard that statement, but I wouldn't want to make that claim because there are others who also were very close to Pólya over the years. But it's true, as the years went on, Jean Pedersen and I probably took on more and more responsibilities that would normally have fallen to children, and it got to be a time–consuming thing because both he and his wife lived to grand old ages. There isn't a week that goes by when I don't think of something that I'd like to tell them, mainly

when I hear a good story. Pólya loved stories.

Santa Clara

D.A. : In 1958 you left Stanford and came to Santa Clara as an instructor, a rank that has pretty much disappeared from the academic scene. How did you end up at this wonderful Jesuit institution, not being a Jesuit yourself?

G.A. : Not even being Catholic. Well, I was getting increasingly frustrated at Stanford, with the offerings that they had. The courses that I seemed to be most interested in were taught by people who weren't there very long. So I thought I would take a break and earn a little bit of money and try teaching. I interviewed here and a few other places, and I was very attracted to Santa Clara as a pleasant place to be. I thought I would stay a year or two. I have now been here thirty–eight years. I plan to say on a while longer.

D.A. : That's more than a year or two. During the majority of those years, you have also served as the chair.

G.A. : I've been chair since 1967, and Andrew Moursund had been chair at Oregon for thirty–four years. His predecessor had been chair for thirty–four years, and so I assumed that if one became chair, it would be for thirty–four years.
[Laughter.]

D.A. : Santa Clara produces quite a few mathematics majors for an institution of this size with an inordinately large number of women among them.

G.A. : Out of thirty majors who graduated last year, 73% are women. Of the twelve students in my last number theory class, only one was a man. The token man, they called him. We may have to initiate special programs in the schools to get boys interested in mathematics. They'll find that they too can do mathematics.
[Laughter.]

D.A. : How do you account for that?

G.A. : A lot of credit goes to Alice Kelly and Jean Pedersen, both of whom have been very active in the Women & Mathematics program.

G.L. for King

D.A. : Over the years, you've had a very distinguished career as a teacher. Your students seem to like you quite a lot. I know that one class went so far as to make up buttons in your honor that read "G.L. for King." What's the secret? What do you think makes a good teacher?

G.A. : I don't know. I have never thought a great deal about it, and I wouldn't claim to be one, but it does seem to me that some people have a natural flair for it, and others do not. I think that one can make those who do not have a flair into better teachers. I'm not sure that one can make someone into a superb teacher. Nearly everyone has in his or her background some teacher or teachers who were enormously influential, and I would be hard–pressed to find common elements. Sometimes teachers who do not impress one so much during the course leave a great residue of enthusiasm for the subject after the course is over. This is a very difficult area to analyze. In my own case, if I've had any success, it's in generating enthusiasm for the subject, and I think to do that, one has to be something of a ham and in class carry on outrageously. Sometimes it takes a lot of fortitude to exhibit more enthusiasm for a subject than one naturally would feel after the umpteenth time through, say, some part of the calculus. I think that one has to be something of an actor.

D.A. : The show must go on.

G.A. : The show must go on. And that could get one in trouble saying something like that if one does not have a very good reputation for showmanship in the classroom. I, however, really do feel that there is nothing that I can do to learn the material for the students. They must learn the material. The best thing I can do is help them along and encourage them to think that it's really worth doing and worth knowing, and so conveying enthusiasm for the subject is a great part of teaching. Of course, when one is dealing with mathematics, about which it is so easy to be enthusiastic, one has a head start over a lot of other subjects.

D.A. : You've lived through a few reform movements in mathematics education.

G.A. : That's always in the air—I guess it's just the nature of the educational beast—discussions about new approaches. We have the Standards of NCTM today. We have working in small groups, cooperative learning, and the like. There's

Jerry sporting one of his many bow ties.

sometimes a bandwagon effect that comes into play with these things and those who don't jump on the wagon are sometimes regarded in somewhat less than a completely positive light.

When John Ewing was editing the *Monthly* during its centennial year, he took a bunch of quotes out of old *Monthlies*. You could read these quotes and they sounded like descriptions of what is going on today, except that they were quotes from fifty or seventy–five years ago. Ideas cycle through, and I can't get too excited about all of these things because some are not exactly new ideas.

Now, there is one big exception to that, and that is technology. There is no question that the hand–held calculator and the computer are something that we were not talking about in 1925. I wasn't talking about anything in 1925. What I worry about, though, is a certain dogmatism that develops in reform groups; if someone isn't doing it just the way the current advice would specify, that someone is a pariah. If one is still lecturing, at least to some extent in class, I don't think that's an evil. If small groups work for some, that is fine. If they don't work for others, that's fine too. There are lots of ways of being a good teacher.

Bow Ties

D.A. : For many years, you have exhibited more than what I would call a passing interest in bow ties, and I know one of your classes recently presented you with a dodecahedron nicely decorated with bow ties. It's clear that your students notice

these, and I wonder to what extent your wearing bow ties has had an impact on your teaching.

G.A. : It's part of the show. [Laughter.] You've got to be memorable somehow, and these days, you're memorable if you wear bow ties. I haven't tried the beanie with the propeller on the top, and bow ties are about as far as I'll go, but you've got to impress the students that somehow you and your subject are interesting.

Presidential Hopes

D.A. : You've been very actively involved in MAA affairs for many years now, at least as long as I've known you. We go back a quarter of a century at this stage.

G.A. : I joined the MAA when I was an undergraduate, of course. So my *Monthlies* go back to 1954. At Oregon, it was expected that you join the MAA if you were a mathematics major. You subscribed to the *Monthly* and you took the Putnam exam. My involvement started at the sectional level, of course, because I attended section meetings, and at some point, I became secretary of the Northern California Section.

D.A. : You have served as editor of *Mathematics Magazine*. You've finished your term as secretary, and now you're president–elect. It seems that each president coming to the office wants to accomplish something special during his or her term of two years, which really is a short period of time. What do you want to accomplish?

G.A. : I feel strongly about continuing what Ken Ross has started in trying to make sure that people entering the profession know about the MAA because no longer is it sufficient to be competent in research alone. Now, at all schools, people have to be competent as teachers, and the kind of activities that the MAA supports and makes available to its members through its journals, books, *MAA Online* and various programs are very relevant to people who are teaching. So I think that we have to follow through and really make sure that people entering the profession are involved in the MAA. Project NExT, for example, is a wonderful activity that boldly underscores what the MAA is about.

Chyna

D.A. : Recently, you have become friends with a magnificent dog, Chyna. Has your interest in dogs been there from the time you were a little boy?

G.A. : Oh, absolutely. I've had a dog since I was born, I think. I've never been without a dog except my first years at Santa Clara when I was living in an apartment and I didn't have room for one, but life without a dog or two or three is inconceivable.

D.A. : It's also very hard not to notice the deep interest that you have in books.

Jerry and Chyna relaxing.

In fact, you have a better–than–average interest in rare books.

G.A. : I modestly admit to having the best library in the history of mathematics in Santa Clara County, but then I have to modify that statement slightly. I realize that Stanford is in Santa Clara County. I've been collecting rare things in mathematics for thirty or forty years.

D.A. : Where does that interest come from?

G.A. : When I was at Oregon, I worked in the library as a student, and they had a wonderful room at that time where they showed off their rare books. It was right near the entrance and you couldn't go into the library without passing by illuminated manuscripts and beautifully printed books from the 15th century on. I soon developed a passion for books.

D.A. : You're also deeply involved, as the chair of the board of trustees in a very exciting new venture, namely the American Institute of Mathematics (AIM). How did you get tangled up in that?

G.A. : One of my students here at Santa Clara became interested in rare books in mathematics, oddly enough, and he later became president of a company that allows him a much better budget for purchasing books than mine. He has this interest in putting together an enormous mathematical library, the aim being to get absolutely everything in mathematics, and he's on his way. He talked me into chairing the board of trustees of AIM. One of the first major efforts of AIM was the Riemann hypothesis conference held in Seattle in August. We plan to continue this kind of activity, building a library and also sponsoring conferences and research.

D.A. : You also have a strong interest in music. Do you believe mathematics and music are related in significant ways?

G.A. : I've lectured on the subject from time to time, but that doesn't mean I know anything about it, of course. Better people than I have written on the subject: Descartes, Euler, Pólya,....Erdös told me that someone in Hungary had done a study and concluded there is no connection between mathematics and music. But I have not looked up the study – I don't want to be disillusioned. Leibniz, in a letter to Goldbach, had it right, I think, when he said that music is just subconscious counting.

* * *

MAA–FSU Summer Workshop

June 2–6, 1997

Cryptology, Mathematics, and Computers

Robert Lewand, Goucher College, Presenter

For additional information and registration forms, contact: John H. Biggs, co-director and Edward T. White, co-director; E_WHITE@FRE.FSU.UMD.EDU; or Sandra Cochrane, (301) 687-4394; fax: (301) 687-4795.

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Zorn, Paul, Editor, *Mathematics Magazine* (12/00), St. Olaf College

Reform Calculus Short Course

Calculus Enhanced With Computer-Algebra and Graphing Using the TI-92

University of Massachusetts Amherst

June 23–27, 1997

University, college, and high school calculus instructors are invited to attend the short course sponsored by the UMass Amherst Mathematics and Statistics Department and Ohio State University, and partially funded by Texas Instruments.

Each participant will have loan of a TI-92 for the week. Computer Based Laboratory instruments will also be available for data collection. Real-world applications and other calculus reform pedagogy will be featured.

Texas Instruments will offer reduced prices on the TI-92, TI-83 or TI-85 Viewscreen calculator, and CBL. Purchases are limited to one calculator and one other item. *Cabri* for Mac and Windows and *Graph Link*software will also be available. The presenter is Mary Ann Connors. Frank Demana, Ohio State University, will be a guest lecturer.

There is a limited number of spaces available. Applicants will be accepted on a first come–first served basis upon receipt of the $150 registration fee. For more information, contact: Dr. Mary Ann Connors, Math & Stat Dept., Lederle Graduate Research Tower, University of Massachusetts, Amherst, MA 01003; (413) 577-0717; fax: (413) 545-1801; e-mail: mconnors@ math.umass.edu.

Mathematica in the Mountains

Come join us for a cool week in the Colorado mountains (9000 feet elevation) at the fourth annual Mathematica in the Mountains course (July 7-12, 1997).

Introductory and intermediate courses are taught by Ed Packel (Lake Forest College) and Stan Wagon (Macalester College). Emphasis is on materials that will be directly useful in undergraduate courses from calculus through differential equations, number theory, and numerical analysis. Tuition fee of $595 includes use of Mathematica and complete course notes. Information: Stan Wagon, (970) 468-0977; wagon@ macalester.edu.

PERSONAL OPINION

A Mathematician's Apology? It's Time to Stop*

Timothy S. Norfolk

I am now in my twenty-fifth year of studying mathematics and my eighteenth year of teaching. During that time, I have had more than my fair share of people who have happily and openly expressed their lack of ability at mathematics, or even their hostility towards it. In such cases, while I privately wonder whether they would openly express the same feelings towards reading and writing, I usually find myself being sympathetic or apologetic, since that is my nature.

Lately I have noticed a much more disturbing trend. I have the very strong feeling that incompetence at mathematics is not only accepted but encouraged, both by the media and part of the education hierarchy.

Much of the maligning of mathematics centers on the fact that it is *hard* and not *fun*. It is as if mathematics were the vegetables of the academic dinner: Everyone knows that they are good for you, but no one forces you to eat them.

It is my contention that a great deal of this attitude shift can be laid at our own doorstep, since we, as a community of mathematicians, seem to have responded to past attacks by both apologizing for the material and by frequently dumbing it down. As I stated above, I am quite culpable in this process and am sympathetic to the personalities involved, but I believe that we must all make major changes in our attitudes before we attempt curriculum revision, or such efforts will be doomed to failure.

In support of the need for more mathematics education, consider the following items which I have gleaned from both popular and trade literature.

• Most experts agree that in order for the U.S. to stay competitive in the global economy, the *average* American worker is going to need improved skills in data analysis and mathematics.

• In international tests, all but the very best American students regularly rank towards the bottom of the list of nations compared.

• There is and will continue to be a need for more people skilled in engineering and the hard sciences. To be successful in these disciplines requires a deep level of mathematical understanding.

• Given the fact that we are inundated by statistics, and that quite deep understanding is required to extract more than superficial information from them, it would be hard to find a single major field of study that would not benefit from learning more mathematics. This is particularly true if one believes the studies which indicate that most people will have several careers in their working lives.

• There is a tremendous social cost of innumeracy. This cost ranges from the ruinous house percentages in state lotteries to the misguided government programs motivated by misrepresented statistics.

• It is regularly reported in newspapers that companies have difficulty in hiring people with rudimentary mathematical skills, even in cases where the jobs in question pay much more than minimum wage.

The most prevalent arguments against mathematics and mathematicians include the following.

• "I have not used any mathematics since college/high school." This argues very strongly for a static view of the world, which is dangerously shortsighted. In addition, I have often demonstrated to friends that increased knowledge in mathematics can be of immediate benefit, as well as to the mental training that it requires.

• "Mathematics is too abstract," so we should teach people "just what they need to know." This argument is espoused by those who think that we should have college level courses in "balancing checkbooks," as well as by colleagues in other disciplines, who are trying to reduce the quantity and quality of the mathematics courses their students take.

• There is a common misconception that all of the mathematics that is "useful" can now be done with computers and calculators, so we do not need to learn how to do it ourselves. It is sad to report, but I saw this very sentiment expressed in a major newspaper by an elementary school teacher. It requires no great leap of imagination to guess how her students will fare in later courses.

• The fact that all but the best students are routinely steered away from mathematics and science courses in high school. Such tracking is frequently done in the name of "self-esteem," since mathematics is viewed as difficult. The reasoning given is that it is either assumed (often incorrectly) that the student in question will not go on to higher education, or that the student "can make this up in college." The end result is that far too many students come to universities and colleges (particularly open-enrollment state schools) unprepared for our level of work, especially at the rate at which we teach. It is our duty to send a strong message to the schools and the general public that it is much easier and cheaper to learn this material in high school than in higher education, and that the longer one delays, the harder it is. This philosophy also leads to another problem for teachers of higher-level mathematics, and that is overcoming the mental inertia of students. The worst such cases are those who "had calculus in high school" and deeply resent being taught it again, even when it is demonstrated to them that they do not know the material. At first glance it would seem paradoxical that we have students who have taken and passed advanced courses and not learned the material in them. This paradox arises from the following circular reasoning: since all but the best students are steered away from "harder" courses, the only students who are in those courses must be good. Of course, this takes no account of the students who take the courses for other reasons, in spite of lack of background or ability. Unfortunately, using the above reasoning, any failure must be laid at the teacher's door, and so the students are passed on yet again, regardless of their level of achievement.

• There is also the movement in certain disciplines to reduce the amount of mathematics that their students take, to be replaced, in some cases, by mathematics "integrated" into the curriculum. This is the newest threat that we face, and it must be faced head-on. It arises from the cur-

rent drops in funding and enrollment. In some cases, the people in question openly admit that the original reason for the "excessive" mathematics requirements was to act as a filter. This left the departments in question with the ultimate in "deniability," but still with the good students that they wanted. It is even more shameful that for them we did this dirty work on salaries that are frequently much lower than theirs, which further served to devalue us in everybody's eyes. As for the concept of "integrated mathematics," witness the courses in statistics, taught in education, business, nursing, psychology, sociology, or engineering. It is never made clear that teaching only the methods that are of immediate benefit is *not* teaching mathematics, and is likely to backfire, as the individual methods are soon forgotten.

• Mathematics is so unimportant that it can be taught by anyone with some knowledge. The glut of mathematicians in the U.S. stems in major part from the excessive use of part-time faculty to teach lower-level courses. In some embarrassing examples, high school teachers who have passed students on to higher education with insufficient skills are paid to teach the same material to many of the same audience as part-time college faculty. In the ultimate irony, many of them earn more as high school teachers than the professors teaching with them.

Until quite recently, the study of mathematics was considered a cornerstone of a good education. Unfortunately the current trend in education is towards job training and certification, which means that there is little time allowed for such abstract and *useless* studies as mathematics. However, someone entering the workforce today is expected to have several careers in his or her lifetime, with extensive retraining required each time. Given this, what better background could someone have than the ability to reason mathematically?

* *With all due respect to G. H. Hardy*

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Student Projects in Calculus

William Barnier and Douglas Martin

Introduction

Any reassessment of teaching strategies in calculus should consider the potential use of student projects. This article reports briefly on our sense of the importance of projects in calculus classes and on one such project.

Many articles, several texts, and many monographs are now available concerning reform in calculus. We give two examples here. The recent MAA publication *Calculus: The Dynamics of Change* includes a fine description of what should characterize a modern calculus course and is a good place to start for anyone seeking an introduction to reform efforts. For those interested in projects, the MAA bestseller *Student Research Projects in Calculus* has much to offer.

In any discussion of calculus instruction, the following important goals stand out.

1. Students should develop better conceptual understanding of the basic ideas of calculus.

2. To better understand the concepts and methods of calculus, students should hone their algebraic skills including, especially, a mastery of functions.

3. Intuitively attractive examples and problems, including those that relate to the interests of the students who take calculus classes, should be employed. On our campus, the majority of calculus students are science, economics, or computer science major, so we have tried to find ways to raise issues from these disciplines.

4. As instructors, we must continue searching for more effective pedagogical approaches. The use of group learning activities is one way to develop skill and increase learning for all calculus students. It is also important to stress multiple modes of representation—graphical, numerical, and symbolic—which are employed in several of the recent "reform" calculus texts.

Projects in General

Calculus projects are an important aspect of our attempt to achieve each of these goals. We see projects as somewhat extended problems with some kind of "real world" sense. Students are given one to two weeks to complete a project and we usually assign two projects each semester. Projects can be relatively open-ended, as when students were asked to design a roller coaster (smoothly pieced together from various functions) satisfying certain conditions, or they can have a single best solution, as in the heat loss problem described later in this article.

We require that the students, either working alone or in teams of at most three, hand in well written reports including a clear narrative, relevant plots, and calculations. *Mathematica* is available in one Macintosh lab and students are encouraged to hand in each report in the form of a *Mathematica* notebook. Although the use of computers or calculators is not the primary aspect of the projects we assign, many interesting and useful insights can be discovered with an appropriate use of software like *Mathematica*. Because computer software and graphing calculators are readily available, we are not hesitant to assign problems or projects requiring complicated graphs and computations that may be beyond the capability of students to do by hand.

What are the drawbacks of this approach to projects?

1. Novices can become frustrated when using complex software in a tightly scheduled lab. We have to be resourceful in our early semester orientation to *Mathematica* and the students have to be flexible regarding their work schedules in order to have reasonable access to the lab.

2. Degradation of algebraic and computational skills of students who rely too heavily on computer algebra systems is possible. However, we feel that reinforcement of basic skills can (and should) be accomplished without giving up the power of a software system like *Mathematica*.

3. Some students initially dislike projects because they come from the same family as "word problems." For the first couple of days after a project has been assigned,

the questions and complaints from some of the especially frustrated students can range from, "Can't you just tell me what you really want here?" to, "I can't find anything like this in our book."

In our view, however, projects have many advantages.

1. Our teaching is less didactic and more interactive. In fact, we say to students that we will act as their "consultants" on the project, but the main insight and effort must come from them.

2. Students engage projects much more vigorously than more routine text homework problems. Some of our evidence of this includes observing students in the computer lab at all hours and consulting with students as they bring their in-progress work to our offices or to class to discuss with other students. We also have noticed that some students take special pride in their final reports. Sometimes they tell us about some clever approach they have taken. Other students design imaginative covers for their reports or include humorous or philosophical comments in their narrative. While these may be small things, they seem to indicate that many students find it rewarding to work on these projects.

3. Projects allow students to experience the pleasures of mathematical discovery. While the solutions to these problems do not involve original research, the ideas are new to these students, and the joy of discovery may be experienced by many students.

4. Group work done naturally in the context of each project encourages learning and is valuable training for future employment.

5. Projects reinforce concepts covered in class.

6. Projects also require students to engage mathematics from the graphical, numerical, and symbolic viewpoints and to formulate concepts in written form.

A Specific Project

The following project was assigned in a Calculus II class, which takes two to three weeks to introduce just enough two-variable calculus to solve it.

We need to design a building with a rectangular floor, rectangular walls, and a flat rectangular roof, and we want an energy efficient design that minimizes the heat loss of the building. The north and south walls lose heat at a rate of 7 units per square foot per day, the east and west at a rate of 5 units per square foot per day, the roof at a rate of 2 units per square foot per day, and the floor at a rate of 1 unit per square foot per day. The height of the building must be at least 8 feet, the length of each side must be at least 45 feet, and the volume must be exactly 32,000 cubic feet.

1. Specify and plot the domain of the heat loss function. (Hint: The domain of the heat loss function is not a rectangle.)

2. Plot the heat loss function over a rectangular region that includes its domain.

3. Find the dimensions (the height and two, possibly different, sides) that minimize heat loss. Check all points on the interior and the boundary of the domain. Specify the important points on the plot you have made of the domain. Prove that the building dimensions you suggest do minimize the heat loss.

4. Present a brief statement explaining, qualitatively, why this energy efficient design has its particular proportions. For instance, if it is tall and skinny, why do these proportions minimize the loss?

5. Is it possible to design a building which loses even less heat if the restriction on the length of each side is removed? If so, what would the dimensions be?

This project requires students to think algebraically while creating the appropriate functions and to think graphically when analyzing the domain and the heat loss surface. The solution involves the two-variable version of the first and second derivative tests so the project definitely reinforces important calculus concepts.

Conclusion

None of our students solved the heat loss problem in complete generality. They did, however, supply complete and accurate solutions to the problem as it was stated. Narratives and plots included in their solutions indicated a good grasp of both the specific problem and the first and second derivative tests.

The use of a computer algebra system like *Mathematica* made it fairly easy for students to do the algebra necessary to find the critical points, evaluate the discriminant, and calculate values for the heat loss function on the boundary of the domain. As an aside, it seems to us important that students set up and complete the problem but reasonable to allow them to use software to do lengthy or non-routine algebra. However, we recognize that the question of how much algebra to expect of students in calculus is unsettled and indeed controversial among faculty in mathematics.

Many of the students brought questions to us regarding some aspect of the project. These office visits were real "learning moments." When students came in with questions, they were focused and truly ready to learn. In particular, finding the domain of the heat loss function under the given restrictions on the height and the length of the sides was especially difficult for some students. In our role as consultants, we were able to help students construct the specific domain for the heat loss function and to gain a better grasp of the concept of a domain for a function of two variables in general.

When students working on a project seek help, they usually have an insightful idea but need some assistance to push forward to a full answer. Thus our interactions are discussions of ideas rather than explanations of how to do a problem. Furthermore students seem to take ownership of their projects and are thus motivated to consider the problem more deeply than students often consider homework questions. We also sense that by working on projects, students experience something of what it is like to do creative work in mathematics. This may be the greatest importance of projects in calculus.

William Barnier is a professor in and chair of the Department of Mathematics at Sonoma State University. His e-mail address is bill.barnier@sonoma.edu. Douglas Martin is a professor of chemistry at Sonoma State who also teaches calculus. His e-mail address is doug.martin@sonoma.edu.

1997 NSF–CBMS Regional Research Conferences in the Mathematical Sciences

Six NSF–CBMS Regional Research Conferences will be held in the summer of 1997. These six will bring to 263 the total number of such conferences held in the twenty-nine-year history of this NSF–CBMS Regional Research Confernence Series.

These conferences are intended to stimulate interest and activity in mathematical research. Each five-day conference features a distinguished lecturer who delivers ten lectures on a topic of important current research in one sharply focused area of the mathematical sciences. The lecturer subsequently prepares an expository monograph based upon these lectures, which is normally published as a part of a regional conference series. Depending upon the conference topic, the monograph is published by the American Mathematical Society, the Society for Industrial and Applied Mathematics, or jointly by the American Statistical Association and the Institute of Mathematical Statistics.

Support for about thirty participants is provided and the conference organizer invites both established researchers and interested newcomers, including postdoctoral fellows and graduate students, to attend.

The 1997 conferences are:

Numerical Analysis of Hamiltonian Differential Equations
J. M. Sanz-Serna, lecturer
June 2–6, Colorado School of Mines
Erik S. Van Vleck & Graeme Fairweather, organizers
(303) 273-3553; (303) 273-3502
evanvlec@mines.edu
gfairwea@mines.edu
http://www.mines.edu/Academic/macs/nsfcbms

Dynamical Systems in Structured Population Dynamics
J. M. Cushing, lecturer
June 3–8, North Carolina State University
John E. Franke & Abdul-Aziz Yakubu, organizers
(919) 515-2381; (202) 806-6830
franke@math.ncsu.edu
aziz@scs.howard.edu
http://www2.ncsu.edu/math/Announcements/DSSPD/

Shock Wave Theory
Tai-ping Liu, lecturer
June 9–13, Georgia Institute of Technology
Shi Jin, organizer
(404) 894-5463
jin@math.gatech.edu

Longitudinal Data Analysis
Nan M. Laird, lecturer
June 10–14, University of Missouri–Columbia
Paul L. Speckman, organizer
(573) 882-6376
speckman@stat.missouri.edu
http://www.stat.missouri.edu/longitudinal.html

The Monge Ampere Equation: Applications to Geometry and Optimization
Luis Caffarelli, lecturer
July 9–13, Florida Atlantic University
Mario Milman, organizer
(561) 367-3352
milman@acc.fau.edu
http://www.math.fau.edu/htmlfile/CBMS.htm

Spectral Problems in Geometry and Arithmetic
Peter Sarnak, lecturer
August 18–22, University of Iowa
Thomas P. Branson, Palle E. T.Jorgensen, & Florin Radulescu, organizers
(319) 335-0744; (319) 335-0782; (319) 335-0775
branson@math.uiowa.edu
jorgen@math.uiowa.edu
radulesc@math.uiowa.edu
http://www.math.uiowa.edu/faculty/cbms.html

Information about an individual conference may be obtained by contacting the conference organizer(s). Information about the series and guidelines for submitting proposals for future conferences may be obtained by contacting CBMS, 1529 18th St. NW, Washington DC 20036-1385; (202) 293-1170; fax: (202) 265-2384. The closing date for submission of proposals for the 1998 series is April 7, 1997.

Request for Proposals for 1998 NSF–CBMS Regional Research Conferences

Closing Date: April 7, 1997

To stimulate interest and activity in mathematical research, the National Science Foundation intends to support up to five NSF–CBMS Regional Research Conferences in 1998. A panel chosen by the Conference Board of the Mathematical Sciences will make the selections from among the submitted proposals. In the twenty-eight-year history of this NSF–CBMS Regional Research Conference Series, a total of 257 such conferences have been supported.

Each five-day conference features a distinguished lecturer who delivers ten lectures on a topic of important current research in one sharply focused area of the mathematical sciences. The lecturer subsequently prepares an expository monograph based upon these lectures, which is normally published as a part of a regional conference series. Depending on the conference topic, the monograph is published by the American Mathematical Society, the Society for Industrial and Applied Mathematics, or jointly by the American Statistical Association and the Institute of Mathematical Statistics.

Support is provided for about thirty participants at each conference and the conference organizer invites both established researchers and interested newcomers, including postdoctoral fellows and graduate students, to attend.

Colleges or universities with at least some research competence in the field of the proposal are eligible to apply. Since a major goal of these conferences is to attract new researchers into the field of the conference and to stimulate new research activity, institutions that are interested in upgrading or improving their research efforts are especially encouraged to apply.

Inquiries concerning this conference series or the preparation of proposals for conferences should be directed to CBMS, 1529 18th St. NW, Washington DC 20036-1385; (202) 293-1170; fax: (202) 265-2384.

Professional Development Workshops Over the World Wide Web

The MAA Committee on Professional Development announces the first series of MAA workshops to be conducted over the World Wide Web. These workshops will enable individuals to participate in professional development activities from their computers at home or in school. All that is required is access to electronic mail, an ethernet connection or dial-in access at a minimum of 14.4 kbps (28.8 recommended), and access to a web browser, such as Netscape 3.0, that is capable of handling frames, Java, and "plug-ins".

Workshop readings will be distributed through U.S. mail. The World Wide Web and electronic mail will be used for assignments and discussions. Each workshop will be limited to twenty-five participants to ensure full interactivity. Preference will be given to multiple registrations from a single site.

There will be a workshop fee of $350 for MAA members for each workshop ($400 for nonmembers). The workshop web pages will be password protected. Limited scholarship support is available to graduate students for the workshop on Teaching Undergraduate Mathematics.

Full details and registration information about the workshops will be available on *MAA Online* (http://www.maa.org). The workshops and tentative schedule are as follows:

CLUME ONLINE: A Workshop on Cooperative Learning in the undergraduate mathematics classroom, this workshop will be taught by David Mathews, Sr. Barbara Reynolds, and Ed Dubinsky, who have been running summer workshops on this topic as part of the MAA's Project CLUME.

This workshop will be taught three times in 1997: April 2–30, June 4–25, and September 7–October 5. For more information about the content of these workshops, contact David Mathews: **David.M.Mathews@cmich.edu**.

TEACHING UNDERGRADUATE MATHEMATICS: This course will be taught by John and Annie Selden. The Seldens' research is in collegiate mathematics education are they edit the "Research Sampler" column in *MAA Online*'s new *Teaching and Learning* section. The course is intended for graduate students who have passed their preliminary examinations. It will be equivalent to a three-credit course and will be offered during a thirteen-week period beginning in the summer of 1997 and continuing through the fall.

A limited number of partial scholarships will be available to graduate students. For more information about the content of this workshop, contact John or Annie Selden: **JS9484@tntech.edu**.

PRESENTING MATHEMATICAL CONCEPTS ON THE WORLD WIDE WEB: This course will be taught by Carol Scheftic who has run summer workshops on this topic at the Geometry Center. The course will focus on mathematical "typesetting" on the web, producing and displaying visual images and other interactive mathematical objects, as well as design and management issues for web-based materials.

The workshop will run twice during the summer of 1997. For more information on the content of the course, contact Carol Scheftic: **scheftic@geom.umn.edu**. (These workshops are sponsored jointly by the Committee on Professional Development and the Committee on Computers in Mathematics Education.)

Individuals who are interested in presenting future web workshops should send a proposal to the chair of the Committee on Professional Development, Jerry Porter: **gjporter@math.upenn.edu**.

Submission Procedures for Contributed Paper Proposals

After you have selected a session to which you wish to contribute a paper, forward the following directly to the organizer (indicated with an asterisk (*)):

- the name(s) and address(es) of the author(s); and
- a one-page summary of your paper.

The summary should enable the organizer(s) to evaluate the appropriateness of your paper for the selected session. Consequently you should include as much detailed information as possible within the one-page limitation. **Your summary must reach the designated organizer by Monday, April 14, 1997. Earlier submission is encouraged.** The organizer will acknowledge receipt of all summaries. You will receive notification from the organizer by April 28, 1997 whether your paper has been accepted. Please note that, as in recent MathFests, there will be no published abstracts for this meeting.

Do not forward completed summaries to the MAA. They are to be sent to the session organizer.

MAA Contributed Papers in Atlanta

The MAA will hold its annual MathFest from Saturday, August 2, 1997 through Monday, August 4, 1997 in Atlanta, Georgia. The complete meetings program will appear in the April 1997 issue of FOCUS. This preliminary announcement is designed to alert participants about the MAA's contributed papers sessions and their deadlines.

Note that the days scheduled for these sessions remain tentative. The organizers listed below solicit contributed papers pertinent to their sessions; proposals should be directed to the organizer whose name is followed by an asterisk (*). For additional instructions, see the Submissions Procedures box on page 18.

Sessions generally limit presentations to ten minutes, but selected participants may extend their contributions up to twenty minutes. Each session room contains an overhead projector and screen; blackboards will not be available. Persons needing additional equipment should contact, as soon as possible, but prior to May 1, 1997: Donovan H. Van Osdol, Dept. of Math, University of New Hampshire, Durham, NH 03824; e-mail: dvanosdo@maa.org.

Using Technology to Implement the Crossroads Standards in College Mathematics Courses
Saturday & Sunday afternoons

Cheryl Stratton,* Learning Support Programs, Georgia State University, University Plaza, Atlanta, GA 30303-3083; (404)651-3360; fax: (404)651-4377; e-mail: cstratton@gsu.edu

Jean Bevis, Georgia State University

We invite presentations which focus on innovative ways to use technology in undergraduate mathematics courses; in particular, how these changes in delivery can support the AMATYC Standards and how the classroom can become a learning laboratory. Presentations should emphasize planning, implementation, and student performance. Participants wishing to extend their presentations beyond ten minutes should indicate so on their proposals. Submission of proposals via e-mail preferred.

Mathematics for Liberal Arts Students: New Goals, Methods, and Assessments
Sunday & Monday afternoons

Janet Heine Barnett,* Dept. of Math, University of Southern Colorado, 2200 Bonforte Blvd., Pueblo, CO 81001-4901; (719)549-2540; fax: (719)549-2732; e-mail: jbarnett@meteor.uscolo.edu

Janet G. Nichols, University of Southern Colorado

Despite the reputation of liberal arts mathematics courses as "Math for Poets," such courses fulfill a standard graduation requirement and provide a final mathematical experience for numerous students who go on to important careers in non-technical fields. Recently a variety of philosophies concerning the quantitative and mathematical needs of these students have developed, along with new and often innovative methods of instruction and assessment. This session invites papers addressing these philosophies and instructional or assessment techniques being used to meet their goals.

History of Mathematics and Its Use in the Mathematics Classroom
Saturday & Sunday afternoons

Charles B. Pierre,* Dept. of Math Sciences, Clark Atlanta University, PO Box 332, Atlanta, GA 30314; (404) 767-2119; fax: (404) 767-2119; e-mail: cbpierre@prodigy.com

Elinor Berger, Columbus College

This session invites papers describing innovative ways of using the history of mathematics in the classroom. Investigative approaches, descriptions of ways to teach history of mathematics courses using both original and non-original sources, uses of the history of mathematics in accord with current changes in curricula, pedagogy, and the preparation of teachers of mathematics—or ideas inherent in the Standards—are all welcome.

Calculus Reform—What Works and What Does Not Work
Saturday & Monday afternoons

Lawrence Husch,* Dept. of Math, University of Tennessee, Knoxville, TN 37996; (423) 974-4162; fax: (423) 974-6576; e-mail: husch@math.utk.edu

We are particularly interested in receiving reports from departments which have implemented calculus reform in a significant manner for a significant period of time and which have decided either that this is the way to teach calculus or that this is not the way to teach calculus. Reports on decisions based on experiences with either client departments and/or the training of mathematics majors are sought.

Innovative Teaching Ideas for Undergraduate Mathematics
Saturday & Monday afternoons

Mohammed H. Ahmadi,* Dept. of Math and Computer Science, University of Wisconsin Whitewater, Whitewater, WI 53190; (414) 472-5175; fax: (414) 472-1372; e-mail: ahmadim@uwwvax.uww.edu

Tingxiu Wang, Oakton Community College

Throughout our teaching careers, we often find new methods which are creative or interesting in teaching standard topics in undergraduate mathematics. This session invites papers which describe instructors' outstanding or innovative ideas and their insights into teaching everyday materials in undergraduate mathematics.

The Incorporation of Statistics in Non-Statistics Mathematics Courses
Sunday & Monday afternoons

Cathy A. Godbois,* Dept. of Math, Harrisburg Area Community College, Lancaster Campus, 1008 New Holland Ave., Lancaster, PA 17601; (717) 293-6137; e-mail: cagodboi@hacc01b.hacc.edu

Eric Y. Leung, Harrisburg Area Community College

As the trend toward the incorporation of modeling real and student collected data into the mathematics curriculum expands, issues regarding the amount of statistics required as a prerequisite and/or the statistics topics which must also be included in the course must be resolved. How much or how little statistical background is required or should be included? Papers describing different viewpoints and current practices are sought.

For any late changes, consult MAA Online.

FLORIDA

Florida Southern College
Assistant/Associate Professor

The Department of Mathematics seeks a full-time faculty member for Fall 1997 at the assistant or associate level depending on qualifications. A doctorate is preferred (ABD considered) along with the ability to teach introductory and advanced statistics and mathematics courses. Excellent teaching credentials and a strong commitment to undergraduate teaching using technology are essential, and advising and committee responsibilities required. Commitment to both the Lakeland and Orlando programs is also expected.

Currently enrolling 1625 full-time residential students plus 1000 students in extension programs, the College is in a period of sustained growth. Affiliated with the United Methodist Church, FSC has been named in the top ten of southeastern liberal arts institutions for value by U.S. News and World Report and also boasts the world's largest collection of Frank Lloyd Wright architecture.

Please send a letter of interest, a vita and three references to:

Dr. Nancy J. Aumann, Vice President and Dean of the College

111 Lake Hollingsworth Drive

Lakeland, FL 33801-5698

Full review of applicants will begin February 1, 1997 and continue until the position is filled. EO/AAE.

KANSAS

Mathematics Department Chair
Baker University

Baker University invites applications for the position of Chair of the Department of Mathematics. The ideal candidate will have a record of excellent undergraduate teaching; familiarity with mathematics reform; administrative and leadership skills, and an ability to work collaboratively with faculty from other disciplines. Ph.D. is required, and teaching experience in mathematics education is desirable. The new Chair should have a vision for the use of technology in enhancing undergraduate mathematics education, and will have an opportunity to shape planning for a new science and mathematics building.

The department is part of the College of Arts and Sciences at Baker's main campus in Baldwin City. The College, with an enrollment of 800 undergraduates is located in a growing and picturesque town of 3,000 near to Kansas City, Lawrence, and Topeka. Founded in 1858, Baker is the oldest four-year college in Kansas. Send a letter of application, curriculum vitae, and arrange to have three letters of reference forwarded to: Dr. Jean Johnson, Chair, Mathematics Search Committee, Department of Mathematics, Baker University, P.O. Box 65, Baldwin City, KS 66006.

Washburn University
Position Announcement

MATHEMATICS: Mathematics or Statistics (tenure track). Doctorate required for appointment at rank of Assistant Professor. Extensive background in statistics and experience in college teaching preferred. Commitment to excellence in instruction required. Will teach undergraduate courses in mathematics, upper and lower division statistics, and courses related to Actuarial Science. Must demonstrate potential for scholarly activities. Review of applications will begin February 14, 1997 and continue until a suitable candidate is found. Respond to Dr. Larry Blumberg, Chair, Search Committee, Department of Mathematics and Statistics, Washburn University, Topeka, KS 66621. Affirmative Action/Equal Opportunity Employer.

MARYLAND

United States Naval Academy
Department of Mathematics

Applications are invited for up to three anticipated tenure-track positions (subject of funding) in mathematics at the Assistant Professor level to start in August 1997. Candidates must have a Ph.D., demonstrate a strong commitment to undergraduate teaching, and show potential to continue an active scholarly program. Faculty members receive full federal government service benefits. Promotion and tenure evaluations follow AAUP guidelines. Information about the U.S. Naval Academy and the Mathematics Department can be found at Web site http://nadn.navy.mil.

Applicants should provide a letter of application that includes a statement of professional goals, a C.V., three letters of reference (at least one of which comments on the applicant's experience and promise as a teacher), and undergraduate transcripts. Applications will be evaluated starting in February 1997. Send all materials to: Search Committee; Mathematics Department, 572 Holloway Road, U.S. Naval Academy, Annapolis, MD 21402-5002. Tel: 410-293-6700; Email: search@sma.usna.navy.mil. The United States Naval Academy is an EO/AA employer.

MINNESOTA

Metropolitan State University
Mathematics Faculty

Metropolitan State University invites applications for a probationary tenure-track faculty position in mathematics at the assistant professor level, subject to the availability of funding. Qualifications include a Ph.D. in applied mathematics or mathematics; evidence of successful teaching experience; and commitment to mathematics education reform efforts that promote active learning and to the implementation of technology through the curriculum; commitment to serving a culturally diverse population of traditional and nontraditional students and to student-centered education. Applications should be postmarked by February 28, 1997, for appointment beginning Fall, 1997. For additional information, call (612) 349-2528 or TTY users call 800-627-3529. A complete application should include a letter of interest, a teaching philosophy statement, a curriculum vitae, and the names, addresses and telephone numbers of four references. Applications should be sent to: Mathematics Search Committee, Metropolitan State University, 730 Hennepin Ave., Minneapolis, MN 55403-1897. AA/EEO

MONTANA

Math/Engineering/Physics/Computer Science

Carroll College, Helena, MT seeks three tenure track faculty positions in the Department of Mathematics, Engineering, Physics and Computer Science: Position 1 requires expertise in applied mathematics and extensive calculator/ computer technology background; Position 2 requires expertise in applied math, physics, civil engineering, or computer science and extensive calculator/ computer technology background; Position 3 requires expertise in computer science with competency in networking, communication and information systems. Because the department promotes an integrated and interdisciplinary curriculum with significant use of technology, applicants with experience and/or credentials in more than one field (to include biology and/or chemistry) are encouraged to apply. Salary and rank DOQ.

Carroll College is a Catholic, undergraduate, liberal arts school of 1,400 students. Located at the foot of the Rockies in Helena, MT. Review of applications will begin 2/15/97. Send letter of application, curriculum vitae, names, addresses and telephone numbers of at least three professional references to Dr. James Trudnowski, Vice President for Academic Affairs, Carroll College, Helena, MT 59625. EOE

NEBRASKA

Assistant Professor
Mathematics & Statistics
University of Nebraska at Kearney

Tenure-track. Teach undergraduate/graduate mathematics courses; be involved on Department, College, and University committees. Required: Ph.D. in Mathematics with Ordinary/Partial Differential Equations or Dynamic Systems specialization; strong commitment to excellence in teaching and scholarship; productive research; strong interpersonal/communicative skills. Preferred: Background in use of technology in mathematics/math labs. Starting date: August 1997. Salary and benefits are competitive. Review of applications begins February 17, 1997 and will continue until the position is filled. Send letter of application, vita, copies of undergraduate and graduate transcripts; three letters of recommendation to: Dr. Lutfi Lutfiyya, Chair Mathematics Search Committee, Dept. of Mathematics and Statistics, UNK, Kearney, NE 68849-5360; (308) 865-8531. Lutfi@platte.unk.edu. AA/EO/ADA. http://www.unk.edu

NEW JERSEY

Rutgers University
Newark, New Jersey
Associate or Full Professor of
Developmental Mathematics

The Academic Foundations Department of Rutgers University in Newark, an Interdisciplinary department providing courses, academic mentors, and tutors for underprepared and nontraditional students, seeks to hire at the Associate of Full Professor level a person to teach in the (developmental) Mathematics Unit of the Department, starting 1 July 1997. Doctorate required. Immediate or early tenure possible for appropriate candidate. Preference given to those who evidence long-term and current interest in work with underprepared students, have demonstrated excellence in teaching and have a record of research and publication. Responsibilities include teaching computation, algebra, pre-calculus and calculus, developing curricula, advising and serving on departmental and collegiate committees. Teaching assignments may include both day and evening classes. Review of applicants begins immediately and will continue until position is filled. Salary is competitive, based on rank and experience. Arrange to have sent 4 letters of recommendation, at least one of which addresses the quality

of your teaching and research experience to: Chair, Academic Foundations Department, Rutgers University, University Heights, Newark, NJ 07102. Hiring is subject to final budgetary approval. AA/EEO. Women and minorities are especially encouraged to apply.

NORTH CAROLINA

Mathematics

Lenoir-Rhyne College invites applications for a tenure track position in Mathematics at the rank of Assistant Professor beginning August 15, 1997. Ph.D. in mathematical sciences required. Strong commitment to teaching required. Proven teaching ability with experience in technology and a background in statistics preferred. Responsibilities involve teaching wide range of undergraduate mathematics and statistics courses; normal teaching load is 12 hours/semester. Besides teaching, the successful candidate will be expected to participate in academic advising, faculty committees and to engage in professional development activities and community service. Salary is dependant upon educational preparation and years of experience; excellent fringe benefit package. Lenoir-Rhyne College is classified as a "Master's (Comprehensive) II" Institution with a strong emphasis upon the liberal arts. Lenoir-Rhyne is the 105 year old college of the North Carolina Synod of the Evangelical Lutheran Church in America. Consideration of applications will begin immediately and will continue until the position is filled. Send letter of application, vita, addresses and phone numbers of three references, and all graduate transcripts to Mathematics Academic Affairs, Box 7420, Lenoir-Rhyne College, Hickory, NC 28603. Lenoir-Rhyne College is an Equal Opportunity Employer and applications from qualified women and minorities are encouraged.

OHIO

Oberlin College
Department of Mathematics

One-year, full-time, non-continuing positions beginning the 1997-98 academic year. Responsibilities include teaching undergraduate courses in mathematics and/or statistics (5/year), supervising honors students, and sustained scholarly production. Ph.D. degree (in hand or expected by August 31, 1997) required. All specialties considered. Candidates must demonstrate potential excellence in teaching. Send letter of application, curriculum vitae, academic transcripts (graduate and undergraduate), and 3 letters of reference to Susan Colley, Department of Mathematics, Oberlin College, Oberlin, OH 44074 by March 1, 1997. Use of AMS Application Cover Sheet appreciated. Oberlin College admitted women since its beginnings in 1833 and has been historically a leader in the education of blacks. AA/EOE.

Assistant Professor of Mathematics
Ohio Northern University

The Department of Mathematics and Computer Science at Ohio Northern University invites applications for an assistant professor position in mathematics starting in the 1997-98 academic year. The position will be a tenure-track nine-month appointment, four-year renewable nine-month contract, or visiting nine-month appointment depending on interests and qualifications of the candidate. A Ph.D. in mathematics is required. Only applicants who are expected to complete their degree by Fall 1997 will be considered. Applicants should be dedicated to excellent teaching at the undergraduate level and committed to continued scholarship. Ohio Northern is an Affirmative Action/Equal Opportunity Employer and encourages applications from women and minority candidates. Qualified applicants should send a letter of application, resume, copies of transcripts and three letters of recommendation to: Dr. Robert Hovis, Chair, Department of Mathematics and Computer Science, Ohio Northern University, Ada, OH 45810 by March 1, 1997 for full consideration. For further information about the university, visit our web page at http://www.onu.edu.

Shawnee State University
Announcement of Math Sciences Vacancies
Two Positions

SHAWNEE STATE UNIVERSITY'S Department of Mathematical Sciences has two openings beginning with the 1997-1998 academic year. SSU is an open admission, state assisted university that emphasizes excellence in teaching. Duties will include teaching three or four courses per quarter during the academic year. Teaching effectiveness is of primary importance. Scholarship and service are encouraged and expected. Both positions are continuing contract (tenure track) eligible.

Qualifications required for the first position include a doctorate in the mathematical sciences (a doctorate in math education along with the equivalent of a strong master's degree in math will be acceptable); and expertise in secondary mathematics education.

The second position requires a doctorate in the mathematical sciences and expertise/experience in industrial mathematics and/or student internship programs. The department will consider filling this position on a one-year temporary basis with an industrial mathematician on sabbatical leave.

Applicants will receive a position description and be asked to complete a questionnaire. To apply, submit a letter of application, resume, copies of graduate and undergraduate transcripts (official or unofficial), a completed questionnaire, and three letters of reference. Application review will begin on February 10, 1997, and will continue until the positions are filled. Send application materials to: Dr. Jerry Holt, Dean, College of Arts and Sciences, Shawnee State University, 940 2nd St., Portsmouth, OH 45662-4344.

SSU seeks staff who share our commitment to students as our first priority. SSU is an equal opportunity employer.

The University of Akron
Department of Mathematics
Assistant Professor

Two Assistant Professor (tenure-track) positions are available starting Fall 1997. Applicants should demonstrate potential for excellence in teaching and research. Two-thirds of the teaching responsibility consists of general education courses. The remainder of the teaching load may consist of other undergraduate and graduate courses. Applicants should possess a Ph.D. in the mathematical sciences. Preference will be given to candidates with expertise in any of the areas of algebra and number theory, discrete mathematics, geometry, materials/fluids process modeling, optimization and control theory, or applied probability and stochastic processes.

The Department offers Bachelor and Master degrees in Applied Mathematics, Mathematics, Statistics, and Computer Science. An Engineering Applied Mathematics doctoral program, emphasizing interdisciplinary applied mathematics, is offered cooperatively with the College of Engineering. See http://www.math.uakron.edu/ for more information about the Department.

All materials (application letter, curriculum vitae, unofficial copy of graduate transcripts, and three letters of recommendation) should be sent to:

Chair, Mathematical Sciences
Search Committee
Ref.#M1
Department of Mathematical Sciences

The University of Akron
Akron, OH 44325-4002

Inquiries may be sent to stef@uakron.edu. Review of completed applications will begin March 1,1997, and will continue until the positions are filled.

Women and minorities are encouraged to apply. The University of Akron is an equal education and employment institution.

OKLAHOMA

Northeastern State University

The Department of Mathematics at Northeastern State University invites applications for an Instructor or Assistant Professor beginning Fall 1997. Masters degree required in Mathematics or Mathematics Education to teach lower level mathematics courses, experience in teaching in the public schools preferred. Submit vitae, unofficial transcripts, and three letters of recommendation to: Personnel Office (EOMM), Northeastern State University, Tahiequah, OK 74484, Review of application begins February 15, 1997. AA/EO employer.

The University of Oklahoma
Department of Mathematics

The Department invites applications for a tenure-track assistant professor position in Mathematics beginning August, 1997. Candidates must have a Ph.D. or equivalent degree in mathematics and demonstrate potential for excellence in both research and teaching. Preference will be given to candidates whose research interests are compatible with existing faculty in the area of algebra, analysis/applied math, geometry and topology. Post-doctoral experience is desirable but not essential. Faculty members normally teach two classes each semester, do research, and contribute University and Department service appropriate to their experience. Salary will be commensurate with qualifications and experience. For full consideration send a completed AMS Cover Sheet, curriculum vitae, and a description of current and planned research; and, have three letters of recommendation, at least one of which discusses the candidate's teaching, sent by January 15, 1997. Applications will be considered until the position is filled. All correspondence should be directed to: Search Committee, Department of Mathematics, University of Oklahoma, 601 Elm, Phsc 423, Norman, OK 73019-0315, USA. Telephone 1-405-325-6711; FAX 1-403-325-7484; email: search@math.ou.edu. The University of Oklahoma is an Equal Opportunity/Affirmative Action Employer. Women and minorities are encouraged to apply. The University of Oklahoma has a policy of being responsive to the needs of dual-career couples.

PENNSYLVANIA

Neumann College

Applications are invited for a full time permanent position in mathematics at the assistant professor level. We seek a committed and dynamic teacher of undergraduate mathematics with an interest in interdisciplinary instruction and a doctorate in mathematics or a related discipline. Responsibilities include teaching a variety of undergraduate courses including college algebra, introductory statistics, liberal arts mathematics, and introductory calculus. Neumann College is a Catholic co-educational institution of higher education in the liberal arts and Franciscan traditions located between Philadelphia and Wilmington, Delaware. The College offers an education based on the concepts that knowledge, while valuable in itself, is to be used in the service of others, and that learning is a life-long process. Interested candidates should send a letter of application, vita, copies of undergraduate and graduate transcripts and three letters of reference to Dr. Mary McCoy, Chair of Mathematics Search Committee, Neumann College, One Neumann Drive, Aston, PA 19014-1298. Deadline - March 15, 1997.

TEXAS

DEAN, College of Science & Engineering
University of Texas-Pan American

The newly formed College of Science and Engineering at UT-Pan American is seeking a dean. The College is comprised of the departments of Biology, Chemistry, Computers Science, Engineering, Mathematics, and Physics and Geology. Bachelor's degrees are offered in each department, with Master's degrees in Biology, Computer Science, and Mathematics. UTTA is a growing university with approximately 12,700 students. Qualifications for the position include: earned doctorate with credentials sufficient for an appointment as full professor in one of the College's departments, and administrative experience at the level of Department Chair or above. Applicants should send 1) a letter of interest, 2) a detailed vitae, and 3) a list of three references with addresses and phone numbers to Director, Personnel Office University of Texas-Pan American, 1201 W. University Drive, Edinburg, TX 78539-2999. Review of applications will begin November 30, 1996 and continue until the position is filled. UTPA is an AA/EEO Employer (F96/97-07).

UTAH

Mathematics Education Position

The Department of Mathematics, Weber State University is seeking applicants for a senior level person in Mathematics Education. Expertise in areas of mathematics education research, curriculum development, and developing funded proposals are of prime importance. Strong teaching credentials are also essential. A PhD in Mathematics Education with a strong mathematics background or a PhD in Mathematics is preferred, but other degrees will be considered depending on overall credentials. **Responsibilities:** teach a wide variety of mathematics and mathematics education courses, supervise student teachers, and assume a leadership role in an active mathematics education group. Rank and salary (with excellent benefits) commensurate with credentials. **Application:** Send a curriculum vita and three letters of reference to: Dr. Kent Kidman, Chair, Dept. of Mathematics, c/o Human Resource Department, 1016 University Circle, Ogden, UT 84408-1016. Initial screening will begin February 10, 1997. Position will remain open until filled. WSU is an AA/EOE.

VERMONT

Lyndon State College

Tenure-track position, teach nine-credits undergraduate statistics plus one course in introductory mathematics or computer science each semester. Doctorate in Statistics, Mathematics, or Mathematics Education required for tenure. Apply to Academic Dean, Lyndon State College, Lyndonville, VT 05851.

Tenure-track position, teach introductory math courses, coordinate small math education program. Doctorate in Math Education or Mathematics required for tenure. Research focus on learning of mathematics and teaching experience desirable. Apply to Academic Dean, Lyndon State College, Lyndonville, VT 05851.

WISCONSIN

University of Wisconsin-River Fall
Assistant Professor

Applications are invited for a tenure-track positions in mathematics at the Assistant Professor level, specializing in mathematics education, beginning August 25, 1997. Qualifications are a doctorate in math education with the equivalent of a master's degree in mathematics, or a doctorate in mathematics with strong interest and training in K-12 math education. Responsibilities will include teaching content courses for prospective teachers as well as other undergraduate math courses and working collaboratively with area schools. Other responsibilities include advising students, department and university committee work, and continued scholarly activity. Applicants should send a curriculum vitae and letter of interest specifying: 1) qualifications to meet the position responsibilities, 2) teaching philosophy and area(s) of interest, 3) background in the use of educational technology, and 4) ability to enhance student appreciation of diverse ethnic and cultural heritages. Applicants must also submit undergraduate and graduate transcripts (unofficial copies accepted - official copies will be required if hired) and three letters of recommendation, at least one of which addresses teaching effectiveness. Inquiries and applications should be sent to Dr. Pamela Katzman, Chair, Search and Screen Committee, Dept. of Mathematics/Computer Systems, University of Wisconsin-River Falls, River Falls, WI 54022. Review of applications will begin April 1, 1997 and continue until the position is filled. UW-River Falls is an Affirmative Action/Equal Opportunity employer.

MEETINGS

National MAA Meetings

August 2–4, 1997 MathFest, Atlanta, GA. Board of Governors Meeting, August 1, 1997

January 7–10, 1998 Eighty–first Annual Meeting, Baltimore, MD. Board of Governors Meeting January 6, 1998

January 13–16, 1999 Eighty–second Annual Meeting, San Antonio, TX. Board of Governors Meeting, January 12, 1999.

January 19–22, 2000, Eighty–third Annual Meeting, Washington, DC. Board of Governors Meeting, January 18, 2000.

January 10–13, 2001 Eighty–fourth Annual Meeting, New Orleans, LA. Board of Governors Meeting, January 9, 2001

Section Meetings

ALLEGHENY MOUNTAIN – April 4–5, 1997, Westminster College, New Wilmington, PA
– April 1998, Clarion University of PA, Clarion, PA

EASTERN PA & DELAWARE – April 17, 1997, Ursinus College, Collegeville, PA
– November 1, 1997, University of Pennsylvania, Philadelphia, PA

FLORIDA – Feb 28–March 1, 1997, Florida State University, Tallahassee, FL

ILLINOIS – March 21–22, 1997, Rockford College, Rockford, IL

INDIANA – March 14–15, 1997, Franklin College, Franklin, IN
– October 18, 1997, Wabash College, Crawfordsville, IN
– March 20–21, 1998, Ball State University, Muncie, IN

INTERMOUNTAIN – April 10–12, 1997, Utah State University, Logan, UT

IOWA – April 11–12, 1997, Iowa State University, Ames, IA

KANSAS – March 14–15, 1997, Pittsburg State University, Pittsburg, KS

KENTUCKY – March 28–29, 1997, Western Kentucky University, Bowling Green KY

LOUISIANA–MISSISSIPPI – Feb 28–March 1, 1997, Millsaps College, Jackson, MS
– March 6–7, 1998, University of New Orleans, LA

MD–DC–VA – April 18–19, 1997, William & Mary, Williamsburg, VA

METRO. NEW YORK – May 3, 1997, Mercy College, Dobbs Ferry, NY

MICHIGAN – May 2–3, 1997, Wayne State University, Detroit, MI
– May 1–2, 1998, Western Michigan University, Kalamazoo, MI

MISSOURI – April 11–12, 1997, Missouri Western State College, St. Joseph, MO
– Spring 1998, Southwest Missouri State University, Springfield, MO

NEBRASKA–SOUTHEAST

SOUTH DAKOTA – April 11–12, 1997, Wayne State College, Wayne, NE

NEW JERSEY – April 12, 1997, Middlesex County College, Edison, NJ

NORTH CENTRAL – April 25–26, 1997, Mankato State University, Mankato, MN

NORTHEASTERN – June 6–7, 1997, Merrimack College, N. Andover, MA
– Nov 21–22, 1997, Western New England College, Springfield, MA

NORTHERN CALIFORNIA – Feb 22, 1997, Univ of San Francisco, CA

OHIO – April 11–12, 1997, Youngstown State University, Youngstown, OH

OKLAHOMA–ARKANSAS – April 4–5, 1997, University of Central Oklahoma, Edmond, OK
– March 27–28, 1998, University of Arkansas–Little Rock, AR
– Spring 1999, Southern Nazarene University, Bethany OK

PACIFIC NORTHWEST – June 19–21, 1997, Western Washington University, Bellingham, WA

ROCKY MOUNTAIN – April 11–12, 1997, Metro State College and Univ of Colorado–Denver,CO

SOUTHEASTERN – March 13–15, 1997, Georgia Institute of Tech/Spelman College, Atlanta, GA
– March 13–14, 1998, College of Charleston, SC

SOUTHERN CALIFORNIA – March 8, 1997, Occidental College, Los Angeles, CA

SOUTHWESTERN – April 1997, New Mexico
– Spring 1998, Southern Methodist University, Dallas, TX

SEAWAY – April 18–19, 1997, Broome Community College, Binghamton, NY
– November 7–8, 1997, Siena College, Loudonville, NY
– April 1998, York University, No. York, Ontario, Canada

TEXAS – April 3–5, 1997, Texas Lutheran College, Sequin, TX
– Spring 1998, Southern Methodist University, Dallas, TX
– Spring 1999, Southwest Texas State University, San Marcos, TX

WISCONSIN – April 11–12, 1997, University of Wisconsin–River Falls, River Falls, WI
– April 17–18, 1998, University of Wisconsin–Stevens Point, Stevens Point, WI

Mathematical Olympiad Summer Program of the Mathematical Association of America

Applications are being solicited for an instructor for the Mathematical Olympiad Summer Program (MOSP), conducted annually by the Mathematical Association of America. This four-week summer program is held at the University of Nebraska-Lincoln. Thirty outstanding high school mathematics students are chosen for the program on the basis of their performance on the American Mathematics Competitions and their potential as members of the U.S.A. International Mathematical Olympiad (IMO) team. The top six students on the U.S.A. Mathematical Olympiad constitute our IMO team and they are given specialized coaching during the four-week summer program for their participation in the IMO. All MOSP participants receive in-depth enrichment in important mathematical topics to stimulate their continuing interest in mathematics and help prepare them for future study of mathematics.

Instructors in the program provide accelerated instruction in Geometry, Number Theory, Combinatorics, and Advanced Analysis. Experience working with high-ability students and familiarity with olympiad-type competitions is desired. Some instructors also serve as coaches for the IMO team, and accompany the team to the international competition, to be held in 1997 in Argentina.

Applicants should send a copy of their Curriculum Vitae and a statement of related experience to:

Professor Walter Mientka Executive Director, American Mathematics Competitions Department of Mathematics and Statistics University of Nebraska Lincoln, NE 68588-0658; e-mail: walter@amc.unl.edu; Fax: 402-472-6087

Applications are due February 21, 1997. It is expected that instructor will be selected by March 21, 1997. The MAA is an equal opportunity/affirmative action employer.

OTHER MEETINGS

April 3–5, 1997 31st Biennial Kappa Mu Epsilon (Math Honor Society) National Convention, Springfield, MO. For more information, contact Arnold Hammel, Central Michigan University, Mt. Pleasant MI 48859; (517) 774-3543; e-mail: a.hammel@cmich.edu.

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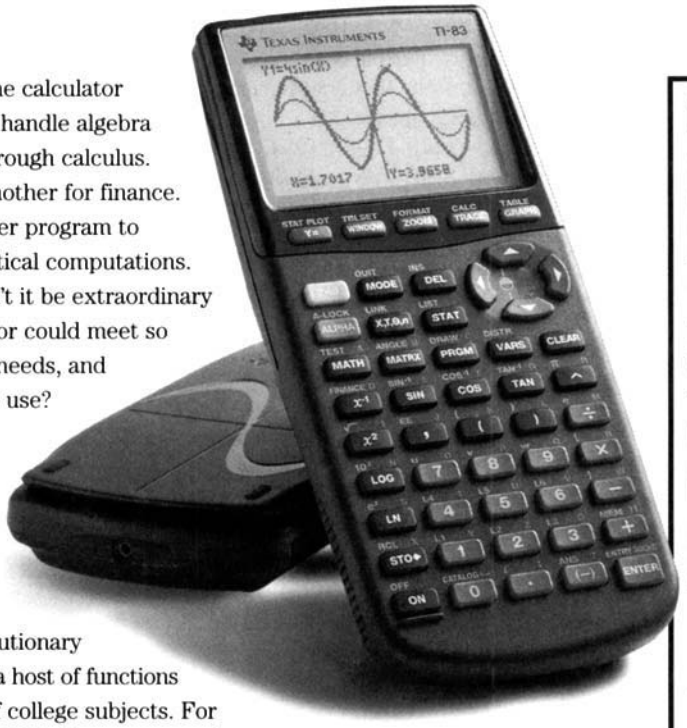

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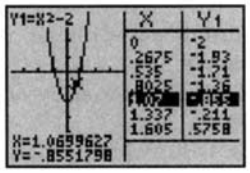
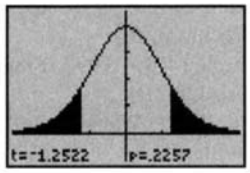
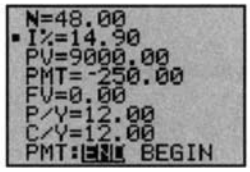


Math. *Graph-Table split screen allows you to trace the graph and scroll the table simultaneously.*



Statistics. *Display results of hypothesis tests graphically and numerically. Calculate confidence intervals.*



Finance. *Financial functions include Time-Value-of-Money, cash flows, and amortization.*

TEXAS INSTRUMENTS

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