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The Mathematical Association of America
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FOCUS

THE NEWSLETTER OF THE MATHEMATICAL ASSOCIATION OF AMERICA

MAA Election Results

Gerald L. Alexanderson of Santa Clara University has been elected the next president of the MAA, following the term of Kenneth A. Ross. Alexanderson will serve a one-year term as president-elect beginning in January 1996, and will take over as president a year later, to serve a term of two years.

On the same ballot, the members of the Association elected Louise Raphael of Howard University and Wade Ellis, Jr. of West Valley College as first and second vice-president, respectively. Both will serve two-year terms beginning January 1996.

Alexanderson served the Association as first vice-president in 1984–85, as editor of *Mathematics Magazine*, 1986–90, and as secretary from 1990 to the present. He has been a member of the Association for forty-one years and has served in various capacities on the Board of Governors for a total of fourteen years. He is familiar to many MAA members in the sections, having given talks to over half of the twenty-nine sections. He is coauthor of a variety of books on mathematics, including the *Mathematical People* volumes coedited with Donald J. Albers and Constance Reid.

Raphael, a member of the Association for twenty-five years, chaired the MAA Task Force

on Minorities in Mathematics, the report of which led to the forming of the SUMMA office at MAA headquarters. She has done research in the area of wavelets and multivariate splines, in addition to being involved at the NSF as the first program director of the Calculus Curriculum Initiative.

Ellis has served on numerous committees of the MAA, most notably chairing the Committee on Two-Year Colleges, and is a former member of the Mathematical Sciences Education Board. He is well-known for his work on the use of calculators and computers in the classroom, having written books and manuals in this area. He has been a member of the MAA for fifteen years.



Gerald L. Alexanderson



Louise Raphael



Wade Ellis, Jr.

Math Education Programs That Work

New MAA Study Provides Pointers to Success

Models That Work: Case Studies in Effective Undergraduate Mathematics Programs is the title of an MAA project report that has just been completed. The project was sponsored by the NSF and directed by Alan Tucker, chair of the MAA Education Coordinating Council. The institutions visited spanned the spectrum from two-year colleges to research universities. They have undergraduate mathematics programs that are particularly successful in several of the following areas:

(i) Attracting and preparing large numbers of mathematics majors;

(ii) Preparing students to pursue advanced study in mathematics;

(iii) Preparing future school mathematics teachers; or

(iv) Attracting and preparing members of underrepresented groups in mathematics.

The report describes general attitudes and strategies as well as particular activities, along with suggestions for creating and sustaining an environment that will foster such attitudes and activities. The following features, found among See Education Programs on page 4

FOCUS

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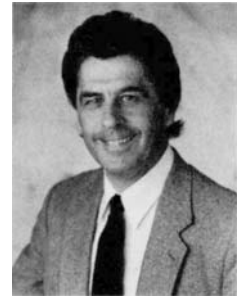
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Editorial

The Myth of Scientific Literacy



Some time ago I was one of two research mathematicians in a group discussion whose other participants consisted of elementary and high school mathematics teachers and college mathematics education faculty. The question was raised as to whether schools should spend as much time as they do on the algorithmic aspects of elementary arithmetic. The debate grew quite heated, with arguments in favor of higher standards of competency in arithmetic ranged against the suggestion that the electronic calculator had eliminated any need for arithmetical skills. At some point in the discussion, I was asked to give my view. (Until then I was content to be an innocent observer in what was clearly a long-running battle.) The individual who had just spoken was a high school teacher who had recounted the story of how she had recently used arithmetic to calculate the amount of sand, gravel, and cement required to lay the base for a concrete driveway at her home. This was an example, she claimed, of the importance of everyone having basic arithmetical skills.

I disagreed. Whenever I had wanted building work done, I said, I had simply employed a builder to do the work for me. I never had to make any calculations of the kind that had just been described. Indeed, I found it hard to remember the last time I had found it necessary to carry out a nontrivial arithmetic calculation. Or indeed to make explicit use of any mathematical knowledge in my everyday life. My opponent—as now she had become—did not agree, though there were nods of assent from many of the math ed folk sitting around the table. As the debate grew ever more heated, I never did get an opportunity to put forward an argument—a different reason—why it might be important to teach arithmetic to young children.

There is a story that often gets told when mathematicians and scientists justify the need for all school and college students to take mathematics and science courses. It goes like this.

Today's society is more dependent on the products of mathematics and science than ever before. To be able to function effectively in society, a citizen should therefore be sufficiently numerate and sufficiently knowledgeable of science to appreciate quantitative data and make informed judgements about scientific and technological matters. The illustrations usually put forward to support this claim range from everyday matters such as being able to count your change at the supermarket and checking the cost estimate your builder submits for constructing your kitchen extension, to more profound matters such as being able to handle scientific data when on a jury, evaluating the relative benefits and costs to society of nuclear power, the justification—or not—for the use of animals in experiments and education, and being able to engage in the public debates on Star Wars, the funding of the Supercollider, the teaching of 'creationism' in schools, and so forth.

Sound familiar? It probably does even if you yourself don't believe it, since the same argument was used when we ourselves, today's mathematics and science educators, were students. But is this argument valid?

Notice that I am not questioning the importance, desirability, or necessity of mathematics and science education for all. The issue I am raising is the reason often given, both to funding authorities and to the students themselves, to justify such education.

Since the FOCUS readership is mathematically literate, I can express the issue by means of an algebraic formula. I am questioning the validity of the antecedent p in a conditional $p \rightarrow q$. I happen to think that q (the importance of mathematics and science education) is valid. But I don't think that p (the well-worn rationale outlined above) is valid. And as any mathematically literate individual will know, the falsity of p here need have no bearing on the truth or falsity of q .

There is no question that society needs a number of people who are highly skilled in mathematics and science. And if we do not expose everyone to mathematics and science early on in their lives, the supply of such people will soon dry up. So on simple, utilitarian grounds, society needs to ensure provision of good mathematics and science education for all students at least until well into the high school years. But what about the continuation of “mathematics and science for all” at the college level?

This is precisely the question raised by Morris H. Shamos in his book *The Myth of Scientific Literacy*, just published by Rutgers University Press. Shamos is Professor Emeritus of Physics at New York University, was a president of the New York Academy of Sciences, and is a past-president of the National Science Teachers Association. As the book makes clear, he has thought long and hard about the issues raised above. He does not argue that we should not provide everyone with mathematics and science education (and nor, let me repeat, do I). Like me, what he takes issue with is the reason often given for such education. And because we start with the wrong reason, he says, the resulting education is often inappropiate.

Decades of attempts to raise the base level of ‘scientific literacy’ in society have failed, Shamos says. (The book concentrates on ‘scientific literacy’, but practically everything he says refers to mathematics as well.) It is not even clear what exactly is meant by the phrase ‘scientific literacy’, he points out. If this really does mean an ability to make informed decisions about societal and political is-

ues involving science and technology, then it is not clear that all trained mathematicians and scientists would qualify—I know I don’t.

However you define it, scientific literacy for all is an impossible goal, Shamos asserts. And he demonstrates this in true scientific fashion with a proof. Suppose the goal was the far less ambitious one of having enough citizens scientifically literate (whatever that means) so that a committee or a jury of twelve persons chosen at random had at least one scientifically literate member. (Ignore the fact that such groups are rarely selected at random, and lawyers usually exclude scientifically literate people from serving on a jury.) A simple probability calculation (Shamos, p.192) tells you that if 20% of the adult population were scientifically literate, then the probability of a randomly selected group of twelve citizens including at least one scientifically literate person is 0.93. High, but not certainty. The significance of the 20% figure is that this is the percentage of college graduates in the United States population—in all subjects. Estimates of the number of individuals in the country who might reasonably be called ‘scientifically literate’ range from 3% to 6%. With a 5% rate, the probability of a randomly selected jury including one scientifically literate person is a low 0.46, less than half.

Shamos presents a mass of evidence to expose the myth that “scientific literacy for all” is an achievable goal, as indeed is the far weaker “scientific literacy for all college graduates”. (If you disagree with the general thrust of this editorial, please read the book before flaming me. In the

short space available to me here, I can’t even scratch the surface of the case Shamos mounts.) Given that the present goal is unachievable, Shamos says, what is required is a refocusing from ‘scientific literacy’ to ‘scientific awareness’. If we learn the lessons of history, he says, most college graduates will leave college with no significant mathematical skills and no real scientific ability—whatever we do as mathematics and science educators. And what little they do learn will soon be forgotten. But as citizens in a world dominated by technology, they should have a sophisticated awareness of what mathematics and science are, of their nature, their power, and their limitations (and, I would add, the place of mathematics and science in human culture). Given an adequate supply of mathematics and science experts, society as a whole can manage just fine if managers, politicians, and the various professionals are sufficiently aware of mathematics and science at the very least to realize the level of their own ignorance and know when to consult an expert.

Shamos believes that we do not at present achieve this far more modest goal of scientific awareness, but that this is what we should set our sights on when it comes to mathematics and science education for the non-science student. Though I don’t agree with everything in his book, the pragmatist in me says that on this point he is absolutely right. I recommend that you get hold of his book and decide for yourself.

—Keith Devlin

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

Another First: World’s Largest Truncated Icosidodecahedron

They said they would and they did! Former MAA Governor-at-Large S. Brent Morris lends a hand to Mrs. Priscilla Shaver’s class of mathematicians who constructed what they believe to be the world’s largest truncated icosidodecahedron. The 4th and 5th graders at Longfellow Elementary School in Columbia, Maryland, had set their new goal last year after tackling the world’s largest rhombicosidodecahedron (FOCUS, February 1994).

The polygonal faces are made of quarter-inch foam core board and the edges are

connected with pipe cleaners and bristol board hinges. The students illustrated each of the sixty-two faces (thirty squares, twenty hexagons, and twelve decagons) with appropriate math themes. Assembly totaled about two and a half hours.

What will they do for an encore?



Education Programs from page 1

the programs visited, seem to underlie these programs' success:

- No matter how successful their current programs are, faculty members in the visited departments are not yet satisfied with the programs. Experimentation is continuous.
- There is a great diversity of instructional and curricular approaches, varying from one visited department to another, and even varying within a single department.
- Faculty members believe in the value of their work as collegiate educators, enjoy teaching, and care about their students.
- Faculty members communicate explicitly and implicitly that the material studied by their students is important, and that they expect their students to be successful in mathematical studies. Courses are designed to meet the needs of the program's students, not the program's faculty.
- There is an environment that fosters extensive interaction among students and faculty. Students discuss mathematics inside and outside of class, with faculty members and with each other.

Attracting Students to Study Mathematics: In-Class Experiences

- Most faculty in the visited programs approach all courses with a primary focus on the general mathematical experience rather than the particulars of the individual subject. In every class, they try to motivate their students to learn and to be interested in mathematics. The particular course syllabus is a context for achieving these broad goals.
- All programs visited gave considerable attention to the teaching of first-year calculus. Many faculty considered it the most important teaching assignment they had. They believe the best inducement for beginning students to take another mathematics course is to have an excellent teacher in their current course. As a consequence, the departments were more selective about who was allowed to teach in beginning calculus than in higher level courses.
- Despite a variety of student abilities and classes with a mixture of those eager to learn more mathematics and those required to be there, faculty in visited programs

seemed to be effective in reaching virtually all students in their classes. Faculty were seen by all students to be setting high but achievable standards and then helping them meet these standards.

- Almost all the programs visited put a large amount of effort into developing and validating good placement tests whose results students tended to follow closely. This heightened the faculty's confidence that in introductory courses all students could master the material.

Organization of the Mathematics Major and Supporting Activities

- Most of the effective mathematics major programs visited have an inclusive view, trying to serve a broad range of student objectives with general training in the modes of reasoning and techniques of mathematical sciences.
- The prime objective of the mathematics programs studied was to train their majors to think mathematically. Helping students master particular concepts and techniques was less important.
- A very successful style of mathematics major used at one institution is a contract major in which a student and faculty advisor negotiate the courses in the mathematics major. As well as giving students a sense of ownership of their major, this format forces faculty to justify the value of their vision for a mathematics major.
- Most of the programs visited had a significant number of students participating in special individual or small group learning experiences such as independent study during summers or the academic year, an internship, senior thesis, or a (small group) directed reading course.

Effective Programs for Preparing Students for Advanced Study

Two very different strategies were observed for increasing the number of students continuing on to advanced study in mathematics:

- Develop a major attracting a large number of students with an inclusive goal of preparing students for a wide variety of careers and then motivate some of this large cohort to pursue graduate study; and
- Have a major focused primarily on preparation for graduate study; this approach

requires a selective student body and excellent instruction to avoid scaring most potential mathematics majors away.

Effective Programs for Preservice Preparation of School Teachers

- The syllabi and viewpoints of post-calculus courses enrolling substantial numbers of preservice secondary school mathematics teachers should give consideration to the special needs of these students. Instructors of these courses should have a basic familiarity with the NCTM Standards.
- The instructional style in the mathematics program served as a model for good teaching practices.
- The mathematics methods courses develop more than the mathematical foundations of school mathematics. They take a broad view of contemporary mathematics education issues.

Effective Programs for Under-represented Groups in Mathematics

- Effective instruction and extensive student-faculty interactions in the mathematics programs visited appears to 'disproportionately benefit' women, but not minorities. Special, additional efforts seem to be required to obtain fuller participation of underrepresented minorities in mathematics.
- The mathematics programs at historically Black colleges and universities (HBCUs) visited had especially nurturing atmospheres for students.

The institutions visited were Lebanon Valley College, Miami University of Ohio, Mt. Holyoke, St. Olaf, Seattle Central Community College, Southern University, Spelman College, University of Chicago, University of Michigan, and University of New Hampshire. A copy of the report has been sent to each U.S. mathematical sciences department. Additional copies are available from the MAA.

Project NExT — The Second Year

On August 3, seventy-eight mathematics faculty members new to the profession began their year as Project NExT Fellows. Intensive presentations, animated discussions, conversations over dinner as well as late into the night, were among their activities at the opening workshop at the University of Vermont. During the MathFest, the fellows reinforced their links to one another with long walks into downtown Burlington, mathematical card games, and a juggling seminar.

The 1995–96 fellows include forty men and thirty-eight women holding faculty positions in thirty-one states. The institutions represented include two-year and four-year colleges, comprehensive state universities, and research institutions. There are representatives from twenty-six of the twenty-nine MAA sections. (A complete list of the fellows by MAA section of faculty appointment is included at the end of this article.) As the workshop presenters discovered, the fellows are an exciting and energetic group with which to work. Their application materials were impressive and indicated that they were already wrestling with some of the major issues confronting undergraduate mathematics education.

Recognizing that the movement to “reform” the teaching of undergraduate mathematics presents special challenges and opportunities to those just entering the profession, Project NExT was developed to provide not only an overview of current issues in the teaching and learning of undergraduate mathematics, but also to build a network of peers and more experienced mathematicians to provide advice and ongoing professional support. This project of the MAA is funded by the Exxon Education Foundation for a three-year period. The project is now halfway through its second year.

The workshop in Burlington included more than twenty hours of special sessions. Among the topics were calculus reform, assessment, and the use of technology in teaching and learning mathematics. The fellows not only discussed broad issues, but also explored specific curriculum materials and teaching strategies, such as

writing, projects, and cooperative learning. Other sessions discussed such questions as how to maintain a welcoming classroom environment, what mathematics education research can contribute to our teaching, and how best to prepare future elementary and secondary teachers. A panel on the faculty member as teacher and scholar addressed an issue of critical importance to new faculty. To acquaint the fellows further with the professional associations, there was an evening discussion with Ken Ross, president of the MAA, and John Ewing, executive director of the American Mathematical Society.

One goal of Project NExT is to build a network of peers and more experienced mathematicians to provide professional support as the fellows launch their own careers. The intense workshop experience in Burlington got this network of peer support off to a running start. The fellows are connected through a special electronic network that the MAA has established for them and selected “consultants” from the mathematical community. That network has already been quite active in discussing issues of teaching and learning. The variety of the fellows’ institutions and teaching assignments is reflected in the discussions that take place on this network. The comments of the more experienced mathematicians who have joined the network provide a resource for these new fellows that reaches beyond their home schools.

Project NExT is a full year of commitment on the part of the individual fellows and their home institutions. In addition to the workshop and MathFest last August, the fellows are expected to attend the Joint Mathematics Meetings in Orlando in January 1996 and the 1996 summer MathFest at the University of Washington. The task of the codirectors, James R. C. Leitzel (University of Nebraska–Lincoln) and T. Christine Stevens (Saint Louis University) has been made a bit easier by the enthusiasm and talents of the fellows, who have taken it upon themselves to plan a program of activities for Project NExT participants at the Joint Meetings in Orlando. Additional Project NExT activities at the Joint Mathematics Meetings in Orlando will include a panel discussion by fellows on Friday, January 12, at 9:35AM and a booth in the exhibit area where members of the mathematical community will be

able to find out more about the project.

Fifty of the 1994–95 fellows joined the new class on Friday evening, August 4, for a Ben and Jerry’s Ice Cream event. The 1994–95 fellows had planned their own program for Saturday morning, but joined with the 1995–96 fellows for the afternoon activities. At the closing session, these 1994–95 fellows concluded their year with the project and were appropriately recognized by the MAA and the Exxon Education Foundation. Both Ed Ahnert, president of the Exxon Education Foundation, and Robert Witte, chief program officer, were in attendance. In fact, they both had actively participated in many of the events of the workshop. It was extremely exciting to have 128 young faculty actively engaged in issues confronting undergraduate mathematics education. Discussions and interactions continued throughout the three-day MathFest. A tremendous network has been formed.

Project NExT is supported, in part, by a three-year grant from the Exxon Education Foundation. The third group of fellows will be chosen in the spring of 1996. We hope that you will actively encourage applications from new faculty at institutions in your section. Further information can be obtained on the Project NExT Home page on the World Wide Web (<http://archives.math.utk.edu/projnext/>), at the booth in Orlando, or from either of the codirectors [Jim Leitzel, University of Nebraska–Lincoln; e-mail: jimleitz@unlinfo.unl.edu; (402) 472-7232; Chris Stevens, Saint Louis University; e-mail: stevensc@slu.vca.slu.edu; (314) 977-2444].

1995–96 Project NExT Fellows

Dora Cardenas Ahmadi, Morehead State University

Stuart Boersma, Alfred University

Theresa Ann Bright, Xavier University

Michael A. Brilleslyper, Arizona State University

Clayton Brooks, Georgia Southwestern College

Maureen T. Carroll, University of Scranton

Kevin E. Charlwood, Saint Leo College

Lee Chasen, Lebanon Valley College

Robin A. Cruz, Univ. of Southern Colorado

Debra Curtis, Bloomfield College

Barbara K. D’Ambrosi, John Carroll University

See *Project NExT* on page 8

The Double Bubble Conjecture

Frank Morgan

A proof of the equal-volumes case of the Double Bubble Conjecture, on the most efficient shape for a double soap bubble, was announced by Joel Hass (University of California, Davis) and Roger Schlafly (president, Real Software, Santa Cruz, California) at the Burlington MathFest. The story has two remarkable features:

- Although the problem is continuous, the proof was by computer.
- Much of the relevant theory came from undergraduate research.

Soap bubbles try to minimize area, and it is a famous theorem that a sphere—a single round soap bubble—provides the least-area way to enclose a given volume of air. When two soap bubbles come together as in Figure 1, they produce a double bubble consisting of two partial spheres and a separating surface (which is flat if the two original bubbles have the same volumes). The Double Bubble Conjecture says that this standard shape is indeed the least-area way to enclose and separate the two given volumes of air. This fundamental question has remained open in general despite the fact, as Brian White pointed out to me, that the least-area solution must be a surface of revolution, a fact which reduces the problem to a question about curves in the plane.

Figure 2 shows John Sullivan's computer simulation of a competing type of equilibrium double bubble, consisting of a peanut-shaped bubble with an innertube torus bubble around its waist. It is easy to compute that this particular nonstandard double bubble has more area than the standard one and unequal volumes. But you can begin to imagine there might be many other possibilities. If you allow the two regions of prescribed volume to have several components, you might obtain chains of torus bubbles on torus bubbles, as in Figure 3. And unfortunately you must allow such regions of several components because they arise as limits of connected regions with similar subregions connected by thin tubes of negligible area. Similarly you must allow the exterior to have additional bounded components, sometimes called

"empty chambers" because they are enclosed regions containing none of the prescribed volumes.

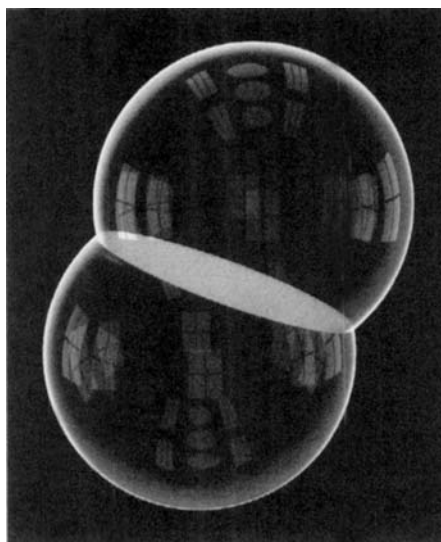


Figure 1 Hass and Schlafly proved that the standard double bubble is the least-area way to enclose and separate the two given volumes of air.

Graphics by John Sullivan, University of Minnesota

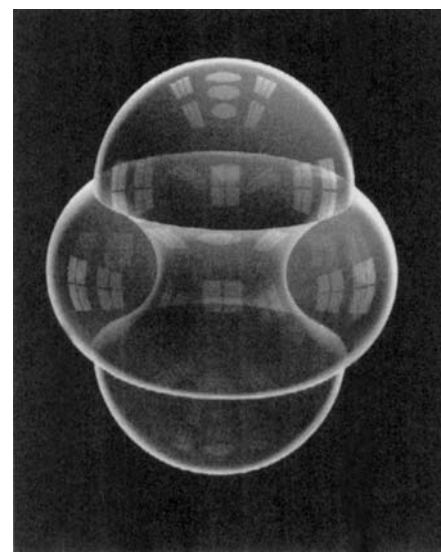


Figure 2 A nonstandard double bubble

John Sullivan, University of Minnesota

In the summer of 1990 my Williams College NSF "SMALL" undergraduate research Geometry Group, consisting of Manuel Alfaro, Jeffrey Brock, Joel Foisy, Nickelous Hodges, and Jason Zimba,

proved the planar version of the Double Bubble Conjecture: that the least-perimeter way to enclose two regions of prescribed areas in the plane is given by the standard double bubble, consisting of three



Joel Hass, one of the two mathematicians who finally cracked the double bubble conjecture.

meeting in two points at equal 120° angles, and not some crazy alternative with empty chambers and regions of many components (see Figures 4 and 5). The proof used some ingenious arguments and geometric constructions. Their result was published in the *Pacific Journal of Mathematics*² and featured in the 1994 AMS *What's Happening in the Mathematical Sciences*.

Michael Hutchings, a member of the later 1992 Geometry Group (which published results on the planar triple bubble³) and now a graduate student at Harvard, went on to exploit symmetry, convexity, and rearrangement arguments to prove that any nonstandard least-area double bubble in \mathbb{R}^3 looks like that of Figure 3, and in the case of equal volumes, looks like that of Figure 2. The torus waist bubble need not lie symmetrically in the center; there is a large two-parameter space of possibilities. Sullivan, Rob Kusner, and Hutchings made some early progress on numerical computations, but it was a big space to check accurately.

Last year, during a calm stretch between rapids while kayaking down the south fork of the American River in Northern California, Hass and Schlafly had an inspiration about carrying out a computer proof. In the end, they narrowed the possibilities and reduced the problem to 200,260 integrals, which an ordinary PC running DOS on a Cyrix processor and coprocessor, programmed in C++ and some assembly language, accomplished in about twenty minutes. All results were duplicated on an Intel 486 DX2-66 processor. The computations showed that every competing possibility had pieces which failed to match up, or violated stability conditions, or had

unequal volumes. In close cases, they subdivided the parameter domain more finely for greater accuracy. They maintained careful error estimates at every step.

Hass and Schlafly announced the result on August 6 at the Burlington MathFest at my special session on Soap Bubble Geometry.⁴ The audience included Ivars Peterson, whose report appeared in *Science News* that Friday.⁵ His title, "Toil and Trouble over Double Bubbles," refers to one of many Shakespearean quotes in Hass and Schlafly's result, the one that begins and ends with "Double bubble":

Double, double, toil and trouble;
Fire burn and cauldron bubble.

Macbeth

Act 4, Scene 1, Line 10–11

All such work depends on foundational work from 1960 of De Giorgi, Riefenberg, Federer, and Fleming on general theories of surfaces with singularities. The difficult existence and regularity of least-area bubble clusters was proved in 1976 by Fred Almgren and Jean Taylor.^{6,7}

Before parting I now provide a four-sentence outline of a proof that a least-area double bubble must be a surface of revolution. It begins with the existence of two orthogonal planes (say the xz - and yz -planes) which split both volumes in half. Then one may assume symmetry under reflection through both planes, and hence under 180° rotation about the z -axis. Therefore, all vertical planes through the z -axis split both volumes in half. It follows that the double bubble must intersect these planes orthogonally and hence must be a surface of revolution.

Hutchings found a way to generalize this symmetry argument to prove the surpris-



Figure 5 As part of his undergraduate thesis, Joel Foisy, now a graduate student at Duke, revised the 1990 *Geometry Group* paper for publication in the *Pacific Journal of Mathematics*.

ingly difficult fact that the area of a least-area double bubble is an increasing function of the prescribed areas. An immediate consequence is the absence of empty chambers, since filling such a chamber would increase volume and decrease area. Second, Hutchings added a geometric decomposition argument to show that in the case of equal volumes, each region must be connected. This reduced the competing possibilities to those of Figure 2, which Hass and Schlafly eliminated by their clever computations.

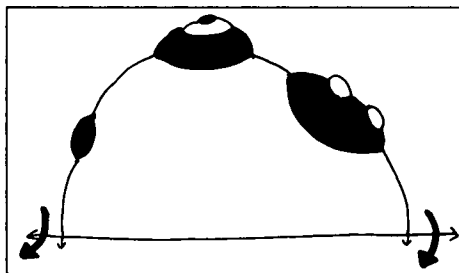


Figure 3 You have to allow regions of many components.¹

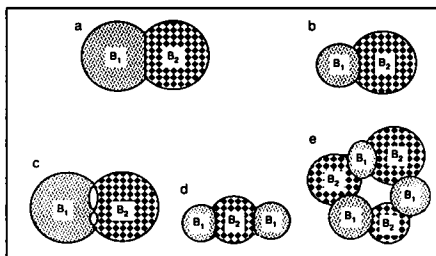


Figure 4 The standard double bubble (a and b); not some crazy alternative with empty chambers and regions of many components (c, d, e).

For more general background and further references, see my 1994 article⁸ and the new chapter in my book's second edition.⁷ The general Double Bubble Conjecture on area minimization for unequal volumes remains open.

¹ Hutchings, M. "The Structure of Area-minimizing Double Bubbles." *Journal of Geometric Analysis*, to appear.

² Foisy, J., Alfaro, M., Brock, J., Hodges, N., and Zimba, J. "The Standard Double Soap Bubble in R^2 Uniquely Minimizes Perimeter." *Pacific Journal of Mathematics* 159 (1993): 47–59.

³ Cox, C., Harrison, L., Hutchings, M., Kim, S., Light, J., Mauer, A., and Tilton, M. "The Shortest Enclosure of Three Connected Areas in R^2 ." *Real Analysis Exchange* 20 (1994–95): 313–335.

⁴ Hass, J. and Schlafly, R. "Double Bubbles Minimize." Preprint, 1995.

⁵ Peterson, I. "Toil and Trouble over Double Bubbles." *Science News* 148 (August 12, 1995):

101.

⁶ Almgren, Jr., F. J. and Taylor, J. E. "Geometry of Soap Films." *Scientific American* 235 (1976): 82–93.

⁷ Morgan, F. *Geometric Measure Theory: A Beginner's Guide*. San Diego, CA: Academic Press, 1995.

⁸ Morgan, F. "Mathematicians, Including Undergraduates, Look at Soap Bubbles." *American Mathematical Monthly* 101 (April 1994): 343–351.

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Summer Program for Women Undergraduates

Pending funding by the NSF, in 1996 Carleton and St. Olaf Colleges will continue their successful, intensive, four-week summer program to encourage talented undergraduate women to pursue advanced degrees in the mathematical sciences.

Students will take two courses in areas of mathematics not normally offered in an undergraduate curriculum, with female instructors who are active professionals and outstanding teachers. In addition to their courses, the students will participate in recreational problem-solving, visit the Geometry Center, receive information about graduate schools and careers in mathematics, and attend twice-weekly colloquia.

Please announce this to your talented first- and second-year female mathematics students. For information or application materials, e-mail Dr. Deanna Haunsperger at dhaunspe@carleton.edu, or write to Summer Math Program, Mathematics Department, Carleton College, Northfield, MN 55057, or consult the program's WWW page at

<http://www.stolaf.edu/stolaf/depts/math/SummerProgram.html>.

Project NeXT from page 5

Steven M. Deckelman, Wayne State College
 D. Scott Dillery, Albion College
 Jenny Dorrington, Colorado College
 Gerri M. Dunningan, University of North Dakota
 Della D. Fenster, University of Richmond
 Benjamin Ford, University of Washington
 Frederick Ford, Dickinson College
 Mark Foskey, Jacksonville University
 Lisa R. Galminas, Northwestern State University of Louisiana
 Richard Gayle, Montana State University-Northern
 Stephen J. Giust, Nicholls State University
 Philip E. Gustafson, Emporia State University
 Jacqueline A. Hall, Hampden-Sydney College
 John M. Harris, Appalachian State University
 John P. Holcomb, Jr, Youngstown State University
 Judy A. Holdener, U. S. Air Force Academy
 Philip K. Hotchkiss, Rhodes College
 Tamara J. Hummel, Allegheny College
 Sara Hawtrey Jones, University of Southern Colorado
 Renee Koplon, Wright State University
 Bonita A. Lawrence, North Carolina Wesleyan College
 Jeffrey Kent Lawson, Wake Forest University
 Aihua Li, Loyola University New Orleans
 Fengshan Liu, Delaware State University
 Sergio Loch, Grand Valley College
 John D. Lorch, Wingate University
 William W. Ma, Pennsylvania College of Technology
 Mary K. Marshall, Illinois College
 William O. Martin, North Dakota State University
 Christine A. McMillan, Virginia Tech
 J. Lyn Miller, Western Kentucky University
 Margaret L. Morrow, University of St. Thomas
 Carl D. Mueller, Georgia Southwestern College
 Leigh Ann Myers, Northwestern State University of Louisiana
 Jodie D. Novak, Ball State University
 Zephyrinus C. Okonkwo, Alabama State University
 Robert Park, Southern University
 Sharon Persinger, Bronx Community College
 Kristin A. Pfabe, Northern Kentucky University
 Christopher J. Pladdy, Nicholls State University
 C. Lanette Poteete-Young, Judson College

Math Options at Penn State Celebrates Fifth Anniversary

In 1991 the Philadelphia Region of Women and Mathematics held the first Math Options program at Penn State Ogontz Campus for 150 seventh grade girls. Celebrating its fifth year in 1995, this award-winning program has grown to host five hundred girls, again at Penn State Ogontz Campus. In total, Penn State campuses throughout Pennsylvania hosted almost two thousand girls, due in part to an expansion grant awarded in 1993 by Bell of Pennsylvania (now Bell Atlantic). Gloria Dion and Deborah Simon, Women and Mathematics Philadelphia Region coordinators, originated Math Options with the help of the Continuing Education Division of Penn State Ogontz Campus.

Math Options is a series of career awareness programs offered at Penn State campuses. At the Math Options Career Day, women in mathematics, science, and related fields lead hands-on sessions designed to expose young women to the varied career options available to those who have studied mathematics throughout high school. Math Options is built upon the models of the UC Berkeley Lawrence Hall of Science's "Expanding Your Horizons" and Cedar Crest College's "MathConn" programs. The overwhelmingly positive response to Math Options—from students, teachers, parents, and presenters—has underscored the need for providing such experiences for young women. In addition to the Career Day, the Ogontz and Delaware County campuses of Penn State organized one-week Summer Institutes for Math Options alumnae entering ninth grade. The Summer Institutes began in 1994 and are funded for five years by the Mobil Corporation. As a follow-up activity, graduates of the Summer Institutes are invited to participate in the Women and Mathematics Philadelphia Region's mentoring program.

A manual with suggestions for organizing a similar career day is available by writing on school letterhead to Dr. Mary Day Cote, Regional Director of Continuing Education, Penn State Ogontz Campus, 1600 Woodland Rd., Abington, PA 19001-3990.

Secretary Search

Due to the election of the current secretary to the position of president-elect, it will be necessary to find a new secretary for the Association. A nominating committee will be formed. In the meantime please forward names of potential candidates for this position to G. L. Alexanderson, Department of Mathematics, Santa Clara University, Santa Clara, CA 95053; galexanderso@scuacc.scu.edu.

Vrunda P. Prabhu, William Woods College
 Mary Lynn Reed, Philadelphia College of Pharmacy and Science
 Stacey Rodman, Augustana College
 Elyn Rykken, Indiana University, Northwest
 Daniel J. Schaal, Clarion University of Pennsylvania
 Paula A. Shorter, Rockhurst College
 Richard M. Single, St. Olaf College
 Jude Thaddeus Socrates, Pasadena City College
 Jody M. Sorensen, Bates College
 Barry Spieler, Birmingham-Southern College
 John Swallow, Davidson College
 Thaddeus Tarpey, Wright State University
 John Thurber, Eastern Oregon State College
 Rebekah Valdivia, Augsburg College

Troy D. VanAken, University of Evansville
 Vonn Walter, Southeastern Oklahoma State University
 Fred Weening, Edinboro University of Pennsylvania
 Randy Westhoff, Bemidji State University
 Frederick J. Wicklin, University of Minnesota
 Sheryl Wills, University of Wisconsin-Oshkosh
 Haidong Wu, Southern University
 Weiqing Xie, California State Polytechnic University
 Yajun Yang, SUNY-Farmingdale
 Maureen Yarnevich, Towson State University
 Kuo-chuan (William) Yin, LaGrange College
 Holly Zullo, Eastern Oregon State College

Report Shows Improved Performance in High School Math

American high school students are taking harder courses, especially in mathematics and science, and they are doing better at those courses, according to a government report released in early fall. The National Center for Education Statistics prepares its report *Condition of Education* annually, by examining sixty 'indicators' that, taken together, present a snapshot of the health of American education since the publication of *A Nation At Risk* a dozen years ago. The report includes data on enrollment, student achievement, curricula, the transition from school to work, revenues and expenditures, school climate, staffing and salaries, degrees conferred, and tuition.

A selection of findings from the 1995 report include:

High school students are taking harder courses, especially in mathematics and science.

- Between 1982 and 1992, the percentage of high school graduates taking the core courses recommended in *A Nation At Risk* increased sharply, from 13% to 47%. This increase was broadly based, with increases observed for both sexes and in all racial/ethnic groups. [Indicator 25, p. 78]
- More students are taking algebra, geometry, trigonometry, and calculus—courses emphasized in many recent school reform efforts—as well as advanced science courses, including chemistry and physics. For example, the percentage of high school graduates who took geometry increased from 48% to 70% between 1982 and 1992; the percentage of graduates who took chemistry increased from 32% to 56%. [Indicator 26, p. 80]

The mathematics and science proficiency of students has increased.

- Between 1982 and 1992, the mathematics and science proficiency scores of seventeen-year-olds on the National Assessment of Educational Progress (NAEP) increased 9 and 11 points, respectively, on each assessment. This is roughly equivalent to an additional year of learning in high school. Riley noted that the new math standards and an em-

phasis on improving science and math instruction are focuses of many education improvement strategies. [Indicators 15 and 16, pp. 58–61]

- Although proficiency scores in reading and writing have not shown similar increases [Indicators 13 and 14, pp. 54–57], U.S. students compared favorably to those in other countries in an international assessment of basic reading literacy in 1991–92. [Indicator 17, p. 62]
- Even though the number of Scholastic Assessment Test (SAT) test-takers as a percentage of high school graduates has increased 8 percentage points since 1983, the average mathematics score has increased and the average verbal score has remained stable. [Indicator 20, p. 68]

More high school graduates go to college immediately after high school, even though college costs continue to rise relative to family income.

- Between 1980 and 1993, the proportion of high school graduates going directly to college increased from 49% to 62%. Most of this increase was in enrollments in four-year colleges and universities. Increasing preparation for college and promoting college participation are continuing to be at the heart of many education reforms, Riley said. [Indicator 9, p. 42]
- Between 1980 and 1993, tuition, room, and board at public institutions increased from 10% to 14% of median family income. This increase was larger for low-income families than for high-income families. Over the same time period, tuition, room and board at private institutions rose from 22% to 39% of median family income. [Indicator 7, p. 38]

The U.S. population compares favorably with other countries with regard to educational attainment. [Indicator 23, p. 74]

- In 1992 the percentage of twenty-five- to thirty-four-year-olds who had completed at least secondary education (high school in the U.S.) ranged from 42% in Italy to 91% in Japan. In the U.S. 87% of this age group had completed high school.

- The percentage of twenty-five- to thirty-four-year-olds who had completed higher education (a bachelor's degree in the U.S.) ranged from 7% in Italy to 23% in both Japan and the U.S.

- A higher percentage of young women had completed higher education in the U.S. (23%) than had their counterparts in other industrialized countries (12% in Japan and 11% in Germany).

There are positive economic returns to education.

- Employment: In 1993, 64% of recent high school graduates not enrolled in college were employed compared to 47% of recent dropouts. [Indicator 28, p. 88]
- Employment: For both young men and young women, employment rates were higher for college graduates than for those with only a high school diploma or GED. [Indicator 29, p. 90]
- Earnings: For both young men and young women, the earnings gap between college graduates and their counterparts with only a high school diploma or GED has widened since the early 1980s. [Indicator 30, p. 92]
- Welfare Dependency: In 1992 high school dropouts were three times more likely to receive income from AFDC or public assistance than high school graduates who did not go on to college (17% versus 6%). This gap has increased over time. [Indicator 32, p. 96]

Federal investment lessens revenue disparity among school districts.

- In 1989–90 the federal share of cost-of-living adjusted revenue ranged from 13% in school districts with 25% or more school-age children living in poverty to 2% in districts with less than 5% of school-age children living in poverty. [Indicator 53, p. 150]

The full report is available in paper only. Send \$34.00 to the Superintendent of Documents, U.S. Government Printing Office, PO Box 371954, Pittsburgh, PA 15230, Stock No. 065-000-00791-6. To order by phone, call (202) 512-1800.

AAAS Meeting in Baltimore Offers Strong Mathematics Program

Warren Page

The 1996 Annual Meeting of the American Association for the Advancement of Science, February 8–13, 1996 in Baltimore, will feature many outstanding expository talks by prominent mathematicians. These include the following symposia (three-hour sessions) and invited talks sponsored by Section A (Mathematics) of the AAAS.

- Pattern Formation, organized by Martin Golubitsky (University of Houston) and Charles Radin (University of Texas at Austin)
- Analytic Approaches to Fairness, organized by Steven J. Brams (New York University)
- Geometric Arrangements, organized by Janos Pach (Courant Institute) and Charles Radin (University of Texas at Austin)
- Mathematical Problems in the Diagnosis and Treatment of Disease, organized by David Isaacson (Rensselaer Polytechnic Institute)
- Knots, organized by Cameron Gordon (University of Texas at Austin)
- Building Evolutionary Trees: Evidence and Analysis, organized by Martin Farach (Rutgers University)
- Frontiers of Physical Sciences lecture "Partitions: From Number Theory to Physics," George E. Andrews (Pennsylvania State University)
- Topical Theme lecture, John Conway (Princeton University)

Other symposia that will be of interest to mathematicians and mathematics educators include:

- Frontier Applications in Computer Methods for Dynamic Systems, organized by Ronald E. Mickens (Clark Atlanta University)
- Using Problem Based Learning to Bolster Achievement for All Students, organized by Maxine Bleich (Ventures in Education)
- Quantitative Literacy and Science Education, organized by Cathy Crocker (American Statistical Association)

- Science of Decision Making in a Complex World, organized by Alice F. Healy and Francis A. Beer (University of Colorado)
- Are Women Succeeding in Science—Why and Why Not? organized by Mary Frank Fox (Georgia Institute of Technology)
- Frontiers of the Physical Sciences, two symposia organized by Rolf Sinclair (NSF)

The above symposia are only a few of the 150 or so AAAS program offerings in the physical, life, social, and biological sciences that will broaden the perspectives of students and professionals alike. Indeed the AAAS Annual Meetings are the showcases of American science, deserving greater participation by mathematicians.

In presenting mathematics to the AAAS Program Committee, I have found the committee genuinely interested in more symposia on mathematical topics of current interest. The Section A Committee is looking for organizers and speakers who can present substantial new material in understandable ways. This task is not easy, but the outstanding success of mathematics symposia at the previous AAAS Annual Meetings proves that effort and

inspiration can accomplish wonders. The mathematics programs at these meetings show that first-rate mathematical researchers and educators can also effectively reach a broad scientific audience.

We in Section A of the AAAS know that the increasing representation and participation of mathematicians at the AAAS Annual Meetings are important means for deepening public awareness and appreciation of the manifold ways that mathematics contributes to science and society. We need and welcome your suggestions for symposia topics and individuals who might be able to organize them.

I hope that you will have the opportunity to attend some of the exciting symposia and talks in Baltimore. For details of the program, see the October 27, 1995 issue of *Science*. I invite you to attend our Section A Committee Meeting, 12:30–3:30 P.M., Friday, February 9, 1996, Room 312 of the Convention Center. The meeting is open to all who wish to stimulate interest and activities of the mathematical sciences within the AAAS. Please send me, and encourage your colleagues to send me, symposia proposals for future AAAS meetings.

The AAAS wishes to acknowledge the AMS for their generous support.

Warren Page is secretary of Section A of the AAAS.

Top Ten Math Graduate Schools

The National Research Council recently released a report on the status of U.S. research doctorate programs, the first such report it had issued since 1982. The study examined the quality and effectiveness of more than 3600 doctoral programs in forty-one fields at 274 universities, updating and expanding on the 1982 assessment. The report provided ratings on a variety of factors. However—and controversially—the rankings of programs were based solely on the "scholarly quality of program faculty," as evaluated by other mathematicians, not on the quality of the graduate programs offered. For those who are interested in such rankings, here, according to the report, are the institutions where you will find the top ten graduate mathematics faculty.

1. University of California, Berkeley & Princeton University (tie)
3. Massachusetts Institute of Technology
4. Harvard University
5. University of Chicago
6. Stanford University
7. Yale University
8. New York University
9. University of Michigan & Columbia University (tie)

Only the University of Michigan is new to the top ten. The 1982 assessment's top ten included the other nine plus the University of Wisconsin–Madison.

More information is available on the WorldWide Web at <http://www.nas.edu>, via gopher at <gopher.nas.edu>, and via ftp at <ftp.nas.edu/pub/>.

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A Foundation in High Gear

Don Albers

Ed Ahnert, president of the Exxon Education Foundation (EEF), and Bob Witte, its senior program officer, were in Burlington, Vermont in early August for the second summer meeting of Project NExT (New Experiences in Teaching), the MAA's program for new Ph.D's entering teaching that EEF is funding. The project provides an overview of current issues in the teaching and learning of undergraduate mathematics and has built a network of peers and more experienced mathematicians for advice and ongoing professional support. The success of Project NExT has been phenomenal and has brought big smiles to the faces of Foundation officials Ahnert and Witte. The first group of sixty-six NExT fellows, selected in 1994, joined the 1995 group of fellows in Burlington at the combined summer meetings of the MAA and AMS. The energy and enthusiasm of the NExT fellows is contagious and powerful. Codirectors Professor James Leitzel of the University of Nebraska-Lincoln and Professor Christine Stevens of St. Louis University describe the fellows as "exhilarating and exhausting!" Ahnert and Witte were impressed with the NExT project from the start, and seemed like two proud parents of 130 fellows at the various NExT activities in Burlington. They attended NExT workshops, NExT panel discussions, and the NExT ice cream social. If there were not a slight age differential between them and typical NExT fellows, you might have thought that they, too, were NExTers.

In addition to funding Project NExT, EEF has helped the MAA by providing support for the following:

- *Math Horizons*, our new magazine for students
- SUMMA (Strengthening Underrepresented Minority Mathematics Achievement)
- the Student Chapters Program
- publication and dissemination of "Guidelines for Programs and Departments in Undergraduate Mathematical Sciences" and "A Call for Change"

• Distinguished Teaching Awards

EEF also has been very active in the development of new standards for mathematics education and the associated new approaches to teaching and curricula. In addition to the MAA, support in pursuit of these goals has been given to the American Mathematical Association of Two-Year Colleges (AMATYC), the National Council of Teachers of Mathematics (NCTM), the Mathematical Sciences Education Board (MSEB), and the Consortium for Mathematics and Its Applications (COMAP).

Math Horizons and two other mathematics publications can trace their all important start-up funds to EEF: *What's Happening in the Mathematical Sciences?*, an annual publication of the American Mathematical Society, and the *Elementary Mathematician*, a newsletter of COMAP.

Although EEF is now forty years old, its involvement with mathematics education dates back only to 1987 with the creation of their Mathematics Education Program, which is concerned with promoting mathematics at all levels, with special emphasis on grades K-3. That early emphasis reflects the reality that students' math performance patterns are shaped largely in the early school years, where the quality of math instruction has needed strengthening. By the early 1990s, seventy-five school districts had received grants to introduce math specialists.

The work of EEF at college and university levels has been carefully targeted and very successful. Each year EEF distributes about twenty million dollars in grants to schools, colleges, universities, and education-related organizations.

The impact of EEF on mathematics education in seven years has been nothing short of extraordinary. Marcia Sward, executive director of the MAA, is very impressed with the work of EEF. She says, "The Exxon Education Foundation has been a key player in mathematics education reform efforts for almost ten years. Exxon staff members have made it their business to understand our community and what it is seeking to achieve, and to support those activities with the greatest potential for transforming our vision into reality."



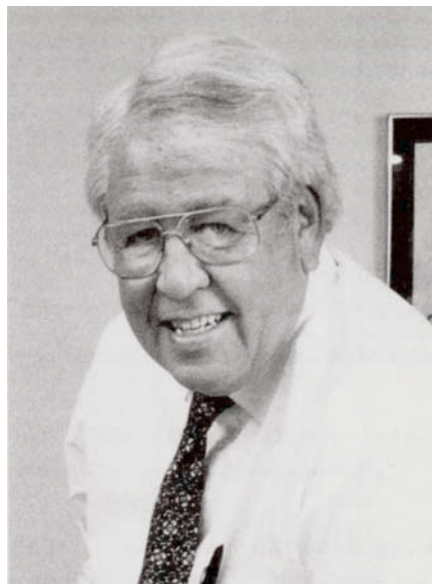
Ed Ahnert, President of the Exxon Education Foundation

The NExT project underscores one of the particular joys that Ahnert expresses about being at the helm of EEF: "I like being able to distribute funds to people who have common problems and watch the empowering effect. We empower them not only with money but with recognition; just getting a grant is important. It may be more important for elementary school teachers who often don't have the same freedom to practice their ideas as do college teachers.

"I enjoy being able to come back and get to know grantees over long periods of time and see them grow. The NExT program and our program for developing math specialists for kindergarten through third grade (K-3) are especially gratifying in that regard.

"I've been attending the annual meetings of K-3 math specialists since 1990. At the 1990 meeting, there was still a great deal of uncertainty, skepticism, and fear. In that large group of developing math specialists, there was an initial hesitancy to reveal to their peers that they didn't know something; that's a kind of fear. Now there is a sense of the whole group working as a team and resource group. It's great to see them address problems openly, rather than concealing them."

Taking the long view is central to EEF's success. Ahnert notes that "accomplishing change in mathematics education is something that takes a while. We are willing to move into mathematics education reform and stick with it for a long period



Bob Witte, Senior Program Officer for the Exxon Education Foundation

of time.

"Because we're small and private, we can be a bit more experimental than NSF or the Ford Foundation and take some risks. So Bob Witte can follow a thread that he sees developing, sort of go with the flow, and redesign what we're doing each year in some small but important marginal way."

When asked what it is like working with the mathematics community, Witte responded, "What really impresses me about the mathematics community is their well-developed sense of common purpose. Even the dissenting voices in mathematics education reform are really quite healthy. They provide the basis for an ongoing discussion that needs to be there."

"I think that there's a lot that mathematics can give to other disciplines as well, and I think that the right sort of perspective on change in mathematics education could be enormously helpful to people who now aspire to improve teaching in science."

The many successes of EEF are perhaps more easily explained when reflected in Ahnert's general view of education. According to him, "Education is a very personal experience. It takes place between a learner and a guide, a teacher and a mentor, or a fellow student in some cases. It's the most personal and intimate of activities, and if you lose that sense of how personal and intimate learning and teach-

ing are, then you quickly run into the swamp and bog down.

"I go to a large number of educational conferences where many presenters go on and on with all sorts of data. Oftentimes you wouldn't know that they were talking about students and teachers. In fact, at most of those meetings there are no students or teachers present. It's amazing and sad how far away that part of education has shifted from what I think is the central purpose of the enterprise. At EEF, we try to stick close to the purpose."

Bob Witte is in the unique position of simultaneously working with primary school teachers and university teachers. The K-3 math specialists and the NExT fellows have established electronic discussion groups that he is, as he puts it, "privileged to observe on a day-to-day basis." He has noticed that the K-3 group spends most of its time discussing students and some time on mathematics. For the NExT group, the situation is reversed. That observation and his rapidly growing contacts with members of MAA and other professional organizations lead him to ask, "What in the long run is the role of the profession? It seems to me that the profession from university to kindergarten needs to work hard at establishing two-way transmission lines. If not, you will see more advertisements on TV and in the popular press for mathematics for our elementary children that may be nothing more than number games. You can't build an educational program on that sort of thing."

"I was really encouraged by the discussion about teaching and learning at the last joint meetings of the AMS and MAA in San Francisco. Nineteen-ninety-five may have been the year when the discussions about teaching and learning took on a real synergy."

In spite of considerable success, Ahnert cites a problem that is common to many foundations. "It's saying no to good people. For every grant that we make, we say no to ten. And nine of those ten are fine projects."

Witte adds, "In the end we end up betting on people with vision. Most of the best grants we make go to people who would find a way to do what they want to do whether we made the grant or not. That in a sense sets a very high standard for people

who get our grants."

What's next for EEF? Ahnert responds, "I manage not only the foundation, but the entire corporate grant-making apparatus, half of which is made up of EEF. We're involved in a lot of things: mathematics education, science education at both the pre-college and college levels, and a huge three-to-one educational matching gift program that has benefitted nearly every university in the country."

"On the corporate side, we make grants to health and human services organizations. In communities where we have Exxon facilities, we have provided grants for arts-related activities, environmental projects, and minority and women's services. I am interested in trying to draw all of these activities together. One of the best things we do is to leverage two or three different things at the same time. For example, what we've learned about mathematics education is informing a lot of what we're doing in our new collegiate science program. In fact, we're calling it Science, Math, Engineering, and Technology. The math is already there in what Bob Witte is doing. I'm interested in doing more cross fertilization and cross leveraging."

"I also believe that we will have to engage in fewer and bigger projects. That's a reality that many corporations are now facing. Our budgets haven't been cut, but we're getting head count pressure. So there's pressure that's going to require doing a few bigger things. We want to be as effective as we can, and Exxon's shareholders and directors deserve our accountability for the resources they provide. Like mathematics educators who are wrestling with assessment issues, we too are challenged to provide that accountability by measuring what's important to know about our programs, not just what is easy to measure. Our grantees can help us by making sure we understand and can explain what is important to know about the work we support."

Updates for the Joint Mathematics Meetings

January 10–13, 1996

Orlando, Florida

MAA Invited Addresses

Robert L. Bryant's title is "*Perspectives in the geometry of differential equations*"

Other MAA Sessions:

Making Teaching More Public: Thursday, 2:15 P.M. The panelist who will represent the two-year college perspective is **Linda Boyd**, DeKalb College.

Department Chairs Session: **Encouraging Departmental Change:** Thursday, 7:30 P.M. to 9:00 P.M., organized by **James R.C. Leitzel**, University of Nebraska–Lincoln, sponsored by the Committee on the Teaching of Undergraduate Mathematics. This session will open dialogue with departmental chairs on aspects of changing the undergraduate experience. Topics to be discussed include the role of department chairs in fostering change in content, teaching, assessment, and in encouraging faculty participation in professional development.

Poster Session on Research by Undergraduate Students: Saturday, 8:00 A.M. to 10:00 A.M., sponsored by the CUPM Subcommittee on Undergraduate Research in Mathematics. Posters which describe mathematical research by individual undergraduates will be judged on mathematical content and on presentation. Prizes will be awarded to all participants and monetary prizes totalling at least \$225 will be awarded. Prospective participants should submit an abstract by November 30 to the organizer, **Judith Palagallo**, Department of Mathematical Sciences, The University of Akron, Akron, OH 44325-4002; (216) 972-7402; e-mail: palagallo@uakron.edu.

Panelists for the discussion on *The Job Market for New Ph.D.s* include **Ronald M. Davis**, Anoka-Ramsey Community College; **Paul D. Humke**, St. Olaf College; **Donald E. McClure**, Brown University; **James F. Ramaley**, Ziff-Davis Publishing; and **James R. Schatz**, National Security Agency. **Annalisa Crannell**, Franklin and Marshall University, will

moderate this discussion.

Panelists for the discussion on *Women and Mathematics: Case Studies of Intervention Programs* include **Diana C. Dismus-Campbell**, Rutgers University and Spelman-Bryn Mawr Summer Mathematics Program; **Sarah J. Greenwald**, University of Pennsylvania Women in Mathematics; and **Julie Kimbell**, Chemical Industry Institute for Toxicology and North Carolina Women and Mathematics/Wake County Schools Math Mentoring Program.

You're the Author, What's Next?: Panelists include **Robert L. Devaney**, Boston University; **William E. Hoffman**, Worth Publishers; **Barbara A. Holland**, John Wiley and Sons; **Kay Murray**, Authors Guild; and **Michael J. Sullivan**, Chicago State University.

AMS–MAA Invited Addresses

Andrew J. Granville, University of Georgia, Athens, "*It's as easy as abc*," Saturday, 11:10 A.M.

Roger A. Wiegand, University of Nebraska–Lincoln, "*A century of syzygies*," Wednesday, 11:10 A.M.

Neal Lane, National Science Foundation, will give the government science policy address, sponsored by the AMS Committee on Science Policy, JPBM, and the MAA Science Policy Committee, at 4:20 P.M. on Friday.

Other AMS–MAA Sessions

Joint Prize Session: Thursday, 4:25 P.M. **The Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student**, co-sponsored by AMS, MAA, and the Society for Industrial and Applied Mathematics, will be presented in addition to those listed in the October issue.

An additional presenter in the *Workshop on Teacher Enhancement Opportunities* is **Philip D. Wagreich**, University of Illinois at Chicago.

AMS Invited Address

Janos Pach's title is "*Geometric graphs*."

Peter Shor's title is "*Quantum computation*."

Linda Preiss Rothschild's title is "*Geometry of real algebraic manifolds in complex space*."

Henry Rene Darmon's title is "*Pell's equation and elliptic curves: From Fermat to Wiles*."

Other AMS Sessions

Workshop on Teacher Enhancement Opportunities: Friday, 1:00 P.M. to 2:30 P.M., organized by Ronald A. Douglas, SUNY at Stony Brook, sponsored by the Committee on Education. The National Science Foundation (NSF) sponsors a number of programs for mathematics teachers. This session will describe approaches taken by various university and colleges. Presenters include **Spud Bradley** and **Diane Spresser**, NSF, **Judith Roitman**, University of Kansas, the organizer, and others.

The Council meeting will take place from 1:00 p.m. to midnight.

Does Calculus Reform Really Work?: Saturday, 8:30 A.M. This panel discussion will include viewpoints from panelists on 1) calculus reform works; 2) calculus reform does not work; and 3) it's too early to assess whether or not calculus reform works. Panelists include **George E. Andrews**, Pennsylvania State University; **Morton Brown**, University of Michigan, Ann Arbor; and **John C. Polking**, Rice University.

A reception hosted by *Mathematical Reviews and MathSciNet* will take place Thursday, 8:00 P.M. to 10:00 P.M. All participants are invited to attend where a demonstration of MathSciNet will be given.

Activities of Other Organizations

Association for Symbolic Logic (ASL)

See *Joint Meetings Update* on page 17

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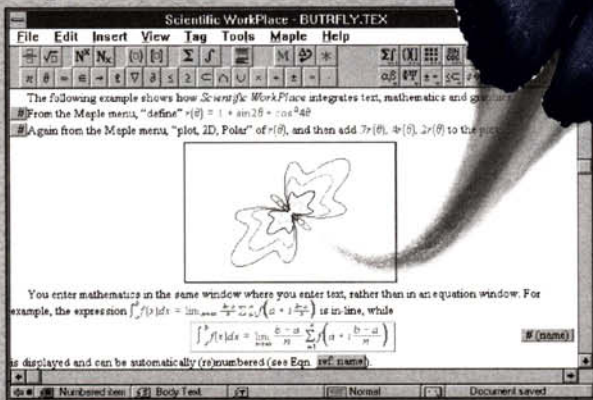
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History of Mathematics Institute

Would you like to teach a course in the history of mathematics? Does your college or university plan to offer such a course soon for prospective teachers to implement the recommendations of the MAA, NCTM, and NCATE? Do you want to learn how the history of mathematics will help you in teaching other mathematics courses?

If you answered "yes" to any of these questions, you are invited to apply to participate in the second MAA Institute in the History of Mathematics and Its Use in Teaching. It will take place at American University, Washington, DC, June 3–21, 1996, with work continuing through an electronic network during the academic year 1996–97. Participants will return to Washington for three additional weeks in June 1997. The teaching staff of the Institute consists of well-known historians of mathematics, including V. Frederick Rickey, Victor J. Katz, Steven H. Schot, Ronald Calinger, Ubiratan D'Ambrosio, Judy Green, Uta Merzbach,

David Pengelley, James Donaldson, and Karen Parshall. Activities at the institute include reading of original sources, survey lectures, small group projects, trips to rare book libraries, and discussions of methods of conducting a history of mathematics course and of using history in the teaching of other mathematics courses. Participants will also have the opportunity to interact with mathematicians who will be returning to the institute for their second year.

Applications are strongly encouraged from faculty at small institutions, at minority-serving institutions, and institutions that prepare secondary teachers.

For more information and application forms, contact V. Frederick Rickey at (419) 372-7452 or Victor J. Katz at (202) 274-5374; or preferably by e-mail: rickey@maa.org and vkatz@maa.org. Applications are due by March 15, 1996. Applicants will be notified of their acceptance or declination by April 15, 1996.

Extending the Scope of Mathematics Education Reform

In October, the Exxon Education Foundation announced a grant to support project EXTEND: Broadening the Scope of Reform in Mathematics Education. The goal of this two-year project is to extend the momentum for reform of mathematics education by engaging the mathematics community in dialogue with constituencies whose support is crucial for continued progress.

EXTEND will engage leaders of diverse communities in discussion of challenges facing mathematics education in the next decade. These pivotal issues include: the nature and "ownership" of mathematics; the growing public demand for accountability; the increasing challenges of access and diversity; and the changing nature of education in relation to careers.

Mathematicians and scientists, vocational and technical educators, business and policy leaders will join mathematics teachers and teacher educators through seminars and at electronic roundtables. Issues and ensuing discussions will be made

widely available on the Internet through the World Wide Web pages.

The project will extend the discussion about mathematics education reform into its second decade through two key strategies—by raising issues that still need to be addressed and by expanding the reach of these discussions to include groups that heretofore have not been major participants (e.g., two-year colleges, business leaders, vocational and technical educators).

EXTEND operates in cooperation with The College Board, the Conference Board of the Mathematical Sciences (CBMS), the American Association of Higher Education (AAHE), the National Center for Research on Vocational Education (NCRVE), and other organizations with interests in mathematics education. The project is directed by Dr. Susan L. Forman of Bronx Community College, City University of New York and by Dr. Lynn Arthur Steen of St. Olaf College in Northfield, Minnesota.

Survey on MAA Electronic Services

The MAA will be expanding its electronic services over the next year and we are surveying our members to determine what services we should add. This survey is intended to gather thoughtful suggestions from our members, not to conduct a scientific sampling of ranked preferences. Take a look at the services currently available on the MAA Gopher and MAA Web pages and at the list below of possible additions that have already been suggested. Then make your suggestions in as much detail and with as much justification as you wish. (Your list may overlap the list below.) Then send your suggestions by January 1, 1996, to Eugene A. Herman, Chair, Committee on Electronic Services, Dept. of Math and Computer Science, Grinnell College, Grinnell, IA 50112; herman@math.grin.edu.

List of Possible MAA Electronic Services

- Online searching of bibliographic information in MAA journals
- Creating and maintaining electronic mailing lists from the MAA membership database
- More complete schedule of conferences, meetings, and workshops
- More complete information on the activities of sections
- Online registration for conferences, meetings, and workshops
- Lifelong e-mail addresses
- Online versions of FOCUS and *UME Trends*
- Online courses (i.e., continuing education) for instructors

This survey can also be filled out electronically on MAA Online.

<http://www.maa.org>

Stop by and share your comments.

Joint Meetings Update from page 14

Invited Addresses **Peter A. Cholak**, University of Notre Dame; **Joan Feigenbaum**, AT&T Bell Laboratories; **Gregory Hjorth**, UCLA; **Kitty L. Holland**, Northern Illinois University; **David E. Marker**, University of Illinois at Chicago; **Itay Neeman**, UCLA; and **David L. Reed**, Duke University.

The NSF Invited Address has been cancelled.

Association for Women in Mathematics (AWM)

Ol'ga Oleinik's affiliation was listed incorrectly in the October issue; it should be Moscow State University.

The title for the panel discussion on Wednesday is "**Affirmative action: A look back and a look ahead.**"

The title of the 25th Anniversary Special Lecture by **Kate Okikiolu** is *Determinants of elliptic operators*.

The title of the Noether Lecture given by **Ol'ga Oleinik** is *On some homogenization problems for differential operators*.

Panelists in the AWM panel discussion include **Ingrid Daubechies**, Princeton University; **Robion C. Kirby**, University of California at Berkeley; and **Cora S. Sadosky**, Howard University. The moderator is **Mary W. Gray**, American University.

Joint Policy Board for Mathematics (JPBM)

Taking Advantage of Math Awareness Week (MAW): Thursday, 9:00 a.m. to 10:00 a.m. All participants are invited to share their MAW activities, ideas, problems, technology, so that JPBM may evaluate the program and learn how to be more responsive to member needs in future planning. Organizers are **Richard H. Herman** and **Kathleen Holmay**, JPBM.

What the Media Look for in a Math Story: Thursday, 2:15 p.m. to 3:45 p.m. Mathematicians and representatives from the media will discuss what they wish the public knew about mathematics, what the public may know about mathematics and how they learn it, how to improve the dialogue between mathematicians and the general public, and how to encourage

mathematicians with interesting stories to go public with them in various ways. Organized by **Richard H. Herman** and **Kathleen Holmay**, JPBM.

AMS-MAA Sessions Workshop on Teacher Enhancement

Opportunities: **Mary M. Lindquist**, Columbus College, Georgia, is co-organizer. Additional presenters are **Jean Klanica**, Cherry Creek School District, Colorado, and **Barbare Reyes**, University of Missouri, Columbia.

Intrigued?

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 & - x^{16}(x-1)^2(x^2-1)^2(x^3-1)(x^4-1) \\
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 & x^{10}(x-1)^3(x^2-1)^2(x^3-1)
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Seattle MathFest Call for Proposals

The Joint Program Committee is soliciting proposals for sessions and/or organizers for the MathFest to be held in Seattle August 10–12, 1996. These sessions may concern any aspect of mathematical research, college education, professional concerns, or other topics of interest to the general mathematical community as mathematicians. There will be two one-hour fifty-minute sessions each day of the meeting for such sessions, and there can be up to fifteen in any of the six slots. A block schedule for the meetings, with sessions entered in these slots as they are accepted, will be posted on the World Wide Web, with hypertext access from both e-math.ams.org and www.maa.org. Please send your proposals for sessions and their organizers to the chair of the Joint Program Committee, Barbara Osofsky, Department of Mathematics, Rutgers University, New Brunswick, NJ 08904; e-mail: osofsky@math.rutgers.edu as soon as possible. The committee will be meeting in Orlando in January; it would help to have proposals by then, but later ones will be accepted if they can be accommodated.

Foundation Seeks Proposals for Programs for Women and Girls

The Tensor Foundation will continue the program, started in 1995, to make funds available for programs to encourage women and girls in mathematics. Ten grants of \$5000 each will be made in April 1996 for student-centered projects conducted by high school, college, or university mathematics faculty, to begin in the academic year 1996–97. The deadline for proposals is March 1, 1996. A request form containing guidelines for proposal preparation and submission is available on the MAA Gopher or from the Mathematical Association of America, 1529 18th St. NW, Washington, DC 20036; (202) 387-5200; e-mail: maahq@maa.org.

International Conference on Functional Analysis and Global Analysis

October 20–26, 1996

University of the Philippines, Diliman Campus, Quezon City, Philippines

Topics include Evolution Equations, Operator Theory, Dynamical Systems, Viscosity Solutions, Wavelets Analysis, Spectral Analysis, Spectral Geometry, Critical Point Theory, Quantum Ergodicity, Mathematical Models for Phase Transitions, and Partial and Ordinary Differential Equations in Complex Domains. Main sponsors are the Department of Science and Technology of the Philippines (DOST) and the Japan Society for the Promotion of Science (JSPS). Co-sponsors are the Southeast Asian Mathematical Society and the Mathematical Society of the Philippines. Registration is October 20; talks October 21–25. Abstract must be sent no later than August 1, 1996, to the organizers. Proceedings of the conference will be published. For further information, contact Dr. Polly W. Sy, Department of Math, University of the Philippines, Diliman Campus, Quezon City, Philippines 1101; fax: (632) 996868 or (632) 971266; e-mail: pweesy@math.upd.edu.ph or pweesy@nicole.upd.edu.ph.

Mathematics Awareness Week, 1996

Mathematics Awareness Week 1996 will be held during April 21–27 with the focus on “The Mathematics of Decision Making.” The Joint Policy Board for Mathematics is seeking ideas, visuals, and other resources from the mathematical community to help develop this theme in a way that can be conveyed to the general public, especially students. If you have suggestions to contribute, please contact JPBM Public Information Director Kathleen Holmay at kholmay@nas.edu.

Mathematician Receives 1995 National Medal of Science

A mathematician was among the eight researchers on whom President Clinton bestowed the 1995 National Medals of Science at a White House ceremony in October. Louis Nirenberg of New York University was recognized for “his fundamental contributions to linear and nonlinear partial differential equations, and applications, particularly in geometry and complex analysis, thus having a decisive impact on the development of mathematics and its applications over a period of years.”

Symposium on Mathematical Modeling in Undergraduate Curriculum

University of Wisconsin–La Crosse

June 13–15, 1996

Submissions are invited for twenty-five- and fifty-minute presentations focusing on any aspect of mathematical modeling. Both mathematical and pedagogical themes are welcome. Publication of the proceedings is planned. Send a fifty-word abstract before March 15, 1996 to Helen Skala, Math Department, University of Wisconsin, La Crosse, WI 54601; e-mail: skala@math.uwlax.edu.

Tensor Grants Awarded

Nine college and university faculty members received grants of \$5000 to carry out programs for women and girls on their campuses during the 1995–1996 academic year. Through this program, the Tensor Foundation, a newly formed charitable foundation, is seeking increased participation of women in mathematics and science. The grants program is administered by the MAA on behalf of the foundation. The foundation will make funds available to the MAA for an additional ten grants annually through the year 2000.

Winners were chosen through a competition advertised in the June 1995 FOCUS and on the MAA Gopher. Various types of institutions are represented among the first round of winners: three state universities, a historically Black university, a private university, three small colleges, and a two-year college. The 1995 winners are:

Judy Ackerman, Montgomery College (Maryland)

Marcella Alkalay and Nancy Harrison, Mercy College (New York)

Hélène Barcelo, Arizona State University

Jane Friedman, University of San Diego
Cheryl Gregerson-Malm and Myrna Main, Northwest Missouri State University
Judith Johnson, Central State University (Ohio)

Virginia Knight and Paula Stone, Meredith College (North Carolina)

Anita Salem, Rockhurst College (Missouri)

Viji Sundar, California State University, Stanislaus.

The winning projects include: the design and teaching of an upper-division undergraduate course that focuses on the work and lives of five great female mathematicians; a program supporting a Sonya Kovalevsky Day for middle school girls and a conference to prepare one hundred high school counselors to provide more encouragement for their female students to study advanced mathematics; a program to introduce African American college women to the TI-92 calculator; a mentoring program for middle school girls; and a program for high school women focusing on mathematical applications in the marine and environmental sciences and the importance of mathematics and scientific literacy to environmental issues and policy.

A request for proposals for 1996 MAA/Tensor grants is on page 18.

Travel Grants for ICME-8 Seville, Spain

The National Council of Teachers of Mathematics has applied to the National Science Foundation for funds to permit travel support for U.S. mathematics teachers at all levels, mathematics supervisors, teacher educators, and researchers to participate in the 1996 International Congress on Mathematics Education (ICME-8) in Seville, Spain, July 14–21, 1996. In anticipation of the availability of funds, the council is prepared to administer the selection process.

Application forms for support and the First Announcement of the congress may be obtained by writing to Department I, National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091-1593, by calling (703) 620-9840 ext. 113, by faxing (703) 476-2970, or by e-mail at infocentral@nctm.org. Completed applications must be received in the NCTM office by **March 15, 1996**. Applicants will be notified by April 30, 1996. Women and members of minority groups are especially encouraged to apply.

Applications will be evaluated by a panel of mathematics educators and mathematicians under the terms of a proposal submitted to the National Science Foundation (NSF). Should the proposal be funded, the following condition will apply: applicants who are given grants for support of their travel to ICME-8 may not supplement them with other NSF funds. Currently, it is the intention of NSF's funding program to provide no additional funds on its other regular grants for travel to ICME-8 in 1996. However, an individual who does not receive a travel grant may use regular NSF grant funds, subject to the usual restrictions and prior approval requirements.

Proposed Bylaws Revision

The Board of Governors recommends to the membership the addition of the following section to the Association Bylaws. The revision is being proposed so that the Association can qualify with the Postal Service for better rates for certain mailings. This note constitutes formal notification to the membership that this Bylaws revision will be considered at the annual Business Meeting in Orlando.

“Article XII - Dissolution of the Association

Upon the dissolution of the Association, the Board of Governors shall, after paying or making provision for paying all the li-

abilities of the Association, distribute all of the assets of the Association for one or more exempt purposes within the meaning of Section 502 (c) (3) of the Internal Revenue Code, or the corresponding section of any future federal tax code, or to the federal government, or to a state or local government, for a public purpose. Any such assets not so disposed of shall be disposed of by a Court of Competent Jurisdiction of the county in which the principal office of the corporation is then located, exclusively for such purposes or to such organization or organizations, as said Court shall determine, which are organized and operated exclusively for such purposes.”

G. L. Alexanderson, Secretary

College Mathematics Journal Survey

The MAA Committee on Publications has appointed a subcommittee—the *College Mathematics Journal Ad Hoc Study Committee*—to study the *College Mathematics Journal* (CMJ). This is the first in what is intended to be a regular series of studies of MAA journals prior to the search leading to the appointment of a new editor.

This study is intended to address matters such as editorial policy, content, level, format, and the like. Its goal is to make explicit features that already make the journal successful and to recommend procedures needed to keep an excellent product running at top form. This is not a study of a journal in trouble, but an attempt to guarantee that the MAA not become complacent about the quality of its journals.

One specific question of interest to the committee is the editorial policy that excludes from the CMJ material that is principally pedagogical (except in Classroom Capsules). Should this continue to be a guiding editorial policy? Or would the CMJ readership be served by including appropriate pedagogical material, for example, on matters of undergraduate "reform" in mathematics?

The work of the committee will be conducted mostly by e-mail, phone, fax, and U.S. mail. The committee is extremely interested in the reactions of current subscribers to the CMJ, former subscribers, and those never having subscribed. The committee wants to learn what readers like about the journal; what might cause current readers to drop the journal; and what would lure new readers to add the journal to their subscription list. You can reach committee members at the e-mail addresses below or at their institutional addresses. U.S. mail sent to the MAA headquarters office in the name of the committee chair will be forwarded to him.

The committee's report is due in late spring 1996. Hence, MAA members and other readers are urged to respond promptly with their comments.

Stephen Rodi (Austin Community College; rodi@tenet.edu) will chair the study committee. Other committee members are Victor Katz (University of the District of Columbia; vkatz@math.maa.org), Dana Mackenzie (Kenyon College; mackenzi@kenyon.edu), Phil Straffin (Beloit College; straffin@beloit.edu), and Bill Watkins (California State-Northridge; bwatkins@vax.csun.edu). Bart Braden (Northern Kentucky; braden@nku.edu) will provide liaison with the CMJ. Don Albers (MAA headquarters; dalbers@math.maa.org) will support the committee in Washington.

1996 Summer Short Course Host Opportunity

The Ohio State University Technology Summer College Short Course Program [T(SC)²], organized by Bert Waits and Frank Demana, will again be co-sponsoring a variety of week-long short courses designed for college mathematics faculty at selected college sites throughout the U. S. during the summer of 1996. Short courses will focus on calculus reform and AMATYC Standards mathematical content. All short courses will feature instruction on Texas Instruments graphing calculators, including the TI-92. T(SC)² instructors are all highly qualified college faculty with experience in the teaching and learning of mathematics enhanced with technology. Short course options include:

Mathematics in the foundation, developmental, and college preparatory levels (TI-82 and CBL)

College algebra and data analysis (TI-82 and CBL)

Precalculus and calculus (TI-82 and/or TI-85 and CBL)

Calculus enhanced with computer algebra (TI-92)

Grants of up to \$4000 are available from Ohio State to selected host sites. If you are interested in hosting a T(SC)² short course at your college or university during the summer of 1996, contact Ed Laughbaum, Department of Math, Room 342 Math Tower, The Ohio State University, 231 W. 18th Ave., Columbus, OH 43210; (614) 292-7223; fax: (614) 292-0694; e-mail: waitsb@math.ohio-state.edu.

Online Math Journal

The Furman University Electronic Journal of Undergraduate Mathematics is an online journal designed to encourage undergraduate research in the field of mathematics. The journal accepts papers of significant mathematical interest written by students containing work done prior to the students' obtaining a Bachelor's degree. Papers of all types will be considered, including technical, historical, and expository. The journal is not refereed in the traditional sense. Rather, any students wishing to submit papers must have a sponsor—a full-time faculty member willing to approve the student's work. The sponsor will play a role in ensuring the quality and veracity of the paper.

Access to the journal is provided by the World Wide Web at the URL <http://math.furman.edu/~mwoodard/fuejum/welcome.html>

Papers are presented primarily in postscript format. Papers will be accepted in a variety of formats through anonymous FTP, but TeX and LaTeX are the preferred formats. For more information, contact Editor in Chief Mark Woodard; e-mail: woodard_mark@furman.edu.

NSA Sabbatical Program

The National Security Agency has a program whereby established professors wishing a glimpse of nonacademic math as a change of pace spend a sabbatical year at the NSA (at Fort George G. Meade, Maryland). The NSA picks up 50% of their academic salary and pays the full salary during the summer. American citizenship is required and it will be necessary to obtain an NSA security clearance. Applications for 1996-97 are now being accepted. For further information, write or call Dr. Charles Osgood, Director, NSA Mathematical Sciences Program, National Security Agency, Fort George G. Meade, MD 20755-6000, Attn: R51A; (301) 688-0400; e-mail: msp@math13.math.umbc.edu. Information will also be available at the NSA booth at the January meetings.

New Advanced Placement Statistics Course

Rosemary A. Roberts

The College Board recently approved offering an AP course and examination in statistics. The first will be given in May 1997. This article gives some background information about the course and discusses the nature of the course and examination.

In 1987 the AP Calculus Development Committee conducted a study of possible new offerings in the mathematical sciences. A survey of high schools and colleges indicated that there was strong support for a course in statistics. It is noteworthy that this occurred at a time when there was great interest in changing the way in which introductory statistics is taught at the college level. It was also a time when a knowledge of statistics was becoming recognized as being important for people in all walks of life. The committee recommended to the College Board that a task force be established to study the feasibility of offering an AP course in statistics.

The task force began its work in 1992. To determine the feasibility of offering an AP statistics course, the task force sent a preliminary course outline to various high schools and colleges. The goal was to determine whether the high school teachers thought it would be feasible to offer the course and whether the colleges would give placement and/or credit to students who had successfully completed the course. Responses from the high schools indicated strong support for the course although concern was expressed about the use of technology and teacher training needs. The proposed course outline was also well received by college and university statistics and mathematics departments. The client disciplines were not as supportive. Their departments wanted additional statistical techniques included before they would award either placement or credit. Given the variety and specificity of the client disciplines' needs, a course that could satisfy all or even most of the client disciplines seemed much less fea-

sible than a course emphasizing a common core of concepts and techniques. The task force thus recommended that a concept-oriented AP statistics course and examination be created and this was approved by the College Board in late 1993.

In 1994 the AP Statistics Test Development Committee was formed and started its work to make AP statistics a reality. The committee has written a preliminary course description, developed test questions for the first exam in May 1997, and planned workshops for teacher training. The preliminary course description, published in April 1995, includes a course outline, a discussion of the AP statistics examination including sample questions, and statements on the use of technology and instructional emphasis.

The topics for the AP statistics course are divided into four major themes: exploratory analysis, planning a study, probability, and statistical inference. Within each theme, the topics emphasize statistical thinking and minimize computational procedures. The instructional emphasis is toward a mode of teaching that engages students in constructing their own knowledge. Important components of the course should include the use of technology, projects and laboratories, cooperative group problem-solving, and writing as a part of concept-oriented instruction and assessment.

The AP statistics examination consists of a ninety-minute section of multiple-choice questions and a ninety-minute section of free response questions. The two sections are equally weighted. The free response section asks the student to answer open-ended questions and to complete an investigative task involving more extended reasoning.

While it would be ideal for students to have access to the computer during the exam, this is currently unrealistic. Thus, graphing calculators will be required and computer output will be provided as necessary. Students will be expected to be familiar with standard computer output and every school offering the AP statistics course is encouraged to make available a computer with an appropriate software package for work both in and outside the classroom.

Teacher training is a major concern of the committee. Last summer, members of the committee led a teacher workshop at Clemson University. This summer the College Board will launch a more far-reaching teacher training effort by hosting a workshop in San Antonio. This will be attended by selected high school teachers and statisticians and will again be led by members of the committee. It is anticipated that teams of these teachers and statisticians will subsequently conduct workshops across the country.

A preliminary course description (IN-201619) is available from Advance Placement Program, P.O. Box 6670, Princeton, NJ 08541-6670; (609) 771-7243.

Rosemary Roberts is chair of the AP Statistics Test Development Committee.

Innovations in Freshman and Sophomore Mathematics Instruction

Friday, January 12, 1996 (at the Joint Annual Meetings) 7-10PM

The Tulane Conference, which began the current calculus reform movement, occurred ten years ago. The CUPM subcommittee on Calculus Reform and the First Two Years (CRAFTY) is sponsoring this poster session in recognition of the Tulane anniversary. The purpose is to disseminate information about innovative programs in freshman and sophomore level mathematics, including (among others) introductory mathematics, precalculus, calculus, and linear algebra. We are particularly interested in programs which integrate a variety of topics in the first two years of undergraduate instruction.

Proposals for poster displays should be sent to William Barker, Department of Math, Bowdoin College, Brunswick, ME 04011; (207) 725-3571; e-mail: barker@bowdoin.edu. Technology support needs (e.g., electrical outlets) should be specified. E-mail is the preferred method of contact.

Notice to Employment Advertisers

The Board of Governors of the MAA is asking departments that are considering hiring temporary faculty to one-year positions to convert these to multi-year positions if at all possible. In addition, those departments that plan to hire temporary faculty for the next 5-10 years are urged to work with their administrations to convert these temporary positions to tenure-track positions.

It is our belief that the repeated hiring of temporary faculty not only impedes the career development of the young mathematicians holding these positions, but also increases the work load of permanent faculty. An individual in a one-year position must begin searching for a new job every October. He or she does not have the time and energy, and, indeed, can hardly be expected, to contribute to the life of the department and of the institution.

It is our hope that those departments that have been forced to hire temporary faculty on a regular basis will be able to work with their administrators in order to reduce or eliminate this practice.

Western New England College Department of Mathematics and Computer Science

Assistant Professor of Mathematics anticipated for appointment beginning September 1996. Term and conditions of appointment depend on candidate's qualifications and experience. The successful candidate will instruct 12 semester credit hours per term. Applicants must have a Ph.D. in Mathematics or the Mathematical Sciences with a record of excellence in and a strong commitment to teaching. Scholarly activity is encouraged and supported through release time, summer research grants, and professional travel funds.

The Department of Mathematics & Computer Science has 10 full-time faculty members and 50+ majors in degree programs leading to a B.A. in Mathematics and a B.S. in Computer Science, and provides courses for the general education program of the college.

Salary is competitive and commensurate with credentials and experience. Western New England College is an independent, non-denominational, private, co-educational institution with Schools of Arts and Sciences, Business, Engineering, and Law, with total day/evening enrollments exceeding 5,000.

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ommendation (including comments on the applicant's experience and promise as a teacher and scholar) to: Dennis M. Luciano, c/o Ann Guyotte, School of Arts & Sciences, Western New England College, Springfield, Massachusetts 01119. Application deadline is January 2, 1996. Western New England College is an Equal Opportunity Employer encouraging applications from women and minority candidates.

Williams College Department of Mathematics

Williamstown, Massachusetts 01267
Two anticipated tenure-eligible positions in mathematics or applied mathematics, beginning Fall 1996, probably at the ranks of assistant professor, in exceptional cases, however, more advanced appointments may be considered. Excellence in both teaching and research is essential. For both positions, a Ph.D. in hand or completed dissertation by September 1996 is required. For one of the positions, experience and strong interest in teaching pre-calculus/quantitative skills is a plus. Please have a vita and three letters of recommendation on teaching and research sent to Hiring Committee. Evaluation of applicants will begin November 15 and continue until the position is filled. As an EEO/AA employer, Williams especially welcomes applications from women and minority candidates.

Transylvania University Lexington, Kentucky

The Mathematics Program invites applications for a tenure-track position commencing in the fall of 1996. Transylvania University is a residential, private, liberal arts college, with a strong commitment to academic excellence. Applicants must have a Ph.D. in mathematics and a strong commitment to undergraduate teaching. Salary and rank will depend on qualifications and experience. Exceptionally well qualified candidates may be considered for a Bingham Excellence in Teaching Award which carries a substantial salary supplement. Applicants should send a letter of application, resume, undergraduate and graduate transcripts, three letters of reference and a statement of teaching philosophy by December 22, 1995 to David L. Shannon, Mathematics Program Director, Transylvania University, Lexington, KY 40508. Applications will be reviewed as received. Transylvania University is an Equal Opportunity Employer.

THE UNIVERSITY OF MONTANA Department of Mathematical Sciences

The Department has openings for two tenure track Assistant Professors and one Visiting Assistant Professor beginning Fall 1996. One tenure-track position in each of algebra and mathematics education and one visiting position in mathematics education are available. Research must be compatible with interests of current faculty members in the Department in algebra or mathematics education. The Department offers BA, MA, MAT, and Ph.D. degrees. A job description and information about the Department of Mathematical Sciences may be obtained on the World Wide Web at <http://www.umt.edu/math/jobs/> or via anonymous ftp from <ftp.math.umt.edu> in `/pub/jobs` or by phoning (406) 243-5311. Applications (including resume, graduate transcripts, and 3 letters of recommendation) should be sent to Johnny Lott, Chair, Mathematics Education Search Committee, or Merle Manis, Chair, Algebra Search Committee, Department of Mathematical Sciences, The University of Montana, Missoula, MT 59812. Phone: (406) 243-5311, e-mail: ma_jwl@selway.umt.edu (questions only for mathematics education). Screening of applicants will begin January 26, 1996 and continue until positions are filled. The University of Montana is an equal opportunity/

MACALESTER COLLEGE

Applications are invited for two tenure-track positions in Mathematics beginning Fall, 1996. Candidates must have the Ph.D. and a commitment to teaching and research in an undergraduate liberal arts environment. Preference will be given to candidates with post-graduate teaching experience and research interests in applied mathematics, dynamical systems, geometry, or algebra. Applicants should send resume, statements of research and teaching interests, and have three letters of reference sent to David Bressoud, Math/CS Dept., Macalester College, St. Paul, MN 55105. Evaluation of applications will begin December 1 and continue until the positions are filled. Women and members of minority groups are especially encouraged to apply.

affirmative action employer and encourages applications from women, minorities, Vietnam era veterans, and persons with disabilities.

Valparaiso University
Department of Mathematics and
Computer Science
Valparaiso, IN 46383

Located one hour from Chicago loop. Pending budgetary approval, tenure-track, assistant professor of mathematics, beginning August 1996. Doctorate in mathematics desired, required for tenure. Teaching experience preferred; background in combinatorics or experience in preparing secondary teachers a plus, as is familiarity with calculus reform. Duties include teach 3 courses (12 hours per semester), continued scholarly activity, and service to the department and University. Applications from women and minorities especially encouraged. Candidates should be willing to work in a scholarly community committed to Christian higher education and the Lutheran tradition. Send letter of application, statement of teaching philosophy, summary of research plans, and vita by January 15, 1996 to: Patrick Sullivan, Chair. E-mail: psullivan@exodus.valpo.edu.

Hope College
Chair, Department of Mathematics
Holland, Michigan

Hope College invites applications for the position of Chairperson of the Department of Mathematics beginning Fall 1996. The successful candidate will have credentials that would sustain a tenured appointment at a rank commensurate with the qualifications of the candidate. The field of specialty is open.

The responsibilities of the chairperson include: teaching two courses each semester; supervising nine full-time faculty members; leading in areas of curriculum development and scholarly activity including undergraduate student research; and acting as a liaison between the faculty and the administration.

A complete application includes a vita, a statement of educational and leadership philosophy, and four letters of recommendation, at least two of which address the applicant's potential and/or background for serving as a department chair. Applications should be sent to: Professor Elliot Tanis, Interim Chair, Department of Mathematics, Hope College, Holland, MI 49422-9000. (tanis@math.hope.edu)

Please indicate in your letter whether or not you will attend the AMS/MAA meetings in Orlando in January. Applications received by December 15, 1995 will be given full consideration. Hope College complies with federal and state requirements for non-discrimination in employment. Applications are strongly encouraged from women and persons of color.

Additional information about Hope College and the department, including a more detailed advertisement, can be found on the Web at <http://www.hope.edu>.

Mathematics/Computer Science

Fort Hays State University, Hays, KS, Department of Mathematics and Computer Science. Position: Full-time tenure-track position beginning in August, 1996. Responsibilities: Teach 12 hours per semester. Duties include teaching computer science and mathematics, primarily at the undergraduate level, service, and course and program development. An important focus for the University is the integration of computer and communication technology into the teaching environment. Qualifications: Minimum requirements are a doctorate in either mathematics or computer science, with a masters degree or equivalent in the other discipline. Commitment to diversity and working in a multicultural setting highly desirable. Rank: Assistant Professor. Salary: Negotiable. Applicant must submit in advance: A letter of application; a current resume including previous teaching experience and scholarly activity; copies of all college transcripts; letters of recommendation from at least three people regarding the applicant's abilities in teaching and scholarship. Mail application materials to: Dr. Elton Beougher, Chair, Search Committee, Department of Mathematics and Computer Science, Fort Hays State University, 600 Park, Hays, KS 67601. Deadline: Review will start January 1, 1996, and continue until the position is filled. FHSU is an AAEO employer. Women, minorities, disabled, and veterans are encouraged to apply.

Mathematics/Mathematics Education

Fort Hays State University, Hays, KS. Department of Mathematics and Computer Science. Position: Full-time tenure-track position beginning August, 1996. Responsibilities: Teach 12 hours per semester. Duties include teaching undergraduate and graduate (in an MAT program) mathematics and mathematics education, service, and course and program development. An important focus for the University is the integration of computer and communication technology into the teaching environment. Qualifications: Minimum requirements are a doctorate in Mathematics or Mathematics Education and at least one year of full-time mathematics teaching experience in grades 6-12 and knowledge of the mathematics needed to teach a broad range of undergraduate mathematics courses. Applicants must be active in the mathematics education community. Experience in distance learning is desirable. Commitment to diversity and working in a multicultural setting is highly desirable. Rank: Assistant Professor. Salary: Negotiable. Applicant must submit in advance: A letter of application; a current resume; evidence of successful teaching; a list of all mathematics courses taught; a complete description of scholarly activities; letters of recommendation from three people regarding the applicant's expertise and teaching effectiveness; copies of all college transcripts. Apply to: Dr. Elton Beougher, Chair, Search Committee, Department of Mathematics and Computer Science, Fort Hays State University, 600 Park, Hays, KS 67601. Deadline: Review

will start January 1, 1996, and continue until the position is filled. FHSU is an AAEO employer. Women, minorities, disabled, and veterans are encouraged to apply.

The University of Akron
Department of Mathematical Sciences
Assistant Professor

An Assistant Professor (tenure-track) position available in Fall, 1996. Primary responsibilities involve curriculum development and coordination of general education multiple-section courses and the teaching of courses such as Math for Elementary Education and Math for Liberal Arts. Applicants with experience in these areas and showing potential for external funding in areas related to mathematics education given preference. Applicants should possess a Ph.D. in Mathematics or Mathematics Education and are expected to establish and maintain a research program. The University offers competitive salaries and excellent fringe benefits.

The University of Akron is the third largest state university in Ohio. The department offers Bachelor and Master degrees in Mathematics, Applied Mathematics, Statistics, and Computer Science.

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

General Education Mathematics Search
 Department of Mathematical Sciences
 The University of Akron
 Akron, OH 44325-4002

Initial review of completed applications will begin December 1, 1995.

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

Millersville University
Mathematics Education

Assistant Professor. Full-time, tenure-track position to begin Fall, 1996. Annual teaching load of 24 semester hours will include teaching mathematics courses in elementary and secondary teacher education, teaching a wide variety of undergraduate mathematics service courses, student advisement, teaching and curriculum development in mathematics education both at the undergraduate and M.Ed. levels, scholarly activity, participation in departmental and university committees, and supervision of student teaching experiences. Must have doctorate (or completion within one year) in mathematics education or mathematics with a specialization in mathematics education. Must be broadly trained in mathematics with at least 24 semester hours of graduate level courses in pure or applied mathematics. Must exhibit evidence of a strong commitment to excellence in teaching and continued scholarly activity, and have familiarity with current direction in mathematics education in the classroom. Evidence of teaching effectiveness is the primary consideration. Preference will be given to candidates with experience teaching

mathematics in secondary or middle schools. Candidates must be able to work effectively with professional and community groups. Full consideration will be given to applications received by 1/19/96. Send letter of application, curriculum vitae, copies of all transcripts and three current letters of recommendation (at least two letters must attest to recent teaching effectiveness) to: Dr. Bernie Schroeder, Search Chair, Dept. of Mathematics/ FO1295, MILLERSVILLE UNIVERSITY, P.O. Box 1002, Millersville, PA 17551-0302. EO/AA Institution.

Maryville College

Division of Math and Computer Science Maryville, Tennessee 37804-5907

Assistant Professor. Tenure-track position in Mathematics, beginning fall 1996. Ph.D. in Mathematics preferred, ABD considered. Duties include teaching undergraduate mathematics courses, advising majors, and supervising senior theses. Expertise in Applied Mathematics preferred, all areas considered. Maryville College is a four-year liberal arts institution related to the Presbyterian Church USA. The curriculum is notable for its emphasis on general education and for the senior thesis required of all students. The College is ranked as one of the ten best Southern liberal arts colleges in the U.S. News and World Report's annual college rankings. The 375-acre campus is located in suburban Knoxville, seat of the main campus of the University of Tennessee, near Oak Ridge, and in sight of the Great Smoky Mountains. Send letter of interest, curriculum vitae, graduate transcripts, and three letters of reference (at least two of which must address teaching experience and potential) to: Dr. William Dent, Chair, Division of Mathematics and Computer Science, Maryville College, Maryville, TN 37804-5907. Applications completed by January 15, 1996 will be given first consideration. EOE. Women and minorities are encouraged to apply.

Dartmouth College

John Wesley Young Research Instructorship in Mathematics

The John Wesley Young Research Instructorship is a two year post-doctoral appointment for promising new or recent Ph.D.'s whose research interests overlap a department member's. Current departmental interests include areas in algebra, analysis, combinatorics, differential geometry, logic and set theory, number theory, probability and topology. Teaching duties of four ten-week courses spread over two or three quarters typically include at least one course in the instructor's specialty and include elementary, advanced and (at instructor's option) graduate courses. Nine-month salary of \$37,000 supplemented by summer research stipend of \$8,222 for instructors in residence for two months in summer. Send letter of application, resume, graduate transcripts, thesis abstract, description of other research activities and interests if appropriate, and 3 or preferably 4 letters of recommendation (at least one should discuss

teaching) to Betty Harrington, Department of Mathematics, 6188 Bradley Hall, Hanover, NH 03755-3551. Applications received by Jan. 15 receive first consideration, applications will be accepted until position is filled. Dartmouth College is committed to affirmative action and strongly encourages applications from minorities and women.

Dartmouth College

The Department of Mathematics has a tenure-track opening (Assistant Professor) for a statistician with strong interests in signal processing with initial appointment to the 1996-1997 academic year. A candidate for the position must be committed to outstanding teaching at all levels of the undergraduate and graduate curriculum and must give evidence of a well-regarded research program that shows real promise for the future. Candidates with several years of experience should in addition be ready to direct Ph.D. theses.

To create an atmosphere supportive of research, Dartmouth offers new faculty members grants for research-related expenses, a quarter of sabbatical leave for each three academic years in residence and flexible scheduling of teaching responsibilities. The teaching responsibilities in mathematics are four courses spread over two or three quarters. The department encourages good teaching with a combination of committed colleagues and bright, responsive students.

To apply, send a letter of application, curriculum vitae, and a brief statement of research results and interests. Also arrange for four letters of reference to be sent, at least one of which addresses teaching, and if the applicant's native language is not English, the applicant's ability to use English in a classroom. All application materials should be addressed to Betty Harrington, Recruiting Secretary, Department of Mathematics, Dartmouth College, 6188 Bradley Hall, Hanover, NH 03755-3551. Applications completed by February 1 will receive first consideration. Dartmouth is committed to Affirmative Action and encourages applications from African Americans, Asian Americans, Hispanics, Native Americans, and women. Inquiries about the progress of the selection process can be directed to Thomas R. Shemanske, Recruiting Chair.

The University of North Carolina at Asheville

The mathematics department at UNCA invites applications for one (possibly two) tenure-track position(s) as an assistant professor of mathematics beginning August 1, 1996. Ph.D. is required. UNCA is a small public liberal arts university dedicated to undergraduate teaching. Candidates must show evidence of effective teaching in mathematics and introductory statistics, have an interest in computer enhanced instruction, and be active in mathematical scholarship.

Application deadline is December 31, 1995. Interested candidates send resume, a statement of teaching philosophy, graduate school transcripts,

and 3 letters of recommendation (at least one addressing teaching ability) to:

Lothar A. Doshe, Chair
Department of Mathematics
University of North Carolina at Asheville
Asheville, NC 28804-3299, or
FAX: (704) 251-6438

As an EEO/AA employer UNCA welcomes applications of women and minorities.

SUNY Farmingdale

Fall 1996 anticipated tenure-track vacancies at the Assistant Professor rank. Teaching responsibilities will include a full complement of undergraduate mathematics courses. Minimum qualifications—doctorate in mathematics, statistics or operations research. Teaching is emphasized with scholarship and service is expected. Interest in using technology in the classroom and prior college teaching experience are desirable. Salary range is \$36,000 to \$40,000. Letter of application and resume including the names and telephone numbers of three references (no letters of recommendation please) must be received by January 17, 1996. Address correspondence to: Dr. Phillip Reichmeider, Chair of Search Committee, Department of Mathematics, SUNY Farmingdale, Farmingdale, NY 11735. The College is an Equal Opportunity/Affirmative Action Employer.

Washington and Jefferson College Washington, PA 15301

Faculty Position in Mathematics

Washington and Jefferson College (W&J) seeks a full-time faculty member in Mathematics. Teaching assignments include calculus, statistics and a variety of upper level courses. Demonstrated excellence in teaching undergraduates and a completed or nearly completed Ph.D. in Mathematics are required. Also required are ability and enthusiasm for teaching students with diverse preparations in mathematics.

A letter of application, resume, and the names, addresses and phone numbers of three references should be sent to the Dean of Academic Affairs, Mathematics Search, Washington and Jefferson College, Washington, PA 15301. The application deadline is January 5, 1996.

W&J is a private, co-educational undergraduate liberal arts college of 1200 students, located in Washington, PA, a medium-sized city situated thirty miles south of Pittsburgh. The college is an Affirmative Action and Equal Opportunity Employer. Women and minority professionals are encouraged to apply.

Indiana University South Bend Department of Mathematics and Computer Science Assistant Professor of Mathematics Education

The Department of Mathematics and Computer Science invites applications for a tenure-track position in mathematics education at the assis-

tant professor level starting August 1996. Applicants must have completed all requirements for a Ph.D. or Ed.D. by August 1996. The responsibilities of this position include: teaching courses in mathematics and mathematics pedagogy; research in the area of secondary/post-secondary mathematics pedagogy; coordinating departmental efforts in the mathematical preparation of pre-service teachers; and liaison with IUSB's Division of Education. The Department currently has 15 full-time faculty and 40 associate faculty. Salaries are competitive and the fringe benefits package is excellent.

IUSB is an Equal Opportunity/Affirmative Action employer; women and minority candidates are especially encouraged to apply. Send a vita and arrange for three letters of recommendation to be sent to William J. Frascella, Chair, Department of Mathematics and Computer Science, Indiana University South Bend, South Bend, IN 46634. Completed applications received by January 31, 1996 will be given full consideration.

Ursinus College

Anticipated one-year position as Asst. Prof. starting Fall 1996. Independent four-year liberal arts college near Philadelphia. Salary commensurate with qualifications. Ph.D. in math required. Applied math or analysis preferred. Excellent teaching credentials essential. Experience with a computer algebra system desirable. Teach three courses per semester. Standard benefits. Send letter of application, resume, and three letters of recommendation to Search Committee, Dept. of Math. & Comp. Sci., Ursinus College, Collegeville, PA 19462; or e-mail jshuck@acad.ursinus.edu. Send by Jan. 15 to receive full consideration. E-mail accepted as plain text only. EOE/AA.

Calvin College Department of Mathematics and Computer Science

The Department of Mathematics and Computer Science invites applications for two possible tenure-track openings (one in computer science and one in mathematics) and a one-year position in mathematics, all to begin September 1996. A Ph.D. is required for each position. Two areas of special need in mathematics include applied mathematics and mathematics education but applicants from all areas of mathematics are encouraged. Evidence of teaching effectiveness, an active research program, and a religious commitment compatible with the mission of a Christian liberal arts institution are essential. Completed applications should be submitted by December 31 to ensure full consideration and must include a resume, three letters of reference (including at least one which addresses the candidate's teaching abilities), a graduate transcript, and a letter of interest addressing specifically the qualifications listed above. Calvin is a liberal arts institution of about 4000 students and is affiliated with the Christian Reformed Church. It is an Equal Opportunity Employer.

Applications from women and underrepresented minorities are strongly encouraged. Respond to Chair, Search Committee, Department of Mathematics and Computer Science, Calvin College, Grand Rapids, MI 49546.

The University of Oklahoma Department of Mathematics

Applications are invited for a tenure-track or tenured faculty position in Mathematics Education starting in Fall 1996. Rank and salary will be commensurate with qualifications and experience. Candidates are required to have a Ph.D. in Mathematics or in Education with a Mathematics specialization, and demonstrated commitment to research in Mathematics Education. A strong background in Mathematics beyond the Master's level is also required. Preference will be given to those whose primary research involves collegiate Mathematics Education, or secondary school teacher training.

The faculty member is expected to carry a teaching load of two courses per semester. Candidates should be capable of directing doctoral students and contributing leadership to the department's active graduate program in Mathematics Education. Responsibilities will include involvement with undergraduate Mathematics courses, and with both undergraduate and graduate courses in Mathematics Education.

The Mathematics Department at the University of Oklahoma offers a Doctoral Degree in Research in Undergraduate Curriculum and Pedagogy. Faculty interests include research in quantitative literacy, undergraduate curriculum and pedagogy, and international comparative Mathematics Education. The Mathematics Department faculty cooperate with the University's College of Education which has an M.Ed. Program in Mathematics Education and a Ph.D. program focusing on research in K-12 Mathematics Education. As a University service the Department is also responsible for advising and preparation of some undergraduate secondary Mathematics Education majors, and for providing courses for both elementary and secondary preservice teachers (about 250 and 20 per year, respectively).

Applicants should send a vita, a statement of professional goals, and three letters of recommendation to:

Math Education Search Committee
Department of Mathematics
University of Oklahoma
601 Elm Avenue, Phsc 423
Norman, OK 73019-0315

Initial screening will begin on January 31, 1996 and continue until the position is filled.

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.

ASSISTANT PROFESSOR OF MATHEMATICS

Southwestern University invites applications for a tenure-track position in mathematics at the Assistant Professor level beginning fall 1996. A Ph.D. in mathematics is required. Faculty are expected to have a strong commitment to excellence in undergraduate teaching, to maintain an active interest in scholarly pursuits, and to possess an appreciation of a liberal arts and sciences education. All mathematical areas will be considered, but areas of particular interest include applied statistics, minority retention in mathematics, and calculus reform and technology in the classroom. The University is committed to increasing the diversity of its faculty; applications are specifically invited from women and members of traditionally underrepresented groups.

Southwestern University is a selective, undergraduate institution committed to broad-based liberal arts and sciences education. Affiliated with the United Methodist Church, it has 1200 students and a history of stable enrollment. Southwestern's endowment of more than \$175 million ranks among the top 30 institutions in the nation in endowment per student. The University is located in Georgetown, Texas, 28 miles north of Austin, the state capital and site of the University of Texas.

Applicants should send a letter of application, curriculum vitae, and current letters of reference, at least one of which should address teaching, to: Search Committee, Department of Mathematics and Computer Science, Job #9546, P.O. Box 770, Georgetown, TX 78627-0770.

Southwestern University is an Affirmative Action, Equal Opportunity Employer.

Presbyterian College Department of Mathematics

Tenure-track position to teach all levels of mathematics in a liberal arts college, beginning August 1996. Rank and salary commensurate with qualifications. Completion or near completion of Ph.D. in mathematics required, with any specialization considered. Upon receipt of a letter or an e-mail message indicating your interest in the position, you will be sent more information about the college, the position, and how to complete your application. Women and minority candidates are encouraged to apply. Send letter or e-mail by January 5, 1996 to Dr. Brian D. Beasley, Presbyterian College, Clinton, SC 29325; e-mail: bbeasley@csl.presby.edu. Presbyterian College is affiliated with the Presbyterian Church (USA).

OHIO UNIVERSITY Department of Mathematics

Applications are invited for a tenure-track assistant professorship which will begin September 1, 1996. A Ph.D. in Mathematics in the area of Analysis is required. We seek a person with strong evidence of research potential and a commitment to undergraduate teaching. Preference will be given to applicants whose research interests are

compatible with those of present faculty members; in particular, we are looking for people in the areas of sequence spaces and harmonic analysis. The salary is competitive and there is an excellent benefits package. Women and minorities are especially invited to apply.

The committee will begin processing applications after Jan. 31, 1996 and will continue to do so until the position is filled.

OU is an Equal Opportunity, Affirmative Action employer.

Send a letter of application and a resume and have three letters of recommendation sent to:

Dr. Jeff Connor, Chair
Analysis Position Search Committee
Department of Mathematics
Ohio University
Athens, Ohio 45701

Bronx Community College of CUNY

The Department of Mathematics and Computer Science at Bronx Community College invites applications for at least one position starting in September, 1996 (possibly February, 1996). A doctorate in mathematics or computer science is preferred but not required, although enrollment in a doctoral program is highly recommended in its absence. Candidates must have a record of and a commitment to excellence in teaching and continued scholarly activity.

Teaching duties range from developmental mathematics to advanced calculus. The department has 21 full-time and 55 part-time faculty members. For general information about the college and the department, see <http://www.panix.com/~shalla/BCC.html>. Bronx Community College encourages applications from women and minority candidates and is an Affirmative Action/Equal Opportunity Employer. Send a letter of application, a statement of teaching philosophy, resume, graduate transcript(s), and three recent letters of reference, at least one of which should address teaching, to:

Dr. Gerald Lieblich
Mathematics and Computer Science
Bronx Community College
University Ave. and West 181 St.
Bronx, NY 10453

Marist College Department of Mathematics

The Marist College Department of Mathematics invites applications for two, possibly three, tenure-track positions to begin September 1996. Responsibilities include teaching 12 hours per semester at the undergraduate level, continuing scholarly activity and institutional participation.

Minimum qualifications include a Ph.D. in Mathematics or a closely related field, ability to teach all undergraduate level mathematics courses, and continued scholarly activity commensurate with the teaching load. Candidates should provide evidence of outstanding teaching skills and of a strong interest and record in the pedagogical uses

of technology. While the positions are open to exceptional applicants from all fields, efforts will be made to match current research interests of members of the department. These include model theory, group theory, combinatorics and dynamics.

Situated on the banks of the Hudson, Marist College is a four year liberal arts institution enrolling 3200 full-time undergraduate students. Marist prides itself on a dedicated faculty committed to our students and to excellence in teaching. Housed in the Division of Computer Science and Mathematics, the mathematics department currently employs 12 full-time mathematics faculty.

Review of resumes will begin immediately. Applications reviewed by January 15, 1996 will receive full consideration. Please submit a letter of application, curriculum vitae, a statement of teaching philosophy, and at least three letters of recommendation to:

Dr. Onkar P. Sharma, Dean
Division of Computer Science and Mathematics
MPO Box 905
Marist College, MAA-MF
Poughkeepsie, NY 12601

Marist College is committed to the principle of diversity. The College is particularly interested in receiving applications from women and members of ethnic minorities. Marist College is an Equal Opportunity/Affirmative Action Employer.

Marymount University Assistant Professor Department of Mathematics Arlington, VA

Marymount University invites applications for a position at the Assistant Professor level in the Department of Mathematics, beginning in the fall of 1996. Ph.D. in Mathematics, excellent teaching skills, teaching expertise in Analysis or Applied Mathematics required. Experience using technology in the classroom preferred. Research area open. Responsibilities include academic advising, curriculum development, research, and scholarship. The Department includes five full-time faculty and twenty-three majors.

Marymount University is an independent, comprehensive University related to the Catholic Church. The University enrolls 4,100 students in 34 undergraduate and 24 master's programs. The University is located in residential Arlington, Virginia, ten minutes from Washington, DC.

Review will begin on February 1, 1996 by a search committee and will continue until the position is filled. Contact Personnel Services for an official faculty application by phone: (703) 284-1680; or by mail: 2807 North Glebe Road, Arlington, VA 22207-4299. TDD (703) 284-1516. Official application must include letter of application, curriculum vitae and five references. An official application must accompany supplements. Current authorization to work in the U.S.A. required.

24 Hour Employment Opportunities Line (703) 284-1518

AA/EEO

Department of Mathematics College of Natural Sciences and Mathematics

Indiana University of Pennsylvania

Indiana University of Pennsylvania invites applications for a tenure-track position in Operations Research and possibly a second tenure-track position in Applied Mathematics beginning in the Fall of 1996. An appointment is anticipated at the Assistant Professor level. Appointment at the Associate Professor level is possible in the case of exceptional qualifications. Ph.D. required by September, 1996.

Complete job descriptions are available on WWW at <http://www.ma.iup.edu/jobad.html> or by contacting:

Dr. Rebecca Stoudt, Chair of OR/AM Search Committee

Mathematics Department
Indiana University of Pennsylvania
Indiana, PA 15705
E-mail: EMWHITE+ORSEARCH@GROVE.IUP.EDU
Fax: (412) 357-5700

IUP is an affirmative action/equal opportunity employer.

Northern Kentucky University Department of Mathematics and Computer Science

Tenure-track position. Assistant Professor beginning August 1996. Doctorate in a mathematical science or computer science; demonstrated potential for effective teaching, scholarly activity and service; and good oral and written communication skills required. Quality teaching is the department's highest priority. Normal teaching load is twelve credit hours per semester. Preference given to candidates qualified to teach mathematics and computer science or statistics courses. Send letter of application, curriculum vitae, transcript, and three reference letters to: Dr. Gail Wells, Chair of Search Committee, Department of Mathematics and Computer Science, Northern Kentucky University, Highland Heights, KY 41099-1700. Applications will be reviewed as received; interviews will begin Feb. 12, 1996. NKU is located seven miles from Cincinnati, Ohio and enrolls approximately 12,000 students. NKU is an AA/EEO actively seeking the candidacy of minorities and women.

Dean of Natural Sciences and Mathematics California State University, Long Beach

The College of Natural Sciences and Mathematics, consisting of the Departments of Biological Sciences, Chemistry and Biochemistry, Geological Sciences, Mathematics, Physics and

Astronomy, and Science Education, are recruiting for the position of Dean. University enrollment approximates 27,000; there are about 1,500 majors in the College served by 175 faculty. All departments in the College, except for Science Education, offer the bachelor's and master's degrees. The successful candidate must possess an earned doctorate and be eligible for appointment as a tenured faculty member in one of the College's departments. The candidate must be committed to research and have a strong publication record, have had college or university teaching experience, be open to faculty governance and consultation, have successful academic administrative experience, have been involved in fiscal management and fund raising efforts, and have the ability to communicate effectively with an ethnically and culturally diverse campus community. Review of applications will begin on January 9, 1996; the position will remain open until filled. Preferred starting date is July 1, 1996. Applications must include a resume, a letter of interest that addresses qualifications, and a list of at least three professional references including names, addresses, and telephone numbers. Nominations are also invited. Send applications, nominations and requests for more detailed information about the position to Dr. Kenneth Marsi, Chair, Dean Search Committee, Office of the Vice President for Academic Affairs, California State University, Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840. California State University, Long Beach is an Equal Opportunity/Affirmative Action, Title IX Employer and is in compliance with the Civil Rights Act of 1964 (Title VI and Title VII), Title IX of the Education Amendments of 1972, the Rehabilitation Act of 1973, the Age Discrimination Act of 1975, and the Americans with Disabilities Act of 1990.

MATHEMATICS AND COMPUTER SCIENCE

The Department of Mathematics and Computer Science at Ouachita Baptist University invites applications for an August 1996 entry-level or higher tenure track position. A doctorate in Computer Science is preferred. Candidates must have at least a Masters in Computer Science or Mathematics and be working toward doctorate in one of the disciplines. A strong commitment to liberal arts education, to teaching courses in both computer science and mathematics, and to directing undergraduate research is expected. Ouachita emphasizes academic excellence within a Christian environment. Salary and rank are commensurate with experience. Review of applications begins immediately and continues into January, 1996. Send resume, statement of teaching philosophy, and arrange for three letters of recommendation to be sent to Alton Crawley, Chair, Department of Mathematics and Computer Science, Ouachita Baptist University, Arkadelphia, AR 71998-0001. Phone (501) 245-5596, FAX (501) 245-5500, email crawley@alpha.obu.edu.

UNIVERSITY OF DELAWARE

Department of Mathematical Sciences invites applications for a tenure track position at the Associate/Assistant professor level starting September 1, 1996. A doctorate in mathematics or mathematics education with an active research program in secondary mathematics education is required. Candidates must possess at least a Master's degree in mathematics or equivalent in course work and have a distinguished publishing record in educational research. Candidate may have the opportunity to work with doctoral candidates in the College of Education who have an interest in mathematics education at the secondary level. Candidates are expected to help support our preservice program. The department presently has some effort and expertise available for preservice and inservice programs. Candidates will be expected to teach a variety of mathematics courses at the undergraduate level including methods courses, and to supervise student teachers. Applicants should send a curriculum vitae, reprints and/or preprints and arrange to have three letters of reference sent to Professor David J. Hallenbeck, Chair; Search Committee; Department of Mathematical Sciences; University of Delaware; Newark, DE 19716. Applications must be received by January 15, 1996 to receive full consideration. The University of Delaware is an equal opportunity employer which encourages applications from qualified minority group members and women.

Western New Mexico University Anticipated Position (August 1996)

ASSISTANT PROFESSOR OF MATHEMATICS - Tenure-track, 9 month (\$28,450-\$31,000). Responsibilities include teaching 12 hours per week at the undergraduate level, maintaining an active program of professional development and student advising.

A Ph.D. in Mathematics or mathematics related field is required. Applicants working in all areas of mathematics will be considered, but preference will be given to applicants working in the areas of applied mathematics, applied statistics or mathematics education. Applicants in mathematics education must also have the equivalent of a Master's degree in mathematics. It is desirable that the applicant be bilingual, as well as having had past successful professional experiences with groups from diverse backgrounds. Proficiency in Spanish preferred.

The University serves a diverse, multicultural population of nearly 2500 including non-traditional students and is located in Silver City which is surrounded by the Gila National Forest in a beautiful mountain environment along the Continental Divide. Exemplary teaching, quality programs, commitment to diversity and enhanced regional service characterize WNMU's mission.

DEADLINE DATE: February 15, 1996 (4:40 p.m.)

A complete application must include a cover letter, vitae, copy of graduate transcripts, at least 3

letters of recommendation (2 to focus on applicant's teaching ability and potential) and a personal statement addressing the applicant's teaching philosophy, experience with and expectations regarding the use of technology in teaching. Send these materials to: WNMU, Human Resources Office, Castorena Hall, Room 114, Silver City, NM 88062.

All qualified applicants will receive consideration without regard to race, color, religion, sex, age, handicap or national origin.

WNMU IS AN AFFIRMATIVE ACTION/
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Coastal Carolina University Department of Mathematics

The Department of Mathematics at Coastal Carolina University is accepting applications for two entry level tenure-track assistant professor positions beginning fall 1996. One position in STATISTICS will involve teaching introductory and upper-level statistics and mathematics. The second position in MATHEMATICS will involve teaching both introductory and upper-level mathematics and applied mathematics.

Located near Myrtle Beach, Coastal Carolina University is primarily an undergraduate liberal arts institution with 4,500 students. Applicants must be committed to excellence in undergraduate classroom instruction and be active scholars. Candidates must have a Ph.D. in mathematics or statistics. Review of applicants will begin December 15 and continue until the positions are filled. Applicants should submit a letter of application, a curriculum vitae, and arrange for three letters of reference (at least one addressing teaching skills) to be sent to:

Deborah A. Vrooman
Coastal Carolina University
Department of Mathematics
P.O. Box 1954
Conway, South Carolina 29526

An Affirmative Action/Equal Opportunity Employer

The University of Wisconsin Oshkosh

The Mathematics Department of the University of Wisconsin Oshkosh invites applications for five positions, including three tenure track positions to begin September, 1996. Applicants must have a Ph.D. in Mathematics, Statistics, or Mathematics Education and at least two years of successful experience in teaching undergraduates (may include TA experience). Tenure track candidates must also have a demonstrated commitment to scholarly activity, to national standards for curriculum, teaching and assessment and the ability to apply technology to the classroom.

Duties of tenure track positions include teaching three courses per semester, continued scholarship, service on department committees and advising students. One tenure track position will be filled from the area of Applied Mathematics. Preferences for other positions will be given to

candidates with interests in geometry or mathematics education or quantitative literacy but not to the exclusion of excellent candidates in other fields.

Closing Date: January 15, 1996.

Send letter of application, vita, three letters of recommendation (at least one of which deals with teaching effectiveness), transcripts, personal statements on approach to teaching and to scholarship, with AMS cover sheet to: C.P. Collier, Chair, Mathematics Department, University of Wisconsin Oshkosh, Oshkosh, WI 54901. UW is an AA/EO Employer.

Assistant Professor of Mathematics Harvey Mudd College

Harvey Mudd College is hiring one tenure track Assistant Professor in mathematics. Excellence in teaching is absolutely essential, as is evidence of a strong and ongoing research program. Preference will be given to applicants in the areas of differential geometry, dynamical systems theory, and functional analysis. Applicants should also have wide mathematical interests and be able to teach across the undergraduate mathematical curriculum. Candidates must be willing to supervise undergraduate research, and work with others in the development of departmental programs.

Harvey Mudd College is a highly selective undergraduate institution of science and engineering. High school calculus is required for admission to the college. More than one-third of the student body are National Merit Scholarship finalists. The college enrolls about 630 students and is associated with four other undergraduate colleges and the Claremont Graduate School, forming together an academic community of about 5,000 students. There are over 40 mathematicians in Claremont.

Harvey Mudd College is an equal opportunity employer and is committed to the recruitment of candidates historically underrepresented on college faculties. Preference will be given to applications received before January 15, 1996. Applicants should send a curriculum vita, a description of their current research, and arrange to have three letters of reference sent directly to the address that appears below. Letters should, as much as possible, assess the quality of the applicant's scholarship, potential as a mathematician, and abilities as a teacher.

Address for application:
Search Committee
Department of Mathematics
Harvey Mudd College
Claremont, CA 91711-5990

Mathematics Position Valdosta State University Department of Mathematics and Computer Science

Applications are invited for a tenure track position at the Assistant/Associate Professor level beginning September 1, 1996. Preference will be given to candidates with expertise in number

theory, history of mathematics, operations research, or graph theory. Requirements include a Ph.D. in mathematics completed by September 1, 1996, a commitment to excellence in teaching, research, and service.

Send a letter of application, a resume, unofficial transcripts of all undergraduate and graduate work, and arrange for three letters of recommendation to be sent to:

Ashok Kumar, Head
Department of Mathematics
and Computer Science
Valdosta State University
Valdosta, GA 21698-0040

The deadline for applications is January 15, 1996. VSU is an Equal Opportunity/Affirmative Action Employer.

ELON COLLEGE

Applications are invited for a continuing position at the assistant professor level in the mathematics department. Applicants must hold a Ph.D. in Mathematics by the effective date of appointment, August 1996. A strong commitment to teaching at the undergraduate level is required. Preference will be given to candidates with experience in teaching and a demonstrated interest in curriculum development. Evidence of experience in statistics, applied mathematics, and interdisciplinary study is desired. Elon is a private, liberal arts college with 3500 students located between Greensboro and Burlington, within an hour's drive of several colleges and research universities. The mathematics department has ten full-time faculty members and 45 undergraduate majors. A representative will be attending and interviewing at the Orlando AMS/MAA meetings in January, 1996. Send letter of application, vita, undergraduate and graduate transcripts, statement of teaching and research goals, and at least three letters of reference to: Dr. Rosalind Reichard, Associate Dean of Academic Affairs, 2163 Campus Box, Elon College, NC 27244. Applications should be received by January 19, 1996. Minority and women candidates are encouraged to apply. Elon is an EOE institution.

Murray State University Department of Mathematics and Statistics

Applications are invited for a tenure-track position starting August 1, 1996.

Priority will be given to applicants with research programs which mesh with those of our current faculty. Research interests of our current faculty include: Lie algebra, operator theory, functional analysis, numerical analysis, combinatorics, ordinary differential equations, topology, mathematics education, and statistics. Applications from persons with training and experience in statistics are especially encouraged. Applicants must have a Ph.D. degree or a completed dissertation by the starting date. Evidence of outstanding teaching and a successful record of

scholarly activity or the potential for continuing scholarly activity is required.

Responsibilities include a maximum three course teaching load consisting of a variety of undergraduate and graduate courses, continuing research/scholarly activities, and university/departmental service.

The application package must include a letter of application, vita, and copies of graduate transcripts. The immigration status of non-U.S. citizens should be indicated on the vita. All applicants must meet federal guidelines for employment in the U.S. For full consideration, applications must be completed by December 21, 1995.

Send the application package and direct three letters of recommendation to:

Dr. Robert Pervine, Search Committee Chair
Department of Mathematics and Statistics
Murray State University
P O Box 9
Murray, KY 42071-0009

Murray State University is an equal education and employment opportunity, M/F/D, AA employer.

MATHEMATICAL SCIENCES DEPARTMENT HEAD

Worcester Polytechnic Institute (WPI) is an innovative university of science, engineering and management with an enrollment of 2,500 undergraduates and 400 full-time graduate students, located in central Massachusetts.

The WPI Mathematical Sciences department, currently with 22 full-time faculty, provides undergraduate and graduate education through the Ph.D. Active areas of faculty research include applied mathematics, optimal control, discrete mathematics, statistics, operations research, scientific computation and pedagogy. Its teaching/research facilities include networked workstation laboratories and offices in addition to well supported campus-wide facilities. For more information see <http://www.wpi.edu/Academics/Depts/Math/>

The department seeks a dynamic individual who can promote growth in the department's nationally recognized research program by attracting several outstanding faculty to fill anticipated openings. The new department head will be expected to take a leadership role in educational innovation. He/she will have the opportunity to expand and develop new research and educational programs, including an industrial project program for graduate and undergraduate students.

Nominations for and applications from persons holding a Ph.D. should be directed to the **Director of Human Resources, Mathematical Sciences Department Head Search Committee, Dept. A, Office of Human Resources, Worcester Polytechnic Institute, 100 Institute Road, Worcester, MA 01609-2280.** Priority will be given to applications received before February 1, 1996.



To enrich education through diversity, WPI is an affirmative action, equal opportunity employer.

**Worcester
Polytechnic Institute**

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Teach academically talented children & adolescents in summer programs held on college campuses & at independent schools in the Eastern and Western United States. Hiring on a rolling basis, with preference given to candidates who apply by Feb. 1, 1996. Call 410-516-0191 for more info and an application. JHU is an EOE.

**Fairfield University
Department of Mathematics and
Computer Science**

Fairfield University's Department of Mathematics and Computer Science invites applications for a tenure-track assistant professorship which begins in September 1996. A doctorate in mathematics or statistics is required. Strong evidence of research potential, demonstrated success in classroom instruction and a solid commitment to teaching are essential. The ability to teach mathematical statistics is preferred, but all applicants will be considered. Experience and interest in the use of technology in instruction are desirable.

Fairfield University, The Jesuit University of Southern New England, is a comprehensive university with about 2,900 undergraduates and a strong emphasis on liberal arts education. There are 14 full-time faculty members in the department and approximately 35 majors per year. The picturesque campus is located on Long Island Sound in southwestern Connecticut about 50 miles from New York City. Fairfield is an Affirmative Action/Equal Opportunity Employer. Send a letter of application, a curriculum vitae, and three letters of recommendation, which comment on the applicant's experience and promise as a teacher and scholar to Joan Weiss, Chair, Department of Mathematics and Computer Science, Fairfield University, Fairfield, CT 06430-5195, 203-254-4000, ext. 2516, weiss@fair1.fairfield.edu. We plan to participate in the Employment Register at the AMS/MAA Meetings in Orlando. Full consideration will be given to complete applications received by February 1, 1996.

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Calendar

National MAA Meetings

January 10–13, 1996 Seventy-ninth Annual Meeting, Orlando, FL. Board of Governors Meeting January 9, 1996

August 10–12, 1996 Annual Joint Summer Meetings, University of Washington–Seattle, Seattle, WA. Board of Governors Meeting August 9, 1996

January 9–7, 1997 Eightieth Annual Meeting, San Diego, CA. Board of Governors Meeting January 8, 1997

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

Sectional MAA Meetings

ALLEGHENY MOUNTAIN April 12–13, 1996, Indiana University of Pennsylvania, Indiana, PA

EASTERN PA & DELAWARE April 13, 1996, Millersville University, Millersville, PA

Fall 1996, Delaware State University, Dover, DE

FLORIDA March 1–2 1996, Florida Power Corporation, St. Petersburg, FL

ILLINOIS March 1–2 1996, Illinois Wesleyan University, Bloomington, IL

INDIANA March 29–30, 1996, Butler University, Indianapolis, IN

October 26, 1996, Rose–Hulman Institute of Technology, Terre Haute, IN

Spring 1997, Franklin College, Franklin, IN

INTERMOUNTAIN April 19–20, 1996, Mesa State College, Grand Junction, CO (joint meeting with Rocky Mountain Section)

IOWA April 26–27, 1996, Cornell College, Mt. Vernon, IA

KANSAS April 19–20 1996, McPherson College, McPherson, KS

KENTUCKY March 29–30, 1996, Murray State University, Murray, KY

LOUISIANA–MISSISSIPPI March 1–2 1996, Southern University, Baton Rouge, LA

February 28–March 1, 1997, Millsaps College, Jackson, MS

MD–DC–VA April 12–13, 1996, Randolph–Macon College, Ashland, VA

METRO NEW YORK May 5, 1996, C.W. Post College, Greenvale, NY

May 3, 1997, Mercy College, Dobbs Ferry, NY

MICHIGAN May 10–11, 1996, Siena Heights College, Adrian, MI

MISSOURI April 12–13, 1996, Southeast Missouri State Univ., Cape Girardeau, MO

Spring 1997, Missouri Western State College, St. Joseph, MO

Spring 1998, Southwest Missouri State University, Springfield, MO

NEBRASKA–SOUTHEAST SOUTH DAKOTA April 19–20, 1996, Univ. of Nebraska–Kearney, Kearney, NE

NORTH CENTRAL April 1996, Hamline University, St. Paul, MN

NORTHEASTERN November 17–18, 1995, Salem State College, Salem, MA

June 7–8, 1995, 1996, Hampshire College, Amherst, MA

November 22–23, 1996, University of Massachusetts–Boston, Boston, MA

NORTHERN CALIFORNIA March 2, 1996, Sonoma State University, Rohnert Park, CA

OHIO April 12–13, 1996 University of Akron, Akron, OH

October 26, 1996 Denison University, Granville, OH

OKLAHOMA–ARKANSAS March 22–23, 1996, Westark Community College, Fort Smith, AR

ROCKY MOUNTAIN April 1996, Mesa State College, Grand Junction, CO (joint meeting with Intermountain Section)

SEAWAY April 12–13, 1996, Elmira College, Elmira, NY

November 8–9, 1996, SUNY College at Geneseo, Geneseo, NY

SOUTHEASTERN April 12–13, 1996, University of Alabama–Huntsville, Huntsville, AL

SOUTHWESTERN April 1996, Northern Arizona University, Flagstaff, AZ

SOUTHERN CALIFORNIA March 2, 1996 University of San Diego, San Diego, CA

TEXAS March 28–30, 1996, Texas Tech University, Lubbock, TX

Spring 1997, Texas Lutheran College, Seguin, TX

Spring 1998, Southern Methodist University, Dallas, TX

WISCONSIN April 12–13, 1996, University of Wisconsin–Platteville, Platteville, WI

Other Meetings

March 13–16, 1996 Seventh International Conference of the Society for Information Technology and Teacher Education (SITE 96), Phoenix, AZ.

June 17–22, 1996 World Conference on Educational Multimedia and Hypermedia (ED-MEDIA 96), Boston, MA.

June 17–22, 1996 World Conference on Educational Telecommunications (ED-TELECOM 96), Boston, MA.

For more information on above three conferences, contact AACE, PO Box 2966, Charlottesville, VA 22902; (804) 973-3987; fax: (804) 978-7449; e-mail: AACE@ virginia.edu.

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