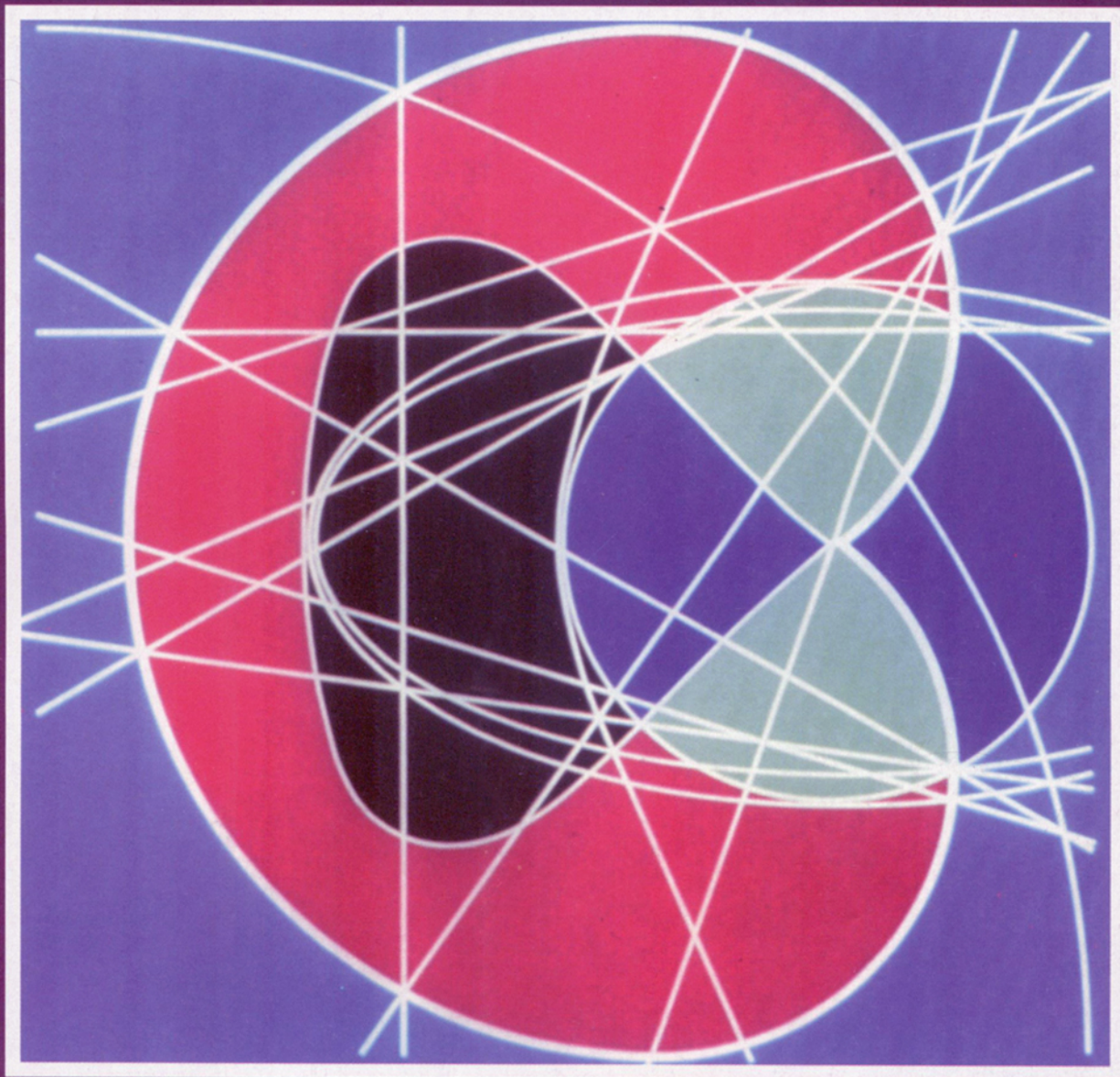


FOCUS



INSIDE:

Art Inspired by Mathematics in New York	4
Geometry for a New Century	9
Abandoning Dead Ends: Embracing Lively Beginnings	10
The Brain in the Box	13

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FOCUS

December 2000

Volume 20, Number 9

Inside

- 4 Art Inspired by Mathematics in New York**
By Ivars Peterson
- 6 Science and Technology Policy Site Now Part of MAA Online**
By Al Buccino
- 8 MAA Issues Revised Guidelines for Undergraduate Programs and Departments**
By John Fulton
- 9 Geometry for a New Century**
By Joseph Malkevitch
- 10 Abandoning Dead Ends: Embracing Lively Beginnings**
By Edward B. Burger and Michael Starbird
- 12 Thinker Mills:**
A Contradiction in Terms for Universities in an Age of Automation
By Brian A. Hagler
- 13 A Different Pencil: The Brain in the Box**
By Frank C. Wilson
- 14 Short Takes**
- 15 Dirk Jan Struik: Mathematician, Historian, and Marxist**
By Arthur B. Powell and Marilyn Frankenstein
- 18 Employment Opportunities**

On the cover: "Quartic" by Clifford Singer. Acrylic on Plexiglas, 30 by 30 inches. (1999.)

FOCUS Deadlines			
	February	March	April
Editorial Copy	December 15	January 19	_____
Display Ads	January 4	February 4	February 22
Employment Ads	December 19	January 26	February 15

AAAS Meeting to Offer Strong Mathematics Program

The 2001 Annual Meeting of the American Association for the Advancement of Science will be held on February 15-20, in San Francisco, CA. As usual, the meeting will feature many outstanding expository talks by prominent mathematicians. These include the following three-hour symposia sponsored by Section A (Mathematics) of the AAAS:

Beauty and the Beast: Realizations of the Art in Mathematics (Michael Field)

Mathematics of the Visual Cortex (Jack Cowan)

The Nature and Origins of Mathematical Thinking (Keith Devlin)

Mathematical Aspects of Intellectual Property Management on the Internet (Matthew Franklin)

Applications of Mathematics to Problems in Medicine (Parros M. Pardalos)

The Role of Mathematics in Pricing and Hedging Financial Assets (Philip Protter)

The Mathematics of Congressional and Other Apportionments (Donald G. Saari)

Other symposia that will be of interest to the mathematical community include: *From Juggling and Magic to Combinatorics, Understanding Music with Statistical Methods, Designing, Implementing, and Assessing Active Learning College Science and Mathematics, Mathematical Statistics in Natural Language Analysis, Mathematical and Computational Properties of Universal Grammar Under Optimality Theory, The Sea of Data and How to Manage It, Science and Mathematics Education: California Since the End of Affirmative Action, and Journey Beyond TIMSS; Rethinking Professional Development*. These are, of course, only a few of the 150 or so AAAS program offerings in the physical, life, social, and biological sciences. For details of the 2001 AAAS program, see the Oc-

tober 20th, 2000 issue of *Science* or visit the AAAS Annual Meeting web site at <http://www.aaas.org/meetings>.

AAAS annual meetings are intended to be showcases of American science, but participation by mathematicians and mathematics educators is often lower than might be expected. AAAS program committees are usually very interested in offering symposia on mathematical topics. Thus, Section A's Committee is seeking organizers and speakers who can present substantial new material in an accessible manner to a large scientific audience. The Section would also like to invite mathematicians to attend the Section A Committee business meeting 7:30-10:30 P.M. Friday, February 16th, 2001 in Mason room B of the San Francisco Hilton. Warren Page, the Secretary of Section A, is looking for proposals for symposia for future AAAS annual meetings. He can be reached by email at wxpny@aol.com. ■

2001 Tensor Grants: Call For Proposals for Women and Mathematics Projects

The MAA plans to award grants for projects designed to encourage college and university women or high school and middle school girls to study mathematics. The Tensor Foundation, working through the MAA, is soliciting college, university and secondary mathematics faculty (in conjunction with college or university faculty) and their departments and institutions to submit proposals. Projects may replicate existing successful projects, adapt components of such projects, or be innovative.

The objectives of the MAA/Tensor Foundation Program are to encourage math-

ematics faculty to develop projects to increase participation of women in mathematics, and provide support to project directors.

Grants of up to \$5,000 will be made to the institution of the project director to be spent within the year. An institution is expected to supply matching funds or in-kind support as an indication of commitment to the project. Grants will be made to college and university mathematics faculty or secondary school or middle school mathematics faculty working in conjunction with college or university faculty.

Proposals should be submitted as soon as possible but must arrive no later than February 5, 2001. The MAA/Tensor Foundation intends to make ten grants. Please do not hesitate to contact the Program Director, Dr. Florence Fasanelli, (202-966-5591 or ffasanelli@juno.com) for assistance in preparing your proposal.

Complete guidelines are posted on MAA Online at http://www.maa.org/projects/solic_99.html. Please review the guidelines before submitting proposals. ■

Art Inspired by Mathematics in New York

By Ivars Peterson

Most people don't expect to encounter mathematics on a visit to an art gallery. At first (or even second) glance, art and mathematics appear to have very little in common, though both are products of the human intellect. Looking at art with a mathematical eye or at mathematics with an artistic eye, however, can be illuminating and immensely rewarding. And there is much more to see than one would expect.

The Art & Mathematics 2000 exhibit at the Cooper Union in New York City offers a rich sampling of artworks inspired by mathematics, ranging from the gracefully curved sculptures of Brent Collins and tensegrity structures of Kenneth Snelson to the playful polyhedra of George Hart and wavy painted grids of Doug Pedens. The show runs from November 7 to December 15.

"A work of art is the demonstration of an idea represented through form, line, color, and value," says New York City artist and exhibit curator Clifford Singer, whose own paintings reflect classical geometric theorems. "Rarely has such harmony been better brought together than in this exhibition."

Mathematics as art or art as mathematics can take on an astonishing variety of forms. It can appear as a huge, geometric framework built of steel plates, a prismatic glass sculpture that refracts light into a shower of miniature rainbows, a painting of brightly colored squares, rectangles, and lines that serves as a window into the fourth dimension, an intricately branched, crinkled, or punctured form, or a garish landscape of ragged peaks and valleys on a computer screen. Such mani-

festations and many others testify to the creativity inherent in both mathematics and art.

More generally, conceived as explorations of form, space, light, and color, sculptures, paintings, and other artworks can themselves embody a variety of mathematical principles, expressed not only in such obviously geometric objects as triangles, circles, spheres, and cones but also

vent of powered flight to the unveiling of the atomic nucleus and Albert Einstein's formulation of the special and general theories of relativity. At the same time, the development of non-Euclidean geometries, which overturn Euclid's postulate that parallel lines never meet, provided alternative but perfectly consistent models of reality. Such concepts offered artists avenues of escape from conventional representation. Obsessively exploring

new mathematical ideas, from fractals to chaos, today's creators continue that tradition.

Examples of mathematics as art and art as mathematics abound in all sorts of settings—indeed, almost anywhere one cares to look. Visitors to Washington, D. C., for example, can readily view several sculptures based on the Möbius strip, originally a product of purely

mathematical research.

A Möbius strip in the form of an eight-foot-high, stainless-steel sculpture perches atop a tall pedestal in front of the National Museum of American History. Looking like a surreal bird with outstretched wings, this swooping, slowly revolving twisted loop was designed in 1967 by José de Rivera, who titled the piece *Infinity*. Across the Mall, a more complicated Möbius form stands guard at the entrance to the National Air and Space Museum. Created by sculptor Charles O. Perry, it is called *Continuum*.

Several miles away in a plaza in front of the U.S. Patent and Trademark Office stands another Möbius strip—a giant,



Infinity by José de Rivera. Photo by Ivars Peterson.

through depictions of motion and metamorphosis. Renaissance painting of the fifteenth century celebrated the precisely mathematical use of proportion and perspective to achieve startlingly natural images of the visual world while paying tribute to the purity of Euclid's geometric vision. Centuries later, artists such as Pablo Picasso, Wassily Kandinsky, Salvador Dali, René Magritte, and M. C. Escher could play with those conventions and illusions to nudge the mind in new and unexpected directions.

The late nineteenth and early twentieth centuries, in particular, were a vibrant period of astonishing, dimension-bursting scientific and technological advances, from the discovery of X rays and the ad-

calligraphic loop of twisted, red-painted steel—also created by Perry. Further away, a granite Möbius strip, carved by Swiss artist Max Bill and called *Endless Ribbon*, reclines in the sculpture garden at the Baltimore Museum of Art.

In commenting on the immense scope of mathematics, the nineteenth-century British mathematician James Joseph Sylvester remarked, "Its possibilities are as infinite as the worlds that are forever crowding in and multiplying upon the astronomer's gaze." The same can be said of the unlimited scope of imagination, whether in mathematics, art, or everyday life. ■

Ivars Peterson is the mathematics and computer writer and online editor at Science News magazine (also on the web at <http://www.sciencenews.org/>) in Washington, D.C. He will present "A Kaleidoscope of Mathematics and Art" at the Joint Mathematics Meetings in New Orleans on Jan. 13, 2001, at 10:05 a.m.



Calligraphic Möbius by Charles O. Perry. Photograph by Ivars Peterson.

Art & Mathematics 2000

Artists and mathematicians represented in *Art & Mathematics 2000*: Manuel Baez and Jean Le Mee, Bob Brill, Benigna Chilla, Brent Collins, Mike Field, Nat Friedman, Bathsheba Grossman, George Hart, Clement Meadmore, James Norman, Doug Pedens, Charles Perry, George Rickey, Tony Robbin, Carlo Séquin, John Sharp, Clifford Singer, Kenneth Snelson, and John Sullivan.

Additional information about the *Art & Mathematics 2000* exhibit and the accompanying catalogue can be obtained from Clifford Singer via email at CliffordhS@aol.com.

MathML Comes of Age

Nearly two hundred leading mathematicians, scientists, and web technology experts attended first "MathML and Math on the Web" conference, held in Champaign, IL, and hosted by Wolfram Research. MathML is the World Wide Web Consortium-endorsed standard for representing mathematical notation on the web. Based on XML (the Extended Markup Language), MathML fills the need for an efficient means of adding equations or other mathematical expressions to web pages. Previously, the most common method for representing equations was to use GIF or JPEG images, a cumbersome method that does not come close to solving the problem.

MathML was developed by the "MathML Working Group," with participation, among others, of Wolfram Research, Waterloo Maple Software, IBM, and the American Mathematical Society. A number of applications based on the new stan-

dard are expected to be out soon. *Mathematica*, Wolfram Research's well-known flagship product, already fully supports MathML. (Visit <http://www.wolfram.com> for more on Wolfram Research products.) IBM, a conference cosponsor, announced at the conference the release of *techexplorer 3.0*, a web browser plug-in for Netscape Navigator and Internet Explorer that is capable of rendering both MathML and TeX documents on the screen. (For more on *techexplorer*, visit their site at: <http://www.software.ibm.com/techexplorer>.) Many other conference participants represented organizations that either have already begun to implement and support MathML or have plans for doing so in the near future.

Tim Berners-Lee, creator of the World Wide Web and director of its guiding consortium, addressed the conference by video. He congratulated the MathML

working group for its perseverance in the effort to establish an XML standard for mathematics. Berners-Lee predicts that the MathML standard will have a widespread effect throughout the web user community, helping more people to get into mathematics, use existing mathematics, and create new ways of doing mathematics.

More information about the MathML conference, including presentation abstracts and an update on the availability of conference proceedings, can be found at <http://www.mathmlconference.org>. The World Wide Web Consortium's "Math Home Page" at <http://www.w3.org/Math> includes links to further web sites, a list of the members of the working group, and much more information about the MathML standard and its implementation. ■

Science and Technology Policy Site Now Part of MAA Online

By Al Buccino

On behalf of MAA's Science Policy Committee and Committee on the Profession, it is a pleasure to invite you to examine the new policy subsite of MAA Online at <http://www.maa.org/sciencepolicy>. This policy site will track indicators of science and technology policy and trends of special interest to the MAA, its members, and member institutions.

Science and technology policy (science policy, for short) has played a significant role for some time, and never more so than today. Nevertheless, science policy is elusive concept. Ideally, such a policy would be a set of principles by which science and technology are directed toward national purposes. Currently, there is no such clear national policy, and perhaps there has never been. Nevertheless, there are certain prominent features that may from time to time be discernible from policies related to: (a) support and performance of research and development (R&D), (b) the science and engineering workforce, (c) education in science, mathematics, engineering, and technology, and (d) contextual features such as the condition of the economy, institutions, laws, and regulation.

The late Representative George Brown (D-CA) was a strong proponent of science and of the articulation of science policy. Recently, he said: "We don't have a science policy, we have a budget policy." Indeed, an argument can be made that in practice S&T policy is the sum of what can be extrapolated from the aggregate of various R&D budgets and programs.

MAA/SPC plans to develop this site in step with the annual Federal Budget cycle, beginning with the Budget proposal the President submits to the Congress each January. We will follow the budget's (mis)fortunes and modifications as the cycle moves through the congressional processes.

In addition to the Budget document itself, a key reference document is Science and Engineering Indicators (S&EI for short), the biennial compilation of data and information on the science and technology enterprise undertaken by NSF's governing body, the National Science Board. The structure of S&EI provides an excellent framework for policy—issues, needs, and trends. Thus the budget and S&EI will frame the discussion presented on the site.

The American Association for the Advancement of Science performs a valuable service to compiling the Budget for R&D for each fiscal year (currently FY 2001) and publishing it on its web site at <http://www.aaas.org>. We will track this information and point you to the relevant material.

The American Mathematical Society publishes each year in the Notices of the AMS an analysis of funding for mathematics research in the Federal Budget. The site will report the AMS analysis and also pay attention to education and training funding and policy from NSF, the U.S. Department of Education, the Department of Labor, and other science agencies such as NASA, Defense, and Energy.

Policy is not advocacy, so the site, while inevitably reflecting different and controversial perspectives, will do so with the demeanor of a trustee and with a certain detachment. While we will occasionally include short opinion pieces, we see this site as mainly a news and information service for MAA members. Please visit and give us your feedback. ■

The Twelfth ICMI Study: The Future of the Teaching & Learning of Algebra

The International Commission on Mathematical Instruction will be holding a study conference entitled *The Future of the Teaching and Learning of Algebra* at the University of Melbourne (Australia) on December 10–14, 2001. "Algebra" will be interpreted broadly as a mathematical topic, and the conference will deal with algebra education from early childhood to college.

Following the pattern of previous ICMI studies, one of the goals of the conference is the production of a study volume to appear in the ICMI Study Series, which

will share the findings with a broad international audience. ICMI is calling potential participants to submit papers; participation in the study conference is by invitation only, based on the papers submitted.

To offer some guidance on what questions are to be addressed, ICMI has released a Discussion Document which highlights crucial issues about the teaching of algebra which are to be discussed at the conference. Some of these issues, which will be addressed by study groups at the conference, are:

Why algebra? For many, algebra acts more like a wall than a gateway, presenting an obstacle that they find too difficult to cross. What is the significance of algebra for the broad population of secondary school students?

Approaches to Algebra: Many approaches to teaching algebra have been proposed: problem-solving approaches, functional approaches, generalization approaches, language-based approaches, and so on. How do all these approaches fit into the algebra curriculum?

Language Aspects of Algebra: The role of notation in the learning of algebra is still not completely understood. A good notation for science may not be a good notation for learning. Current theories of mathematics teaching and learning do not seem to answer these questions.

Teaching and Learning with Computer Algebra Systems: This section addresses questions that arise from the increasing accessibility of computer symbolic manipulation.

Technological Environments: In an attempt to characterize recent research and experience, this section will explore which aspects of specific computer/calculator environments are related to which kinds of algebra learning.

Algebra with Real Data: Modeling the behavior of real things with algebraic functions is fundamental to applications of mathematics. Using real data to teach about functions is therefore important in the curriculum, and can also be highly motivating for students.

Early Algebra Education: This section is concerned with both the algebra education for young children—say age 6 and above—and also the initial steps in more formal algebra education, which happens in some countries when students are about 12 years old.

Tertiary Algebra: Problems exist in the teaching and learning of tertiary algebra courses such as abstract algebra, linear algebra, and number theory. These issues of learning and teaching are of concern, as is the specific question of education for prospective teachers.

Further details about how to submit a paper for consideration can be found at the home page for the ICMI study at <http://www.edfac.unimelb.edu.au/DSME/icmi-algebra/>.

The full Discussion Document, which includes more detailed discussions of each of the topics above, can be found at <http://www.edfac.unimelb.edu.au/DSME/icmi-algebra/discussiondoc.html>. ■

Participation of Women in the MAA—the Data

In 1995, the Board of Governors of the MAA passed a resolution asking that data be collected on the level of participation of women in various activities of the Association. The resolution also specified that the data should be published in **FOCUS** and **MAA Online** in order to keep members informed about how well we are managing to attract and involve women in MAA activities. In this issue, we give the data from 1998 and 1999. Please note that the MAA membership database does not currently include gender information, so that there is no reliable data on the percentage of members who are women. ■

	1998	1999
Board of Governors	Total board members: 50 Women: 14 Men: 26 Female participation: 28%	Total board members: 50 Women: 10 Men: 40 Female participation: 20%
Nominees to the Board of Governors¹	Total nominees: 29 Women: 9 Men: 20 Female participation: 31.0%	Total nominees: 27 Women: 8 Men: 19 Female participation: 30%
Committee Chairs²	Total chairs: 132 Women: 31 Men: 101 Female participation: 23.5%	Total chairs: 149 Women: 49 Men: 100 Female participation: 33%
Speakers at National Meetings	Total speakers: 105 Women: 26 Men: 79 Female participation: 24.8%	Total ³ speakers: 234 Women: 73 Men: 161 Female participation: 31%
MAA Awards	Total awards: 26 Women: 8 Men: 18 Female participation: 30.8%	Total awards: 24 Women: 1 Men: 23 Female participation: 4%

Notes

1. Includes nominees for section governors elected in 1999 as well as nominees for other governor slots included in Board agendas.
2. Includes chairs of committees, including joint committees, representatives, and editors.
3. Includes MAA Invited Addresses, Minicourses and Short Course Instructors, and Organizers of Contributed Paper Sessions.

MAA Issues Revised Guidelines for Undergraduate Programs and Departments

By John Fulton

At Mathfest 2000, the MAA Board of Governors approved a new set of Guidelines for Programs and Departments in Undergraduate Mathematical Sciences. The new MAA Guidelines document was prepared by the *Task Force to Review the 1993 MAA Guidelines for Programs and Departments in the Mathematical Sciences*. It replaces an older set of Guidelines that was approved by the Board of Governors in January 1993. The 1993 Guidelines document was intended to be a "living" document subject to periodic revision. The new document is the result of just such revision. The complete document is online at <http://www.maa.org/guidelines/guidelines.html>.

In 1996, the ASA/MAA Joint Committee

on Undergraduate Statistics produced a report that contains many suggestions for revision of the 1993 Guidelines document. All have been addressed in the new MAA Guidelines. Finally, the six "Guiding Principles" from *Recognition and Rewards in the Mathematical Sciences*, a 1994 report from the Joint Policy Board for Mathematics, have been incorporated into the new MAA Guidelines document.

The purpose of the new MAA Guidelines is stated in the introduction to the document: "These Guidelines are intended to be used by mathematical sciences programs in self studies, planning, and assessment of their undergraduate programs, as well as by college and university administrators and external reviewers. Mathematical sciences programs and their administrations can use the recom-

mendations included in these Guidelines as a basis for allocating resources and planning for the future. It is the joint responsibility of institutional administrations and mathematical sciences programs to provide and use properly the resources necessary to meet these Guidelines."

The new MAA Guidelines are intended to apply to all undergraduate programs in mathematical sciences departments that also include mathematics. Such programs might include pure mathematics, applied mathematics, mathematics education, computer science, statistics, and operations research. The term "mathematical sciences" is used whenever appropriate to emphasize this diversity. While the new MAA Guidelines attempt to address the specific concerns of each discipline, they were written to apply equally to all of the disciplines covered by the term "mathematical sciences."

A Sampling of the Guidelines

Educational Background: "Except [for graduate teaching assistants], those who are hired to teach mathematical sciences courses for undergraduate credit should have a minimum of a master's degree in a mathematical science. In institutions that grant at least a bachelor's degree in the mathematical sciences, tenure-track faculty should possess a doctoral degree in a mathematical science."

Promoting Excellence in Teaching: "Teaching ability and commitment to teaching should be key factors in all appointments to the teaching staff. Faculty should be supervised, monitored, and evaluated in order to help them improve their teaching."

Promoting Excellence in Scholarship: "All full-time faculty members should, as part of their work assignments, engage in disciplinary or interdisciplinary scholarship, broadly defined to include the discovery of new knowledge, the integration of knowledge, the application of knowledge, and scholarship related to teaching. A department should encourage, recognize, and value the diverse nature of faculty scholarship that is directly related to

the department's mission and program goals."

Assignment of Duties: "Institutional and departmental missions vary considerably. Work assignments for faculty should reflect institutional and departmental missions. They should be consistent with locally defined expectations for promotion and tenure as well as with comparisons to assignments in peer departments at other institutions."

Securing and Sustaining a Diverse Faculty: "Departments recruiting faculty from historically underrepresented groups must accept the responsibility for nurturing the professional growth and advancement of these faculty, especially during their early years of employment, in order to insure long-term diversity rather than short-term."

Faculty Isolated by Discipline: "If the department has only one or two faculty members in a discipline, it should seek outside persons to serve as advisors for departments and mentors for these isolated faculty members early in their careers."

Curriculum Access and Pedagogy: "Departments must be provided with the resources necessary to deliver high quality teaching that includes the opportunity for students to interact frequently and nontrivially with their instructors. Departments should facilitate these personal interactions by avoiding the use of large lecture settings that require students to become passive audiences. The best way to encourage active student-faculty interactions and to enable faculty to give students individual attention is to provide a small-class environment with fewer than thirty students in each section."

Impact of Technology: "Mathematical sciences departments should employ technology in ways that foster teaching and learning, increase the students' understanding of mathematical concepts, and prepare students for the use of technology in their careers or their graduate study." ■

John Fulton is Professor of Mathematics at Virginia Tech and currently is director of a project whose goal is to foster more data-based decision-making at the University. He chaired the Task Force to Review the 1993 MAA Guidelines.

Geometry for a New Century

By Joseph Malkevitch

“Millennium madness” has led the mathematics community to take stock of what has been accomplished in mathematics in the last 100 (perhaps even 1000) years. Geometry, like mathematics, has made dramatic progress in the last 100 years. Here is a short list of landmarks:

- Hilbert’s work on putting Euclidean geometry on a firm footing with his definitive axiomatization.
- The work of Steinitz, Grünbaum, and Klee (and others) on the combinatorial theory of polyhedra, polygons, and tilings.
- The development of the theory of finite geometries (and block designs).
- The flowering of geometric graph theory and the birth of the new field of computational geometry.
- Dramatic breakthroughs in the understanding of packing, covering, tiling and dissection problems.
- Significant new results about the geometry of space, including work on space-time geometry and the use of differential geometry, algebraic geometry, and sundry other tools to examine questions in mathematical physics (elementary particles, relativity, quantum field theory, etc.).

Although many of the geometric results we now know are quite technical, the questions involved are often easy to state using non-technical vocabulary. Geometrical problems are often ones in which it is “easy to get started,” at least in the sense that understanding the questions requires a relatively low overhead of prior study in mathematics.

What implications does all the progress in the understanding of geometry have? In particular, what are the implications for the teaching of geometry and the role that undergraduate mathematics departments have in the teaching of this geometry?

Despite all the progress in geometry itself, education in geometry during the last century has been more problematic. By the middle 1960’s there was little geometry (beyond giving names to shapes and

basic area, perimeter, and volume calculations) being taught in primary schools. High schools were teaching a pseudo-axiomatic version of Euclidean geometry; it was typical for a student to graduate from high school without being aware that Euclidean geometry was probably not the geometry of physical space or that non-Euclidean plane geometries existed. In fact, students were probably not aware of any of the landmarks listed above.

It wasn’t much better in college. Historically, the needs of majors in the mathematical sciences have been met either through a “survey course” or through a specific course with geometrical content. The “survey course” typically was designed primarily for students who were planning to become secondary school teachers. It often consisted of simply a survey of axiomatic Euclidean and non-Euclidean geometry. Students not planning to become teachers rarely took this course, and the people who taught this course would rarely have described themselves as geometers. This was because many colleges (and universities) have no person who would describe himself/herself as a geometer. When they do, these geometers try to create courses closer to their research interest than the survey course. (Researchers in geometry rarely are concerned with axiomatics any longer.) Happily, in the last few years, in part because a variety of new textbooks have appeared, the traditional survey course has broadened to include more topics of value both to future high school teachers and students not planning to teach in high school.

The other geometry courses that are typically taught at many colleges and universities are courses in a specific part of geometry. Such courses are often created because the department has a geometer interested in this content. When the person who created the course leaves, retires, or dies, the department may have lots of trouble finding someone to teach this kind of course. These courses have many titles. They might include topics such as convexity, graph theory, knot theory, differential geometry, algebraic geometry,

projective geometry, curves and surfaces, computational geometry, and symmetry. These courses are usually quite specialized and students planning to become high school teachers rarely take them.

The current paradigm has therefore created a “catch 22.” If it would be wise to broaden what is taught in K-12 (which I feel is a good idea), we need teachers who know a broader range of topics than are found in the typical current survey course. However, it is harder to find people to teach these broader courses. People who call themselves geometers should be teaching them. Such individuals need to be willing to teach courses that will appeal both to future high school teachers and to majors who do not plan to teach. The best hope for this is a survey course which has broader reach than the traditional course but which achieves enough depth to attract (not frighten away) future high school teachers and yet also appeal to students not planning high school teacher careers.

Geometry has often been the area of mathematics where many of the most important developments in mathematics first appeared. It is not an accident that geometric approaches to problems have often been followed by later “algebraization” of the same ideas. Mathematical Sciences departments should be re-examining their teaching of geometry, not only with a mind to training people who can teach more geometry in K-12, but also with the hope of creating a wealth of new geometrical results in the next century. ■

Joseph Malkevitch teaches at York College (CUNY). He can be reached by email at joeyc@cunyvm.cuny.edu.

The Committee on the Undergraduate Program in Mathematics (CUPM) is asking the profession to think about and comment on the curriculum for the undergraduate majors. To stimulate the discussion, FOCUS will be printing articles on various aspects of the curriculum, including several in this issue. Comments on these and other curricular ideas can be sent to CUPM by email at cupm-curric@maa.org.

Abandoning Dead Ends: Embracing Lively Beginnings

By Edward B. Burger and Michael Starbird

Question to typical college graduate majoring in the liberal arts: You graduated from college 15 years ago. What was the final mathematics course you took?

Former student: Pre-calculus.

Interviewer: What was your final literature course?

Former student: Pre-Shakespeare.

Pre-calculus should never be a final mathematics course. Pre-calculus and algebra provide essential techniques for a student who requires those specific skills in a technical profession or in subsequent courses. However, technical facility with manipulating algebraic expressions is soon forgotten by anybody who does not practice such manipulations. Algebra is not a used or useful life skill for most people.

Having students end their mathematical education with college algebra or pre-calculus may be the result of a hierarchical view of mathematics. In the eyes of many, mathematics is an edifice built on a foundation that includes algebra and pre-calculus. Students often absorb this idea: they see mathematics as an unending string of courses that starts with arithmetic and progresses relentlessly through high school algebra, geometry, pre-calculus, calculus, and so on ad infinitum or perhaps ad nauseam. Each subsequent course is viewed as dependent on the previous one, and there is no independent payoff from any particular course. It is just the next step in the weary journey. This curricular paradigm results in students traveling along this road as far as they can or wish to. Wherever they stop, their mathematical education ends and is quickly forgotten. If students stop prematurely (as all liberal arts majors will), then they summarize their mathematical education as, "I got as far as pre-calculus."

Question to typical college graduate majoring in the liberal arts: How would you describe the mathematics component of your college education?

Good answer: Important, mind-opening, surprising, interesting, full of useful techniques of effective thinking, life-changing, culturally significant, educationally central.

Actual answer: I completed my math requirement.

Follow-up question to likely answer: What did you learn?

Follow-up answer: I got a C.

We have a tradition of letting students end their mathematics education without seeing any truly enticing mathematical notions. Why do we persist in throwing away golden opportunities to bring intriguing, deep, and valuable ideas from mathematics to students? Having students struggle up the first two rungs of a 100-rung ladder that they will never climb is a curricular strategy born of habit rather than thought. Let's not have students' mathematical journeys end in dead ends.

Things that are not used are not useful to the non-user. Mathematical methods such as linear programming and matrix manipulation are applied in the real world. However, does it follow that it is important to teach such techniques to people who will not use them, or use them only indirectly? Of course, we should not go out of our way to avoid real applications of mathematics. However, the question for students in non-technical majors is whether mathematics can be of personal value to them. The argument that everyone might find uses for algebraic skills in actual life (to figure how to amortize a loan, for example) is extremely weak. Let's be honest with ourselves. How often in our everyday lives do we need to find the foci of a hyperbola? How often does anyone in a non-technical profession multiply matrices?

Question to typical college graduate majoring in the liberal arts: What is mathematics?

Student: Mathematics is problems.

Interviewer: Do you like problems?

Student: No.

Interviewer: What is mathematics good for?

Student: Math gives the formulas you use to do problems at the end of each section of the textbook.

Question to the student's mathematics teacher: What do you teach your students?

Teacher: I teach them how to solve problems.

Interviewer: Where do you get these problems?

Teacher: At the end of each section of the textbook.

Students have clear expectations as they enter a mathematics course. They expect to have homework consisting of problems from the textbook. They expect those problems to be identical to the problems that are worked out in the section, with only the numbers changed. They expect tests consisting of problems similar to ones at the ends of sections, with the numbers changed once again. Most teachers follow this model of teaching.

There is nothing wrong with this model if the goal is to have students mimic worked-out exercises from textbook sections. When we teach liberal arts students, we need to think honestly about what we hope students will take with them from the course and then emphasize those lessons in our teaching. We can highlight methods of thought that arise within mathematics and that are valuable to students as they solve problems not in textbook sections, but in their real, complex lives.

Mathematics courses can touch the lives of our students. Let's not have modest goals. We want our students to look at their lives, their habits of thought, and their world in a new and deeper way. That is the goal of the whole of education, and mathematics can play a central role in allowing all students to grow intellectu-

ally. All teachers should share the goal of improving the lives of their students—that is the purpose of education. However, it seems that the mathematics community has adopted a rather limited self-image about how profoundly our courses can affect students.

Mathematics involves penetrating techniques of thought that all people can use to solve problems, analyze situations, and sharpen the way they look at their world. Our mathematics courses should emphasize basic strategies of thought and analysis. Part of the power of mathematics lies in its inexorable quest for elegance, symmetry, order, and grace. Seeking pattern, order, and understanding is a transforming process that mathematics can help students develop. These and other strategies of thinking that have led to great ideas in mathematics can have their greatest value to people in making real-life decisions and facing situations that are completely outside mathematics. It is a crime for any student to leave a mathematics course with the impression that mathematics is a collection of mindless, rote procedures.

Stressing some basic “life lessons,” inspired by mathematical thinking, can empower students to grapple with and conquer the problems and issues that they all face in their lives from love to business, from art to politics. If such basic, effective strategies of thought allow students to conquer infinity and the fourth dimension, then what can’t they do? By emphasizing the process by which mathematicians create and discover concepts, we can find powerful strategies of thinking that are effective everywhere.

Effective thinking surely is the main goal of any mathematics course. Students must always realize that their primary job is to think and to develop habits of thinking that are illustrated by the mathematics.

Coming to grips with hard ideas is not smooth sailing. Sometimes students will confront issues that start beyond their grasp, but our challenge is to teach students how to make vagueness turn into clarity and confusion evolve into comprehension. The journey to true understanding can be difficult and frustrating, but if

we can engineer a happy ending, the challenges of that journey will be one of the highlights of the course.

Mathematics is not to be viewed from afar. Students should personally engage in the thinking of mathematical ideas. When we present the idea of infinity, we must expose the thinking process by which a systematic exploration of a simple everyday concept of equality (that is, one-to-one correspondence) leads to an intellectual triumph. The idea of exploring consequences of clearly stated simple ideas is a lesson that can potentially last longer than the recollection of Cantor’s diagonalization process.

Somehow, we must invite our students to answer questions and not be afraid to make mistakes. Failing is the only way to learn. It is much better to guess a wrong answer than not to think about the question at all. But that idea is one that requires acculturation and must be built into the method of instruction. It is not in keeping with most of their mathematical experience. In short, failure must be encouraged.

Top 10 Lessons for Life

1. Just do it.
2. Make mistakes and fail, but never give up.
3. Keep an open mind.
4. Explore the consequences of new ideas.
5. Seek the essential.
6. Understand the issue.
7. Understand simple things deeply.
8. Break a difficult problem into easier ones.
9. Examine issues from several points of view.
10. Look for patterns and similarities.

Mathematics contains some of the greatest ideas of humankind—ideas comparable to the works of Shakespeare, Plato, and Michelangelo. Mathematical ideas help shape history, and they can add texture, beauty, and wonder to the lives of all students. Deep, fascinating concepts in mathematics can be authentically presented to liberal arts students. It is an exciting adventure for students and their instructors to grapple with notions of infinity, the fourth dimension, chaos,

fractals, coincidences, and the random.

Mathematics has a great story to tell and we should be forgiven for any excesses of unbridled enthusiasm as we open doors for students to enter into worlds of profound interest and intrigue, but we should not be forgiven for making mathematics appear mundane and boring. This journey of the imagination and the mind should be fun. If students don’t enjoy the course, then their thinking will end at the end of the final. Knowledge comes and goes, but hatred lasts forever. Creating a positive attitude for a lifetime has a continued, incrementally valuable effect. It influences not only the students in the class now, but it influences their presentation of a mathematical attitude to their children in the future. If either the teacher of the class or the students don’t enjoy the experience, the class has not realized its true potential. Students should leave the class with the impression that there is much more fascination remaining to be discovered and learned. Let’s leave them with a thirst for more.

*Shall any gazer with mortal eyes
Or any searcher know with mortal mind
Veil after veil will lift but there must be
Veil after veil behind.*

—Sir Edwin Arnold

Interviewer: *What was the biggest idea you learned in college?*

Former student: Infinity.

Interviewer: *What was the most mind-expanding concept you learned in college?*

Former student: The fourth dimension.

Interviewer: *What class in college most improved your ability to think?*

Former student: My math class. ■

Edward Burger and Michael Starbird are co-authors of The Heart of Mathematics: An invitation to effective thinking (textbook with kit). Both have been awarded numerous teaching awards over the years. Most recently, Starbird has won the prestigious 2000 Friar Society Centennial Teaching Fellowship and Burger has been named a winner of the 2001 MAA Deborah and Franklin Tepper Haimo Award.

Thinker Mills: A Contradiction in Terms for Universities in an Age of Automation

By Brian A. Hagler

There is no reason to believe that recent trends in public K-12 schools will not continue to propagate throughout all of academia. For example, we can expect ever more encompassing efforts to charge colleges and universities with producing greater and greater numbers of individuals who can pass standardized tests. The fundamental motivation behind such movements in higher education is the need for the mass production of a viable workforce, not the improvement of schools (as is claimed at lower levels). Furthermore, automation, although necessary for those needs, conflicts in essential ways with the role of universities in education and society. Indeed, the suitability is questionable at all levels.

By definition, universities provide the ultimate in formal education. They are the mountaintops in the academic world. They represent this planet's best concerted efforts to pass along and carry forward intellectual discourse, in and out of academia. As a consequence, approaches to teaching and learning at the university level should diverge in substantive ways from those at earlier stages, though oftentimes they do not. For example, it is ridiculous to believe that the best an individual can be is the same best as everyone else. Yet this is exactly what the usual college or university course structure, following earlier pedagogies, assumes, ostensibly for the sake of fairness in grading. It is generally thought necessary for content and assessment details for each course to be completely pre-determined. This is a little like laying out a trail of footprints on a beach and judging student performance only by how well each can trace the steps.

A better definition of excellence at the highest levels of education should include the demonstrated ability of students to strive beyond the uniformly-applied constructs of their teachers, to leave the trail of footprints to look at a starfish or to explore the beach. Such criteria can be explicitly integrated into performance evaluation. By taking responsibility for

initiating and directing some of their own studies, students can claim greater personal ownership of their education, develop self-teaching skills, and gain a wider perspective on the meaning of excellence.

There is a distinction between the everyday experience of the people and university experience. In mathematics today, this is illustrated by the assumption that certain skills, collectively referred to as Algebra, are in the purview of every high school graduate, while Calculus forms the core of introductory, entry-level university mathematics and is beyond the expected experience of the general public. Typical of advanced studies, mathematics leaves the realm of craftsmanship and enters a world of intellect and artistry.

The freedom to learn independently and the focus on intellect and art are important distinguishing characteristics of universities, ones that should be promoted in spite of counteractive societal forces. We need such ivory towers and the eggheads they shelter.

In reality, the institutions we call universities today are primarily concerned with churning out workers with compulsory academic degrees, certificates of training, and the like. They have migrated toward trade school status, trying to meet high school graduates at their average current skill and knowledge levels and then to process them into a usable labor force for business and industry. Automation is required for this task, as it is for mass production of any kind. It is also well suited to the task, machines being appropriate role models in this situation. Yielding to pressure from inside and outside academia, our colleges and universities have begun to evolve into automated industrial plants. Their administrators are the business and operations managers, their educators are technology-assisted assembly line quality control officers, and their graduates are standardized, machine-milled, market-ready product. As evident already in some fields, such as Computer Science and Engineering, the

results are a proportionally huge and growing number of graduates, but a dearth of intellectuals and academics.

The defining properties of universities are in conflict with the trends toward automation. The best teachers and role models for human thinkers are human thinkers, not automata, and mass production, with its standardization and use of technology, is contrary to student responsibility and excellence at the peaks of academia. But the two are not mutually exclusive. Compromises are made, and lines are blurred. The result is that universities become thinker mills, so to speak. They promote themselves as passageways to lifetimes of learning, yet utilize methods of business and industry to train their students, en masse, in the name of education. Feeding upon itself, the process thus begun brings the number of intellectuals spiraling downward. Sooner or later, the eggheads are gone, though the towers remain, ivory only in name.

This article, in a way, is a call for subversion at the point of delivery. As such, it is directed toward the teaching faculty of institutions offering advanced degrees. Recognize and subvert those instructional policies and implementations that would treat students as widgets, you and your colleagues as production line workers and our universities as millhouses. Moreover, promote those qualities that distinguish universities from other educational institutions. Beyond instruction and evaluation in the basic tenets of your discipline, build effective incentives and gauges of scholarly initiative and independence into your teaching approaches and assessment schemes. Have high expectations of your students, and don't be surprised by occasional intense feelings of swimming against a spiraling current.

Brian A. Hagler teaches at University of Texas of the Permian Basin.

A Different Pencil: The Brain in the Box

By Frank C. Wilson

Since I grew up in the 1980s, calculators and computers have surrounded me for the majority of my educational life, and the effective use of technological tools has dramatically enhanced my understanding of mathematics. Every time I graph a function on my TI-89 graphing calculator, I'm amazed at the simple beauty of the graphics so effortlessly created on my hand-held "brain in the box." Exploring the graphical world of functions is quick and easy; analyzing several graphs simultaneously is only a matter of a few keystrokes. Whether I'm graphing a function or using advanced calculus features, my calculator is a tried and true teacher, continually revealing to me the subtleties of mathematics. I love teaching with technology because it enhances my ability to communicate with my students. It is my goal to create within my students the same technological fascination that has invigorated my education.

Since I am so infatuated with technology, my students are often surprised that although I let them use calculators on exams, I restrict them from using calculators on quizzes. Many of them feel intellectually paralyzed as they struggle through a quiz armed only with a pencil and paper. It is a painful experience for some of them to face their inability to do mathematics without their "brain in the box."

I began to restrict calculator-use on quizzes after witnessing the lack of mental engagement by some students. More than once I've watched students reach for their calculators when posed with a simple arithmetic problem such as "45/3." I'm quick to confront them with: "Don't use your calculator. Think." Usually they stare at me somewhat surprised and then reply sheepishly, "It's 15."

Even though I restrict calculator use on quizzes, I highly encourage students to use them on exams to check their answers. To ensure that students aren't relying entirely on their calculators to solve problems, I require them to show their work. Some teachers may argue that cal-

culator use on exams should be entirely prohibited. I disagree. I feel I'm doing a disservice to my students if I don't teach them how to use the technology as a part of the learning process. For example, if they discover a discrepancy between the calculator result and their solution, they are motivated to scrutinize their work to discover their error. As they review their work, they may gain additional understanding or insight into the concept. With the added understanding, they can often rework the problem correctly. Admittedly, students can always review their work whether or not they are allowed to use a calculator; however, using the calculator allows them to identify incorrect solutions more quickly, so that they can focus their energy on ferreting out errors. By giving a mixture of calculator and calculator-free assessments, I hope to encourage the effective use of technology without promoting an intellectual dependence on the "brain in the box."

Since calculator use both stimulates mental engagement and spawns mental apathy, how can we effectively use calculators, computer algebra systems, and other technological media in the classroom to encourage learning? The key is to use technology as an aid to intellectual discovery and reaffirmation. Teachers can design learning activities to enable these two aims. For example, to help students determine the effect of a in the equation $y = a^x$ have them plot $y = (0.5)^x$ and $y = (1.5)^x$ simultaneously. Based on their observations, have them predict the shape of $y = (0.3)^x$ and $y = 3^x$. Let them test their hypothesis by plotting the functions on their calculator. Ask them to make some generalizations about the shape of the function given $0 < a < 1$ or $a > 1$. Then have them put away their calculators and plot $y = 2^x$ by hand. Most will be able to plot the function successfully because of what they learned from their calculator. If they later forget the effect of a , they can repeat the discovery exercise and reaffirm their earlier understanding.

Another stimulating calculator activity

involves generating a population growth model from local census data. After the students have determined the equation, I have them plug it into their calculators and generate a table. Looking at the calculator data table, I ask them to predict the past, current, and future population of the city at specified times. The recognition of discrepancies between their model and the historical census data leads to a discussion on the effective use of mathematical models. Generating the same table of model data by hand would be so computationally intensive that students would never reach the valuable discussion stage of the exercise.

To avoid calculator-addiction, students must be accustomed to moving back and forth between calculator use and calculator restriction. They must recognize that the "brain in the box" must never overcome their raw mental power. As teachers, we play a critical role in detoxifying those who are calculator dependent while simultaneously stimulating all students to increase their learning through technology. New educational technologies will emerge in the decades ahead. It is up to us to make sure that they will enhance, not undermine, mathematics education. ■

Frank C. Wilson taught mathematics at Brigham Young University, Park College, Rio Salado College, and the Air Force Academy before assuming his current position at Green River Community College. His research interests include educational technology, alternative assessment, and educational games. His e-mail address is fwilson@grcc.ctc.edu.

Pencils are no less technological than calculators. Thus, mathematicians and teachers of mathematics have been dealing with the issue of the appropriate use of technology in the classroom for centuries. **A Different Pencil** is the overall title for a series of articles about the use of technology in mathematics and in the teaching of mathematics.

Short Takes

Panel on articulation at the January Joint Meetings

A panel on *Articulation Among Secondary and Postsecondary Mathematics Programs* has just been added to the program for the Joint Mathematics Meetings to be held this January in New Orleans.

The panel, organized by Bradford Findell of the Mathematical Sciences Education Board, will be on Wednesday, January 10, from 2:15 p.m. to 3:45 p.m. The organizers note that there is a national need for improved articulation among mathematics programs in high schools, two-year colleges, four-year colleges, and universities.

Articulation depends upon competing influences, including the mix of reform and traditional high-school mathematics curricula, AP programs, the SAT, the ACT, university admissions policies, mathematics placement exams, and widely diverse first-year curricula in college, all of which collide at this borderland between grades 12 and 13.

In February 2000, the Mathematical Sciences Education Board (MSEB) convened a two-day Articulation Workshop that considered current curricular, instructional, and assessment practices and trends, and identified key tension points and potential coordination strategies among the many agents involved in the articulation process.

The panel will present some of the issues from MSEB's work and will engage participants in a discussion of issues that inhibit the transition of students from one level of education to another. The panelists will be Richelle Blair (Lakeland Community College); Christian Hirsch (Western Michigan University); and Gail Burrill, (Director of the MSEB).

An "acute shortage" of Mathematics Education PhDs

An article by Robert E. Reyes printed in the November issue of the *Notices of the AMS* claims that the United States is facing a "critical shortage of people hold-

ing PhDs in mathematics education." The article says that "an increasing number of mathematics departments in colleges and universities are recruiting" specialists in mathematics education.

The article claims that an upcoming wave of retirements means that the situation is not likely to improve soon, and recommends action to rectify the shortage. The author calls for better ways to measure both supply of and demand for mathematics education PhDs and for more extensive support for doctoral programs from the National Science Foundation and the Department of Education. He also asks the AMS, MAA, and NCTM to actively publicize the need for increased doctorates in mathematics education.

Alan Greenspan not a fan of technology in education

In testimony given before the House Education and Workforce Committee related to a bill seeking to improve elementary and secondary school mathematics and science education, Federal Reserve Board chair Alan Greenspan emphasized the importance of good mathematics education for the "new economy" but did not seem very enthusiastic about heavy use of technology.

As reported in the October 6 issue of *Science*, Greenspan said he was glad he was brought up in a generation without calculators and argued that learning the algorithm for long division has "enduring value." In the official version of his remarks, which can be found on the web at http://www.house.gov/ed_workforce/hearings/106th/fc/mathsci92100/w192100.htm, Greenspan is a little more cautious. He argues that "In my experience, competency in mathematics—both in numerical manipulation and in understanding its conceptual foundations—enhances a person's ability to handle the more ambiguous and qualitative relationships that dominate our day-to-day decisionmaking." Thus, "one is led to wonder whether the early sharpening of intellectual rigor that occurs when young students struggle to negotiate the complexities of doing multiplication and division the old-fashioned way is not with-

out enduring value."

Greenspan went on to express concerns about the high level of mathematics anxiety among young people, to laud attempts to reform and improve mathematics education, and to argue that mathematics should be learned in the context of a broad liberal education.

Ethnomathematics at the *Chronicle*

In its October 6 issue, the *Chronicle of Higher Education* reports on the growing presence of ethnomathematics in mathematics classes and degree programs for future schoolteachers. The term "ethnomathematics" has a range of meanings these days. Originally intended as a research program whose aim was to recognize and value the mathematical achievements of other cultures, it is now also used for attempts to revamp mathematical pedagogy by using a cultural perspective.

The article in the *Chronicle* mentions such examples as "in an Orange Coast college math class, for example, students learn about the geometric designs in Navajo rugs when studying the concept of slope. And students in teacher-education algebra courses at the Newark campus of Rutgers University work out river-crossing problems based on different cultures." Critics of this approach argue that it is one more way to "soften" the mathematics curriculum by allowing students to focus on the cultural aspects rather than on the mathematical content. Proponents argue that the cultural approach humanizes mathematics and respects the diverse cultures of the students.

Conference on Adults Learning Mathematics

"Adults Learning Mathematics" is the name of an international research group that tries to bring together researchers and practitioners in numeracy teaching and learning. Its goal is to promote the learning of mathematics by adults. ALM will be holding its 8th international conference at Roskilde University in Denmark on June 28 to 30, 2001. For more information, visit the ALM web site at <http://www.alm-online.org>. ■

Dirk Jan Struik: Mathematician, Historian, and Marxist (30 September 1894–21 October 2000)

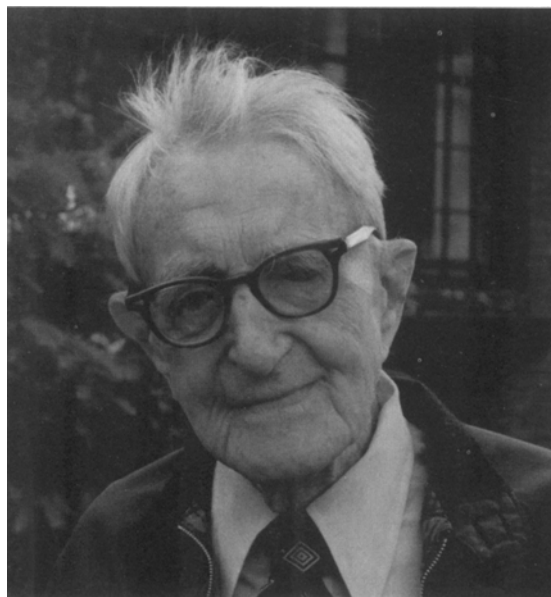
By Arthur B. Powell and Marilyn Frankenstein

Dirk Jan Struik, Professor Emeritus of mathematics at the Massachusetts Institute of Technology, died peacefully on Saturday, 21 October 2000 at his home in Belmont, Massachusetts. He had just turned 106, on September 30. In celebration for what was to be his last birthday, friends from around the world presented him with many multicolor posters containing expressions of admiration and gratitude for the depth and rigor of his academic scholarship and the boldness of his political stances, moving tributes attesting to how he enriched their lives, and words of hope for the worldwide struggle for justice and peace that he championed.

Struik's life spanned many eras. He was born in 1894 in Rotterdam, Holland, where he studied from grammar through high school. In a recent interview, he speculated that from his father, who was a schoolteacher, he inherited a love of mathematics and history (Powell and Frankenstein, 1999, p. 421). In 1912, Struik entered Leiden University to study mathematics and physics. In contrast to his high school notions, he attributed his understanding of the spirit of mathematics and science to the theoretical physicist Paul Ehrenfest at Leiden: "All the science I had learned before was static. Ehrenfest showed me how science is a living and growing field" (Powell and Frankenstein, 1999, p. 442).

In 1922, Struik received a doctorate with a dissertation on applications of tensor methods to Riemannian manifolds (Struik, 1922). However, even before receiving a doctorate, he had already embarked on publishing his many mathematical reflections (Schouten and Struik, 1918). Struik and Jan Arnoldus Schouten carried on an important and fruitful collaboration (Rowe, 1994, contains an extensive bibliography of their technical papers, as well as of Struik's

other works). Throughout his life, Struik did considerable work in and kept current with the mathematical ideas of tensor calculus, Riemannian manifolds, differential geometry, and absolute differential calculus. He wrote a large number of mathematical papers and books, including, in 1950, his *Lectures on Classical Differential Geometry*. At age 101, he published a review (1995a) of Karin Reich's



Dirk J. Struik

(1994) history of tensor calculus and a few years earlier had contributed his own account of the emergence of tensor calculus (1989).

A year after completing his doctorate, Struik married Saly Ruth Ramler, a native of Czechoslovakia, who also became an accomplished mathematician. She died in 1993 at age 99. From 1924 to 1926, with Struik's Rockefeller fellowship, he and his wife traveled to several other European countries and studied, met, and collaborated with many of the great mathematicians and scientists of the 20th Century, including Tullio Levi-Civita, Richard Courant, and David Hilbert.

Nevertheless, by 1926, Struik found himself unemployed in Holland and with

limited opportunities in Europe. After an inquiry from Norbert Wiener, Struik accepted a teaching post from Samuel Stratton, the president of MIT.

From then until 1960, Struik taught and researched at MIT and became internationally acclaimed as a mathematician and historian of mathematics and science. His *A Concise History of Mathematics*, which has been translated into more than seventeen languages, was first published in 1948 (Struik, 1948a). The fourth revision appeared in English in 1987. The book "has probably done more to promote interest in and appreciation for the rich diversity of mathematical ideas and cultures than any other single volume on the history of mathematics" (Rowe, 1994, p. 245).

Perhaps not as well known as his other academic achievements is the fact that Struik was a founding editor (in 1936) of the Marxist-oriented journal, *Science and Society*, and the editor of books on Marxism (Struik 1964a and 1971). He was a scholar-activist whose work exemplifies a commitment to unite theory and practice in the struggle for social and economic justice. Internationally, he influenced scholars from diverse disciplines—mathematicians, philosophers of mathematics and science, and historians of mathematics and science—as well as inspiring practical activities.

His research for his book, *Yankee Science in the Making* (1948b, reprinted 1991, New York: Dover) helped lead to the restoration of several of the sites he studied, including the old manufacturing section of Lowell, Massachusetts, and some sections of the Middlesex Canal.

As the above indicates, the influence of Struik's work was not just confined to the academy. With other left and liberal activists, from 1944 to 1948, Struik founded and taught at the Samuel Adams School,

where, on a volunteer basis, individuals taught courses on labor laws, international conditions, science, and so on. The school filled a need for centers that would promote progressive and militant citizenship among adult workers and an interest in trade unions and left-wing political parties, goals thought unattainable in public schools and colleges.

From 1951 to 1956, Struik suffered an interruption in his MIT professorship. He became a victim of the anti-democratic political witch-hunt of communists and their fellow travelers that was led by Senator Joseph McCarthy and the House Un-American Activities Committee. The Commonwealth of Massachusetts charged him with three counts of sedition, and MIT suspended him with pay. In 1951, though denounced by FBI informant Herber Philbrick, using the right awarded under the Fifth Amendment, Struik refused to "name names," which led him to be branded a Fifth Amendment communist. Eventually, the Supreme Court accepted Struik's plea that the Commonwealth's anti-sedition laws were unconstitutional. In 1956, MIT reinstated Professor Struik, restored his tenure, but censured him "for conduct unbecoming" an MIT professor, basing its judgement on his use of the Fifth Amendment before the House Un-American Activities Committee and "lack of candor with members of the [MIT] administration." Four years later he retired from MIT. Struik's personal experience of persecution led him to lecture widely on freedom of speech issues.

A major theme of Struik's life work consisted of attempting to combine his mathematics and his Marxism. The result was to reconcile the two into a new discipline: the sociology of mathematics (Struik, 1942 and 1986). Besides his purely mathematical preoccupations, he concerned himself with discovering whether and in what ways social and institutional forces influence mathematical research. As Alberts (1994) notes, Struik asserted "that mathematical conceptions can better be understood in conjunction with larger social and intellectual processes" (p. 280). He has used the analytical tools of dialectical and historical materialism to examine and understand the unfolding of

mathematical ideas. However, Struik went beyond assertions and demonstrated that social context interacts with the production of mathematical knowledge. Unlike historians before him, he believed that an understanding of the operative forces within a society was indispensable for knowing and doing historical work on mathematics. In this way, Struik reconciled mathematics and politics by shaping a new sociology of mathematics and science and made significant contributions to the history of these disciplines. These included a study of how philosophical notions decisively influenced Marx's theoretical ideas on the foundation of the calculus (Struik, 1942, 1948c [reprinted in Powell and Frankenstein, 1997]; for more of his work on the sociology of mathematics and science, see 1964b, 1984a, 1984b, 1986). Interestingly, as Alberts (1994) states, Struik's "numerous contributions to the history of mathematics were largely undertaken as a complement to his own mathematical production, and were only rarely self-reflexive in the sense of touching on the latter" (p. 290).

"Mathematicians grow very old; it is a healthy profession. The reason you live long is that you have pleasant thoughts. Math and physics are very pleasant things to do."

—Dirk Jan Struik

Throughout his life, Struik remained an active intellectual. In recent years, Struik extended his scholarship in the sociology of mathematics to include written and oral commentary on the nascent field of ethnomathematics. He published articles in *Monthly Review* (1995b), "Multicultural Mathematics and the History of Mathematics," and in *Technology Review* (1995c), "Everybody counts: Toward a broader history of mathematics." Even more recently, he spoke about research in ethnomathematics at conferences at the University of Massachusetts in Boston (1997) and then at a pre-session of the joint mathematics meetings in Baltimore, Maryland (1998). He was especially keen on the academic and political program of ethnomathematics, which aims to con-

nect mathematics to its origins in culture (including social and productive contexts) and to link mathematics education to social justice.

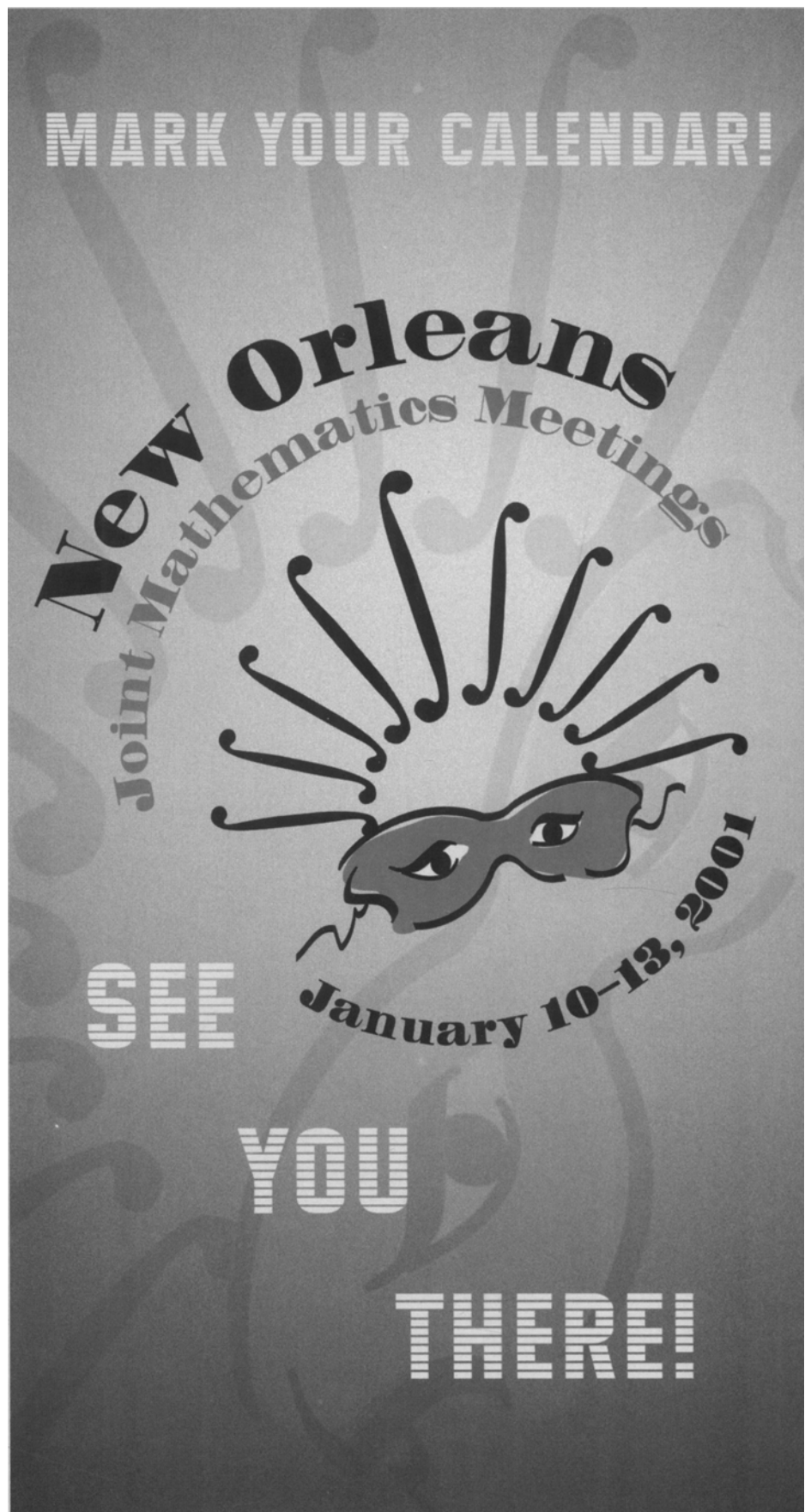
Struik had a fascinating career whose motive force was his pitiless intellectual curiosity. During one of our last visits with him, after we remarked on how sharp his memory still was for details, Struik pointed to a spherical, crystal bowl given to him in Holland at a celebration of his 100th birthday with the etching $M + M + M = 100$. He said that equation symbolized what was responsible for his stamina and continued intellectual acuity: "Marriage, Mathematics, and Marxism." ■

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Arthur B. Powell teaches mathematics and mathematics education at Rutgers University-Newark. Marilyn Frankenstein teaches at the College of Public and Community Service of the University of Massachusetts-Boston.



EMPLOYMENT OPPORTUNITIES

ALABAMA

UNIVERSITY OF ALABAMA IN HUNTSVILLE

Mathematical Sciences Department

The Mathematical Sciences Department at the University of Alabama in Huntsville invites applications for the position of Lecturer and Director of the Mathematics Learning Center beginning Fall, 2001. Applicants must possess at least a Master's degree in mathematics, applied mathematics or mathematics education. Evidence of excellent teaching ability and expertise in computer-assisted mathematics curriculum are essential requirements. The position is a twelve-month appointment, and the duties include teaching undergraduate mathematics courses and the supervision of mathematics tutorial services, the calculus workshop, and computer-assisted mathematics program. The position is non-tenure earning. However, it is renewable upon positive annual evaluation. Send a letter of application, vita, transcripts and the names of three references to Chairman, Department of Mathematical Sciences, University of Alabama in Huntsville, Huntsville, AL 35899. Review of applicants will begin February 15, 2001, and will continue until the position is filled. Women and minorities are encouraged to apply. The University of Alabama in Huntsville is an Affirmative Action, Equal Opportunity Institution.

ARKANSAS

OUACHITA BAPTIST UNIVERSITY

MATHEMATICS: Ouachita Baptist University's Department of Mathematics and Computer Science invites applications for a Department Chair or a tenure track position beginning August 2001. The successful applicant will have a PhD in mathematics and strong commitments to Christian principles, to a liberal arts education in a church-related institution, to directing undergraduate research, and to teaching courses for majors and non-majors. Salary, rank, and tenure are commensurate with experience. Review will begin January 15 and continue until the position is filled. Send CV, transcripts, and statement of teaching philosophy including plans for undergraduate research to Anne Selph; Department of Mathematics/Computer Science; Ouachita Baptist University; Arkadelphia, AR 71998-0001. E-mail: selpha@obu.edu; FAX 870-245-5241; phone: 870-245-5326. For information about Ouachita: www.obu.edu.

CALIFORNIA

CALIFORNIA STATE UNIVERSITY, FULLERTON

The Department of Mathematics at California

State University, Fullerton has two tenure-track openings at the assistant professor level beginning fall 2001. For candidates with exceptional qualifications, appointment at the rank of associate professor may be considered. Minimum qualifications are a Ph.D. in Mathematics or Applied Mathematics awarded by August 20, 2001, high potential in teaching and research, and excellent communication skills.

The first position is in the fields of geometry or differential geometry. An interest in the history of mathematics would be a plus. The second position is in applied mathematics in the fields of computational mathematics, differential equations (ordinary or partial), or dynamical systems.

Teaching duties include courses at the undergraduate and graduate levels. The successful candidate is expected to be professionally active and to participate in departmental and university affairs. Excellence in teaching and ongoing research activity are essential for promotion and tenure.

Applicants should send a summary of their teaching experience and current and future research plans, a current Curriculum Vita, at least three letters of reference addressing their background and potential in both teaching and research, and transcripts of graduate work to: Chair, Search Committee (specify Pure or Applied), Department of Mathematics, California State University, Fullerton, CA 92834-6850. For full consideration, they must be received by January 12, 2001. Further information regarding CSUF and the mathematics department can be found at <http://www.fullerton.edu>. Cal State Fullerton is an AA/EO/Title IX./ADA Employer.

CALIFORNIA STATE UNIVERSITY, NORTHRIDGE

The Department of Mathematics invites applications for one tenure-track appointment at the assistant professor level effective Fall 2001. California State University Northridge is a comprehensive university located in the greater Los Angeles area. For more information see <http://www.csun.edu/math>. Please send a vita, the AMS standard cover sheet and three letters of recommendations, one that addresses the candidate's teaching abilities, to Hiring Committee, Department of Mathematics, CSUN, Northridge, CA 91330-8313 by January 15, 2001. Email (inquires only) math.hiring1@csun.edu. CSUN is an Equal Opportunity, Title IX, section 503 and 504 employer.

CALIFORNIA STATE UNIVERSITY, STANISLAUS

CSU Stanislaus invites applications for a tenure-

track Assistant Professor position in Mathematics, effective September 2001. Candidates must have a Ph.D. degree in mathematics, applied mathematics, mathematics education, or statistics. Candidates with an interest in mathematics education are preferred, but all specialties will be considered. Candidates must have a strong commitment to teaching.

Responsibilities include teaching mathematics course from pre-baccalaureate to senior level and service to the Department and the University. Research and/or grant activity is strongly encouraged.

A complete application consists of a letter of interest, vita, copies of all transcripts, and three letters of recommendation (at least one of which must address teaching). These materials should be sent to Dr. Judith L. Clarke, Chair, Department of Mathematics, CSU Stanislaus, 801 W. Monte Vista Ave., Turlock, CA 95382. Screening of applications will begin on November 15, 2000, but we will continue to accept applications until the position is filled.

CSU Stanislaus is a liberal arts university with approximately 7,000 students, located in Central California. Further information about the University can be found on our web page (<http://www.csustan.edu>).

CSU Stanislaus is an Equal Opportunity/Affirmative Action Title IX/Section 503/504 employer. Qualified women, minorities, and persons with disabilities are encouraged to apply. CSU Stanislaus hires only individuals lawfully authorized to work in the United States.

CAL STATE POLYTECH. UNIV., POMONA Department of Mathematics

Four tenure-track positions

Pure Math and Math Ed. (Asst Prof) Teach major & service courses in secondary teaching/pure option; advise students seeking secondary teaching credential; interact with Center for Education & Equity in Math, Sci. & Tech. (CEEMaST) and College of Ed. (CEIS). Min qual: Ph.D. in pure math with ability to teach geometry, number theory or topology and strong background in math ed. or doctorate in math ed. with ability to teach upper division pure math courses. Initial review of applications 12/15/00.

Math and Math Ed. (Asst Prof) Teach major & service courses in math, applied math, or stat as well as math ed courses; advise students pursuing a secondary teaching credential; interact with CEEMaST and CEIS. Min qual: Ph.D. in math, appl math, or stat and strong background in math ed. or doctorate in math ed. with ability to teach upper division math, appl math, or stat courses. Initial review of applications 1/19/01.

Appl.Math/Stat. (Asst/Assoc Prof) Teach major and service courses in appl math or stat, advise graduate students. Preference will be given to applicants having multiple expertise in the following areas: differential equations, modeling (deterministic and stochastic), random processes, estimation theory, numerical analysis, or operations research. Min qual: Ph.D. in math or stat or related area. Initial review of applications 2/2/01.

Statistics (Asst/Assoc Prof) Teach graduate stat courses, undergraduate and service courses in stat or math; advise graduate students. Preference given to applicants with expertise in one or more of: statistical modeling, multivariate stat, biostat, design of experiment, estimation theory, statistical consulting. Min qual: Ph.D. in stat or math or related area. Initial review of applications 2/2/01.

All positions: Salary dependent on qualifications. Required: evidence of teaching excellence, ability to direct master's theses, potential for conducting scholarly activities. Completion of terminal degree by Sept. '01. Review of applications continues until position is filled or closed. Submit application form (with name of position), curriculum vitae, transcripts, and min. of 3 reference letters to Faculty Search Committee, Math Dept., CSPU Pomona, 3801 W. Temple Ave, Pomona, CA 91768-4007; 909-869-4008; Fax: 909-869-4904; e-mail: lmborchert@csupomona.edu. AA/EEO. See <http://www.csupomona.edu/~math>.

HARVEY MUDD COLLEGE

Department of Mathematics

Assistant Professor of Mathematics

Harvey Mudd College invites applications for a tenure-track assistant professorship. Preference will be given to candidates whose research is in some area of algebra (including algebraic combinatorics, algebraic number theory and algebraic geometry). Excellence in teaching is absolutely essential, as is evidence of a strong and ongoing research program. Candidates will be expected to teach courses in abstract algebra and discrete mathematics, 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, engineering and mathematics; the average SAT score of entering students is over 1480. More than one-fourth of the student body are National Merit Finalists, and one year of high school calculus is a requirement for admission.

Each year there are graduates in mathematics,

with approximately half going to graduate school. Over 40% of mathematics alumni from HMC have obtained a PhD degree in some mathematical field, or an advanced professional degree. The college enrolls about 680 students and is a member of the Claremont College consortium, which consists of four other undergraduate colleges and two graduate institutions, forming an academic community of about 5000 students. There is an active and vital research community of over 40 mathematicians in Claremont.

Claremont is situated approximately 35 miles east of downtown Los Angeles, in the foothills of the San Gabriel mountains. The community is known for its tree-lined streets and village charm. It is an easy drive from Claremont to the cultural attractions and universities of the greater Los Angeles area, as well as the ocean, mountains and deserts of southern California.

Applicants should send a curriculum vitae, a description of their teaching philosophy and experience, a description of their current research program, and arrange to have three letters of recommendation sent to the address that appears below. Further information about the college, department and position may be found at <http://www.math.hmc.edu>. Preference will be given to applications completed by January 5, 2001.

Harvey Mudd College is an equal opportunity employer and is committed to the recruitment of applicants historically underrepresented on college faculties.

Address for applications:

Professor Arthur T. Benjamin
Chairman, Search Committee
Department of Mathematics
Harvey Mudd College
Claremont, CA 91711-5990

MILLS COLLEGE

Assistant Professor of Mathematics

Mills College invites applications for a tenure-track position as Assistant Professor of Mathematics starting Fall 2001. Required: Ph.D in mathematics or statistics, and a broad background in mathematics. Applicants must submit evidence of superior teaching and research abilities. Teaching load: five courses per year. Duties: teach a variety of upper and lower division courses in mathematics; contribute to an environment that excites women about mathematics and prepares them for careers that use mathematics; help build a strong program in mathematics that is attractive to students with diverse backgrounds and interests.

Mills College is a small, well-known, liberal arts

college for women located in the San Francisco Bay Area. It offers 34 majors and 18 graduate programs, including a master's program in interdisciplinary computer science within the Department of Mathematics and Computer Science. The faculty/student ratio is 1:11.

Please send a completed AMS Standard Cover Sheet, a vita, at least three letters of recommendation, a list of the mathematics courses taken, and statements of teaching philosophy and research agenda to: Chair of the Mathematics Search Committee, Department of Mathematics and Computer Science, Mills College, 5000 MacArthur Blvd., Oakland, CA 94613 (e-mail address: mathsearch@mills.edu). Indicate whether you plan to attend the New Orleans Meeting in January. To ensure full consideration, all materials, including letters of reference, should be received by December 1, 2000. Late applications will be reviewed until the search is closed. Women, people of color, and those committed to working in a multicultural environment are encouraged to apply. AA/EEO.

CONNECTICUT

WESLEYAN UNIVERSITY

The Department of Mathematics and Computer Science invites applications for the following positions in Mathematics to begin in the academic year 2001-2002. Candidates for these positions must have a Ph.D. in Mathematics and are expected to have strong records in both research and teaching.

Assistant Professor of Mathematics: We seek candidates for two tenure-track assistant professorships, one in analysis and the other in algebra. These positions are most suitable for candidates with an established research program, typically with some postdoctoral experience. For the analysis position, we are especially interested in probability theory, Lie groups, or geometry with connections to dynamics; for the algebra position, we are especially interested in arithmetic or algebraic geometry, number theory, algebraic groups, commutative algebra, or algebraic combinatorics. Outstanding candidates in any area of mathematics are encouraged to apply.

Teaching duties for each of the above positions are two courses per semester.

Wesleyan University is committed to increasing the diversity of its faculty and is an equal opportunity/affirmative action employer.

Applications must be submitted by January 29, 2001. Applicants should arrange for at least four letters of recommendation, including one which

evaluates teaching, to be sent to the address below.

All correspondence and applications should be submitted to:

Mathematics Search Committee
Department of Mathematics
and Computer Science
Wesleyan University
Middletown, CT 06459

E-mail enquiries may be directed to mathjobs@wesleyan.edu; please mention that you are enquiring about the assistant professorships.

More information concerning the Department of Mathematics and Computer Science and about Wesleyan University can be found via <http://www.math.wesleyan.edu/>.

COLORADO

REGIS UNIVERSITY, DENVER

Regis College, one of three schools within Regis University, invites applications for a tenure-track position in the Department of Mathematics to begin fall, 2001. Ph.D. in mathematics or mathematics education required. The successful candidate will have demonstrated excellence in undergraduate teaching and a strong commitment to professional growth. Interest in teaching a wide range of undergraduate mathematics courses, including courses in the College Core Program, is essential. Interest and experience in doing research projects with undergraduates is a plus, and experience in using current technology is also an asset. Administrative approval for this position is pending. Send letter of application, a resume, and three letters of recommendation to: Dr. Diane Wagner, Regis University, c/o Dean of the College E-24, 3333 Regis Boulevard, Denver, CO 80221. Application deadline: 1/5/01.

Regis is a Catholic liberal arts institution in the Jesuit educational tradition. We seek to examine dominant societal values and major areas of knowledge so that our graduates might become articulate and persuasive leaders in the service of others. Visit us at <http://www.regis.edu>.

WASHINGTON, DC

AMERICAN UNIVERSITY

The Department of Mathematics and Statistics in the College of Arts and Sciences at American University is seeking applicants for the following positions to begin in Fall 2001:

1) Tenure track Assistant Professor of Statistics.

Ph.D. in Statistics or Biostatistics required.

2) Tenure track Assistant Professor of Mathematics. Ph.D. in Mathematics required.

3) Possible additional temporary positions in mathematics, statistics, or mathematics education subject to budgetary authorization.

Qualified candidates will have evidence of effective teaching and scholarship. Responsibilities include teaching undergraduate and graduate level courses; advising students; conducting research; and participating in department, college, and university service activities.

Applications for the tenure track positions will be reviewed beginning 1/15/2001 and will continue until the positions are filled. Applicants should indicate which position(s) they are interested in and send vitae and 3 letters of reference to: Search Committee, Department of Mathematics and Statistics, American University, 4400 Massachusetts Avenue, NW, Washington, DC 20016-8050. American University is an EEO/AA employer committed to a diverse faculty, staff, and student body. Women and minority candidates are strongly encouraged to apply.

GEORGIA

**VALDOSTA STATE UNIVERSITY
Department of Mathematics
and Computer Science**

Applications are invited for a tenure-track position beginning fall semester 2001 at the rank of Assistant Professor. Candidates must have a Ph.D. in mathematics or a closely related field to be conferred no later than August 1, 2001, and the equivalent of a masters degree in mathematics. Special consideration will be given to candidates who can teach lower division courses in computer science or statistics.

Applicants should have a commitment to undergraduate teaching and research. The typical teaching load is 12 semester hours and includes both service courses and major courses. Other responsibilities include continued professional development and service to both the department and the university.

Send a letter of application, resume, statement of teaching philosophy, three letters of recommendation, and unofficial transcripts of undergraduate and graduate work to:

The Mathematics Screening Committee
Department of Mathematics
and Computer Science
Valdosta State University
Valdosta, GA 31698-0040

The review of applications will begin on December 1, 2000, and will continue until the position is filled. Valdosta State University is EOE/AA.

ILLINOIS

BENEDICTINE UNIVERSITY

BENEDICTINE UNIVERSITY - DEPARTMENT OF MATHEMATICS Anticipated tenure-track position at the assistant professor level beginning Fall 2001. Applicants must have a Ph.D. in mathematics or mathematics education and should be prepared to teach a broad range of undergraduate courses in a liberal arts environment. A commitment to continued scholarship, excellence in teaching using technology, and interests in mathematics education and teacher training initiatives are essential. Duties include 12 hours teaching per semester. Send resume, teaching statement, research summary and plans, and 3 letters of recommendation (at least one addressing teaching excellence) to Dr. Thomas Wangler, Department of Mathematics, Benedictine University, 5700 College Road, Lisle, IL 60532-0900. Primary consideration will be given to applications received before 12/15/00. EOE.

EASTERN ILLINOIS UNIVERSITY

Two tenure-track positions: mathematics and/or mathematics education. Visit www.eiu.edu/~math. Screening begins 1/16/01. Send a letter of application, vita, transcripts, 3 letters of reference, and statements of teaching philosophy and scholarly interests to Dr. Max Gerling, Search Committee Chair, Mathematics Department, Eastern Illinois University, 600 Lincoln Ave, Charleston, IL 61920-3099. EOE/EA/AE committed to achieving a diverse community.

**ILLINOIS STATE UNIVERSITY
Mathematics Position**

The Mathematics Department at Illinois State University is seeking applications for one tenure track position in mathematics at the Assistant Professor rank beginning August 1998. Applicants should have a Ph.D. in Mathematics by August 1998 with a research focus in functional analysis, preferably operator theory or operator algebras; the ability to teach a wide range of mathematics courses for major and general education programs; an active research program; and a commitment to quality teaching. To assure consideration send vita, three letters of recommendation, and transcripts by February 1 to: Dr. Lotus Hershberger, Department of Mathematics, Illinois State University, Normal, IL 61790-4520. See our web page at www.math.ilstu.edu for more information. e-mail: search@math.ilstu.edu AA/EO Employer.

LAKE FOREST COLLEGE
Department of Mathematics
and Computer Science

Lake Forest College invites applications for a full-time, tenure track position at the Assistant Professor level in the Department of Mathematics and Computer Science. Candidates should have a Ph.D. in Mathematics, a commitment to excellent teaching in a quality liberal arts environment, and an active interest in mathematical research. Willingness and ability to teach computer science courses within the department will also be an important consideration.

Lake Forest is a selective, 4-year liberal arts college and offers a B.A. Degree in eighteen departments and eleven interdisciplinary fields. The college stands on a wooded 107-acre campus in the city of Lake Forest on Chicago's North Shore, just 30 miles from the Chicago loop. With students from approximately 45 states and 45 countries, Lake Forest College embraces diversity throughout all its constituencies and encourages applications from women and members of historically underrepresented minority groups. The Department of Mathematics and Computer Science offers majors in both disciplines and has seven full-time faculty members. The teaching load is three courses per semester.

Applications should include a curriculum vita, a statement on teaching, and three letters of reference (at least one of which addresses teaching ability). Materials should be sent to:

Dr. Jill Van Newenhizen
 Search Chair
 Department of Mathematics
 and Computer Science
 Lake Forest College
 555 North Sheridan Road
 Lake Forest, IL 60045-2399

Closing date for applications is January 15, 2001. E-mail inquiries are invited at vannewen@lfc.edu, but e-mail applications will not be accepted.

IOWA

GRAND VIEW COLLEGE
Assistant Professor of Mathematics/
Computer Sciences

Two tenure track positions: 1st position begins January 2001, 2nd Position begins September 2001; Responsibilities include teaching 12 hrs/sem in Mathematics and/or Computer Sciences, supervising students internships, advising students and committee services. The successful candidate should have a Ph. D or Ed.D. in Mathematics, Statistics, Math Education or Computer

Sciences; must be willing to participate in scholarship activities. Also, preference will be given to candidates who have experience and are willing to teach developmental mathematics and all levels of mathematics and/or computer sciences. Grand View College is Liberal Arts College that supports a diverse student population of 1400 full and part-time students. The college was founded in 1896 and sits on a beautiful 25-acre campus in the capital city of Des Moines, IA. Des Moines offers exceptional facilities for enjoyment of lectures, forum concerts, museums, and other cultural opportunities. To apply, submit a letter of intent including AMS application cover page, a curriculum vitae, three letters of recommendations with at least one addressing teaching experience, transcripts (unofficial okay at this time), a brief statement of professional goals and teaching philosophy to: Grand View College Human Resources Office 1200 Grandview Ave. Des Moines, IA 50316-1599. Review of applications will begin immediately and continue until position is filled. A representative from Grand View College will be interviewing at the AMS/MAA Winter meeting.

KENTUCKY

BELLARMINE UNIVERSITY

Department of Mathematics
 Louisville, Kentucky 40205
www.bellarmino.edu

Tenure-track Assistant Professor position anticipated starting August 15, 2001. The position requires the ability to enhance our successful program in Actuarial Science. In response to changes in the SOA exams, we plan to update this program. The new faculty member will be expected to contribute to our revisions.

Experience at teaching with technology is highly desired. The department has its own teaching computer lab and most service courses utilize graphing calculators.

Bellarmino University is a Catholic liberal arts institution which emphasizes excellent teaching in both major and service courses. We are in a period of growth, in enrollment and in programs, and Mathematics is active across the University.

Send a letter of application, vita, three letters of recommendation, and evidence of strong teaching to: William Fenton, chair. Consideration will begin January 3. Department members will attend the Joint Meetings. AA/EOE.

NORTHERN KENTUCKY UNIVERSITY

Applications are invited for at least two tenure track positions in mathematics or statistics at

the assistant professor level beginning August 2001. Higher rank may be possible. Ph.D. in a mathematical science required. Normal teaching load is twelve hours per semester. Quality teaching is the Department's highest priority; continued scholarly activity and service required. Oral and written competency in English is mandatory. For further information about the Department, the University, the positions, or additional positions in computer science and mathematics education, see <http://www.nku.edu/~math/> Send letter of application, curriculum vita, transcript, and three letters of recommendation to: Thomas J. Kearns, Chair, Department of Mathematics and Computer Science, Northern Kentucky University, Highland Heights, KY 41099. Interviews begin January 16, 2001, continuing until the positions are filled. NKU is located in the Cincinnati metropolitan area and serves approximately 12,000 students, including some 375 mathematics or computer science majors. AA/EOE.

WESTERN KENTUCKY UNIVERSITY
Head, Department of Mathematics

Applications are invited for the position of Head of the Department of Mathematics. Applicants should hold a doctorate in mathematics or mathematical science and provide evidence of administrative leadership, as well as effective teaching, public service, and research/scholarly activities appropriate for a tenured appointment at the rank of professor. The Department of Mathematics is one of 12 in the College of Science, Technology and Health. With 30 full-time faculty (19 tenured/tenure track), the department offers baccalaureate and masters programs in mathematics. In addition, mathematics is included in the university general education requirements for all undergraduate degrees. Western Kentucky University enrolls approximately 15,000 undergraduate and graduate students, including more than 1000 minority and 300 international students, and has a strong commitment to achieving diversity among faculty, staff, and administration. The university is in Bowling Green, KY, between Nashville, TN and Louisville. For more information, see www.wku.edu/Mathematics. Review of applications will begin February 1, 2001 and will continue until the position is filled, with date of appointment July 1, 2001. Send letter of application, vita, transcripts, and at least three letters of recommendation to Professor Art Shindhelm, Chair, Search Committee, Department of Mathematics, 1 Big Red Way, Bowling Green, KY 42101. Women and minorities are encouraged to apply. Western Kentucky University is an EO/AA employer.

MARYLAND

LOYOLA COLLEGE

Applications are invited for one, possibly two full time entry level tenure track positions beginning in Fall 2001. Candidates should be recent Ph.D.'s in theoretical or applied mathematics. For the first position, preferential areas are discrete mathematics, algebra, or allied areas, especially coding theory and cryptography. For the possible other position, the department seeks expertise in numerical analysis, differential equations, dynamical systems, mathematical finance, or related areas. Candidates must have demonstrated excellence in teaching and research potential. Experience with innovative teaching techniques, including technology, is a plus. Our homepage, www.loyola.edu/mathsci, provides further information. Loyola College is a Jesuit Catholic institution which welcomes applicants from all backgrounds who can contribute to our unique educational mission. Please submit a resume, statement of research objectives, outline of teaching philosophy, and arrange to have three letters of reference, at least one of which addresses the applicant's teaching ability, sent to Dr. Christopher Morrell, Chair, Department of Mathematical Sciences, Loyola College, 4501 N. Charles Street, Baltimore, MD 21210. EOE.

UNITED STATES NAVAL ACADEMY

The USNA Mathematics Department anticipates several tenure-track positions (subject to approval and funding) at the Assistant Professor level to start in August 2001. Candidates must have a Ph.D., demonstrate a strong commitment to undergraduate teaching, and show potential to continue an active scholarly program. See web site <http://www.usna.edu/MathDept/website/Faculty/Hire/Hire.htm> for full information. Tel: 410-293-6700; Fax: 410-293-4883; Email: amg@usna.edu. The United States Naval Academy is an Affirmative Action/Equal Employment Opportunity Employer.

WESTERN MARYLAND COLLEGE

COMPUTER SCIENCE COORDINATOR (Assistant/Associate Professor), Western Maryland College. 3 courses/semester. For complete details visit our website: <http://www.wmdc.edu/academics/mathematics/math.shtml>.

MASSACHUSETTS

FRAMINGHAM STATE COLLEGE

The Mathematics Department invites applications for a tenure-track position beginning September 2001. Applicants must have a doctoral degree in a mathematical science and show evidence of a strong commitment to excellence in

teaching and a commitment to continued scholarly and professional growth. We are particularly interested in candidates who have a background in mathematics education and/or statistics, although other strong candidates will be considered. The successful candidate would teach courses throughout the mathematics curriculum including lower-level courses. The responsibilities include a teaching load of three courses per semester (12 hours per week), advising, and service to the college community.

To apply, please send vita, official transcripts, a statement of teaching philosophy, and three letters of reference, at least one of which comments on teaching ability, to Search Committee, Department of Mathematics, Framingham State College, Framingham, MA 01701. The closing date for applications is January 31, 2001.

Framingham State College is a four-year liberal arts college with a student population of approximately 3000. Teaching is the primary mission of the college, with the integration of technology into the curriculum an important goal. The campus is located 20 miles west of Boston.

Framingham State College is an equal opportunity/affirmative action employer. Persons of color, women, and persons with disabilities are strongly urged to apply.

MICHIGAN

CALVIN COLLEGE

Tenure-track opening beginning Fall 2001 (Pending approval). Requires Ph.D in mathematics or statistics and excellence in teaching and scholarship. Statistician strongly preferred, but outstanding candidates in all areas will be considered. Calvin College is a Christian liberal arts college, and faculty are expected to demonstrate a Reformed and Christian perspective in their professional work. Send CV, graduate transcripts, teaching statement, research program, statement of faith, and 3 letters of recommendation to Chair, Department of Mathematics and Statistics, Calvin College, Grand Rapids, MI 49546 by December 18, 2000. EOE.

Deadline for Applications: December 18, 2000. URL For more information about the position or institution/company: <http://www.calvin.edu/academic/math/>.

MINNESOTA

SOUTHWEST STATE UNIVERSITY

Southwest State University invites applications for a tenure track Assistant/Associate Professor of Mathematics to begin August 22, 2001. The faculty member will teach a full range of under-

graduate courses in mathematics and mathematics education and participate in department and university activities, which may include curriculum development, program review, supervising university courses taught in regional high schools, and other outreach activities in both mathematics and mathematics education. Duties also include student advising, contribution to student growth and development, evaluating student performance, scholarly activities, and service to the University and community. A doctorate in mathematics or mathematics education is required, but individuals within a year of doctoral completion will also be considered. Completion of the doctorate is required by September 1 of the tenure application year. Applicants should have good communication skills and demonstrate a strong commitment to undergraduate teaching and to working with mathematics and mathematics education students. A letter of application addressing position qualifications, a curriculum vita, teaching evaluations, official transcripts, and the name, address, and telephone numbers of three references should be submitted to: Office of Human Resources, Southwest State University, 1501 State Street, Marshall, MN 56258. Review of the applications will begin immediately and will continue until the position is filled. E-mail: almerdk@southwest.msus.edu or visit our website at www.southwest.msus.edu.

SOUTHWEST STATE UNIVERSITY IS AN EQUAL OPPORTUNITY EDUCATOR AND EMPLOYER. APPLICANTS MUST BE ABLE TO LAWFULLY ACCEPT EMPLOYMENT IN THE UNITED STATES.

UNIVERSITY OF MINNESOTA

The School of Mathematics will have available a tenure-track (Assistant Professor or higher) position starting fall semester, 2001. Ph.D. or equivalent degree in mathematics, teaching and related education experience at the undergraduate level and research are required. This position will emphasize: excellence in teaching, including experience with mathematically talented high school students; capacity for educational leadership; involvement with creative academic programs and curriculum development; involvement with educational scholarship and professional involvement (new curricula and curricula supplements, professional development materials, and relevant statistical/evaluative studies and publications); ability to constructively support administrative and public relations aspects of educational programs and projects. Experience working with K-12 mathematics coursework and preservice/inservice teacher education is desirable.

Preference will be given to applicants at any level whose background and experience are compatible with the above stated objectives. Salary will be commensurate with background and experience. Consideration of applicants will begin December 15, 2000 and will continue until the position is filled. Send statement of interest, current curriculum vitae, at least 4 letters of recommendation (including comments on teaching ability and educational experience), and a complete description of related experience and research to: Professor Harvey Keynes, School of Mathematics, University of Minnesota, 127 Vincent Hall, 206 Church Street S.E., Minneapolis, MN 55455.

The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status or sexual orientation.

**MINNESOTA STATE UNIVERSITY
MOORHEAD
Mathematics Department
Moorhead, MN 56563**

Tenure-track position at rank of assistant professor to begin August, 2001. A Ph.D. or Ed.D. in mathematics education is strongly preferred. Substantial progress toward a terminal degree is required. Eligibility for licensure at some level K-12 and good communication skills are required. Preference will be given to candidates with evidence of successful teaching at the K-12 and college level. Interest or experience in teaching a mathematics methods course and evidence of ability to work effectively as a member of a teaching team are desired. Duties include teaching mathematics education methods and content courses and undergraduate mathematics courses. Other responsibilities include advising students, developing in-service workshops, service to the university and maintaining an appropriate level of professional activity. The teaching load is twelve hours per semester, which may include supervising student teachers. Screening of applications will begin January 15, 2001. Applications accepted until filled. Completed applications must include resume, MSUM Standard Application Form, graduate and undergraduate transcripts, and three current letters of reference. Apply to Don Mattson, Chair, Mathematics Department, Minnesota State University Moorhead, Moorhead, MN 56563, (218) 236-2274; fax number: (218) 236-3692; e-mail: mattson@mnstate.edu. Minnesota State University Moorhead is an equal opportunity/affirmative action employer and educator. Women, minorities, and persons with disabilities are encouraged to apply.

**MINNESOTA STATE UNIVERSITY
MOORHEAD
Mathematics Department
Moorhead, MN 56563**

Tenure-track position at rank of assistant professor to begin August, 2001. A Ph.D. in mathematics or statistics is required. Preference will also be given to candidates with successful college teaching experience and some preference may be given to candidates qualified to teach upper division courses in applied mathematics. Duties include teaching undergraduate mathematics courses, advising students, service to the university, and maintaining an appropriate level of professional activity. The teaching load is twelve hours per semester. Screening of applications will begin January 15, 2001. Applications accepted until filled. Completed applications must include resume, MSUM Standard Application Form, graduate and undergraduate transcripts, and three current letters of reference. Apply to Don Mattson, Chair, Mathematics Department, Minnesota State University Moorhead, Moorhead, MN 56563, (218) 236-2274; fax number: (218) 236-3692; e-mail: mattson@mnstate.edu. Minnesota State University Moorhead is an equal opportunity/affirmative action employer and educator. Women, minorities, and persons with disabilities are encouraged to apply.

NEW HAMPSHIRE

DARTMOUTH COLLEGE

The Department of Mathematics anticipates three tenure-track openings with initial appointment in the 2001-2002 academic year. The first is for an Assistant Professor in the field of geometry. The second is for an Assistant Professor who works in the intersection of topology and analysis (for example, someone who works in topology and global analysis; or in gauge field theory; or in topology, C^* -algebras, and noncommutative geometry). And the third is for an Assistant Professor in applied mathematics. Current areas of applied interests include signal and image processing, informatics, and computational methods. The applied mathematics group enjoys close ties with computer science, cognitive neuroscience, engineering, and the medical school. Of particular interest are candidates who will be able to enhance some of these connections.

Candidates for any 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 pro-

gram 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 responsibility in mathematics is 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 January 5 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 Dwight Lahr, Recruiting Chair.

DARTMOUTH COLLEGE

John Wesley Young Research Instructorship

The John Wesley Young Research Instructorship is a two-year post-doctoral appointment for promising new or recent PhD's whose research interests overlap a department member's. Current departmental interests include areas in algebra, analysis, algebraic geometry, 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 \$42,000 supplemented by summer research stipend of \$9,333 for instructors in residence for two months in summer. Send letter of application, resume, graduate transcript, 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 January 5 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.

KEENE STATE COLLEGE

Mathematics

Assistant Professor

Tenure Track Position

Beginning Fall 2001

Responsibilities: teach the full range of introductory and advanced undergraduate courses in mathematics. All faculty positions include teaching 12 credits per semester, academic advising, curriculum development, committee service, and scholarly activity.

Qualifications: Doctorate in Mathematics, Statistics, or Math Education, evidence of excellence in teaching mathematics at the college level, a strong commitment to teaching, and excellent communication skills are required. Experience with the use of technology in teaching and/or expertise in Statistics are desirable.

Minimum salary for Assistant Professor: \$39,510. Submit a letter of application and include why you are interested in Keene State College, a curriculum vitae, a statement of teaching philosophy, a statement of professional interests, and three letters of reference (at least one of which addresses the candidate's teaching) by January 19, 2001 to, Mathematics Search Committee, Office of Human Resource Management, Keene State College, 229 Main Street, Keene, NH 03435-1604. Keene State College will be represented at the January 2001 AMS/MAA Meetings in New Orleans. Application materials received by January 3, 2001 will be considered in scheduling interviews at the meetings.

Keene State College is a public, liberal arts college of the University System of New Hampshire with an enrollment of 5000 students. The College has been recognized as a leader in American higher education for its commitment to its mission, broad-based strategic planning initiatives, and cohesive sense of community. Located in the southwest corner of New Hampshire, Keene provides traditional New England charm and easy access (2 hrs) to Boston, Hartford, and Albany. To learn more about Keene State College, the University System of New Hampshire, and the Keene Community visit these websites: www.keene.edu/ or www.keenesentinel.com/toplist.shtml

Keene State College is a member of the Council of Public Liberal Arts Colleges, a national alliance of leading liberal arts colleges in the public sector. As an AA/EEO employer, we actively seek women and minority candidates.

NEW JERSEY

ROWAN UNIVERSITY

Tenure-track assistant professor to teach lower and upper division courses in analysis and engineering mathematics beginning September, 2001. The ideal candidate should have a background in numerical analysis and PDEs and will be expected to teach undergraduate and graduate level courses based on active research in these fields. Normal teaching load is twelve hours per semester. All applicants must have an earned doctorate in mathematics, with an interest in undergraduate research and teaching. Submit a letter of application, a curriculum vitae, official transcripts, and three letters of reference that attest to your mathematical qualifications and your teaching abilities. Review of applications will begin January 24, 2001 and proceed until the position is filled. Submit all materials to: Ronald J. Czochor, Chair, Department of Mathematics, Rowan University, Glassboro, NJ 08028. E-mail: Czochor@rowan.edu. Rowan University is an Affirmative/EEO employer. Applications from women and minorities are particularly encouraged.

NEW YORK

SUNY COLLEGE AT BROCKPORT

Department of Mathematics

Assistant Professor Vacancy

Tenure-track assistant professorship in the Department of Mathematics beginning August 2001. Required: Earned doctorate in Mathematics. Demonstrated expertise in Applied Mathematics with concentration in Operations Research and/or Actuarial Science. Evidence of a strong commitment to teaching mathematics at the basic and advanced undergraduate and graduate levels. Expertise in developing mathematics courses which utilize technology extensively. A long-term commitment to scholarship regularly culminating in refereed publications. Ability to work with a diverse population.

Send a letter of application, resume, transcript showing highest degree earned, statement of teaching philosophy and research plans or teaching and research portfolios, and have three letters of reference sent to: Mr. Richard D. Meade, Faculty/Staff Recruitment Office, SUNY College at Brockport, Brockport, New York 14420-2929.

AA/EEO/ADA. Review of applications will begin on December 15, 2000. Applications will continue to be accepted until the position is filled.

SUNY COLLEGE AT BROCKPORT

Department of Mathematics

Assistant Professor

Tenure-track assistant professorship in the Department of Mathematics beginning August 2001. Required: Earned doctorate in Mathematics. Demonstrated expertise in Applied Mathematics with concentration in Numerical Analysis and/or Mathematical Modeling. Evidence of a strong commitment to teaching mathematics at the basic and advanced undergraduate and graduate levels. Expertise in developing mathematics courses which utilize technology extensively. A long-term commitment to scholarship regularly culminating in refereed publications. Ability to work with a diverse population. Send a letter of application, resume, transcript showing highest degree earned, statement of teaching philosophy and research plans, or teaching and research portfolios, and have three letters of reference sent to: Mr. Richard D. Meade, Faculty/Staff Recruitment Office, SUNY College at Brockport, Brockport, New York 14420-2929.

AA/EEO/ADA. Review of applications will begin on December 15, 2000. Applications will continue to be accepted until the position is filled.

SUNY COLLEGE AT BROCKPORT

Department of Mathematics

Assistant Professor Vacancy

Tenure-track assistant professorship in the Department of Mathematics beginning August 2001. Required: Earned doctorate in Mathematics. Demonstrated expertise in Number Theory and/or History of Mathematics. Evidence of a strong commitment to teaching mathematics at the basic and advanced undergraduate and graduate levels. Expertise in developing mathematics courses which utilize technology extensively. A long-term commitment to scholarship regularly culminating in refereed publications. Ability to work with a diverse population.

Send a letter of application, resume, transcript showing highest degree earned, statement of teaching philosophy and research plans, or teaching and research portfolios, and have three letters of reference sent to: Mr. Richard D. Meade, Faculty/Staff Recruitment Office, SUNY College at Brockport, Brockport, New York 14420-2929.

AA/EEO/ADA. Review of applications will begin on December 15, 2000. Applications will continue to be accepted until the position is filled.

SUNY COLLEGE AT BROCKPORT

Department of Mathematics

Assistant Professor Vacancy

Tenure-track assistant professorship in the Department of Mathematics beginning August

2001. Required: Earned doctorate in Mathematics. Demonstrated expertise in Real or Complex Analysis. Evidence of a strong commitment to teaching mathematics at the basic and advanced undergraduate and graduate levels. Expertise in developing mathematics courses which utilize technology extensively. A long-term commitment to scholarship regularly culminating in refereed publications. Ability to work with a diverse population.

Send a letter of application, resume, transcript showing highest degree earned, statement of teaching philosophy and research plans or teaching and research portfolios, and have three letters of reference sent to: Mr. Richard D. Meade, Faculty/Staff Recruitment Office, SUNY College at Brockport, Brockport, New York 14420-2929.

AA/EOE/ADA. Review of applications will begin on December 15, 2000. Applications will continue to be accepted until the position is filled.

THE STATE UNIVERSITY OF NEW YORK AT OSWEGO

Mathematics. The Mathematics Department at the State University of New York at Oswego seeks a statistician for a tenure track position (pending budgetary approval) beginning August 2001. The successful candidate will have a Ph.D. in Statistics and must aspire to excellence in teaching. Preference will be given to those candidates with experience as an applied statistician. Duties include teaching 12 hours of undergraduate statistics and mathematics, advising students and the development and successful completion of consulting and scholarly activities. Review of applications will begin on December 11, 2000 and continue until the position is filled. Send letter, resume, official transcripts, and three letters of recommendation to: Dr. Margaret Groman, Chair; Department of Mathematics; SUNY Oswego; Oswego, NY 13126. SUNY Oswego is an Affirmative Action Employer.

NORTH CAROLINA

NORTH CAROLINA STATE UNIVERSITY Professor and Head Department of Mathematics

The Department of Mathematics, in the College of Physical and Mathematical Sciences at North Carolina State University (NCSU), invites applications and nominations for the position of Professor and Head of the Department. The Department has 66 full time faculty, over 100 graduate students, over 200 undergraduate majors, and a number of visiting faculty and postdoctoral research assistants. With annual

research expenditures in excess of \$2 million, the Department has strong research programs in both pure and applied mathematics and an exceptional record of interdisciplinary collaborations with other departments, government, industry, and other academic institutions such as Duke, the University of North Carolina, and other universities in the greater Triangle area. State-of-the-art computing and communication facilities support strong undergraduate, graduate, and outreach programs, all of which the faculty takes very seriously. Members of the Department provide leadership for the Center for Research in Scientific Computation, an interdisciplinary Center that provides a focal point for research in applied mathematics and computational science and facilitates collaborations with outside departments and institutions. The Department and the Center jointly sponsor an Industrial Applied Mathematics Program that involves graduate students, postdoctoral research associates, faculty, and industrial scientists.

The new Head will have an exceptional opportunity to take a leadership role in new directions for the Department. He or she will be expected to establish high standards for the teaching and research programs of the Department, to have a balanced appreciation for teaching, pure and applied research, and outreach, and to maintain a vigorous program of scholarship and professional activity. The salary and initial package for the successful applicant will be competitive and commensurate with qualifications.

NCSU offers unique opportunities for industrial-academic collaborations on the new Centennial Campus, an over 1000-acre site housing both University and industrial research facilities. The nearby Research Triangle Park is home to numerous industrial research campuses, the National Institute of Environmental Health Sciences, a major Environment Protection Agency complex, the Microelectronics Center of North Carolina, and the NCSU Biotechnology Center. The Triangle area is regularly acclaimed in national publications as a great place to live.

Applicants should send a letter of interest, a curriculum vita, and by arrangement at least three letters of reference to:

Dr. D. E. Aspnes, Chair
Mathematics Head Search Committee
College of Physical and Mathematical Sciences
Box 8201
North Carolina State University
Raleigh, NC 27695-8201

The Department and its many activities are described more fully on its Web site <http://www.math.ncsu.edu>. Questions may be directed to aspnes@unity.ncsu.edu. Review of applica-

tions will begin 01 Dec 2000 and will continue until the position is filled. NCSU is an equal opportunity, affirmative action employer and especially solicits applications from women, underrepresented minorities and persons who are physically challenged.

WARREN WILSON COLLEGE

Full-time Mathematics/Computer Science position beginning August 2001; level of experience open. Ph.D. in Mathematics or related discipline expected but master's degree and computer expertise may substitute. Excellence in teaching and ongoing scholarly involvement required. Warren Wilson College located among the Blue Ridge Mountains ten miles from Asheville enrolls 725 residential students in a unique curriculum of academics, work, and community service. Applications accepted until position is filled. Send cover letter, c.v., graduate transcripts, evidence of teaching excellence, and 3 letters of reference to Dr. Virginia McKinley, VPAA, Warren Wilson College, PO Box 9000, Asheville, NC 28815-9000. See <http://www.warren-wilson.edu> for details.

OHIO

BALDWIN-WALLACE COLLEGE

MATHEMATICS - The Department of Mathematics and Computer Science at Baldwin-Wallace College announces a tenure track position at the Assistant Professor level beginning in August 2001. Principal responsibility will be the teaching of freshman and sophomore mathematics courses at the pre-calculus level or below, although there may be some opportunity for teaching upper division courses as sabbatical replacement. The teaching load is 21-24 semester hours per academic year. Other important responsibilities include undergraduate student advising, service on College committees, continuing professional development, and the willingness to become a part of a departmental team that works together to provide an excellent program for its students.

Qualified candidates will possess a Ph.D. in Mathematics or a Ph.D. in Mathematics Education with master's level work in mathematics. Applicants must also provide evidence of good teaching as well as commitment to teaching at this level.

Baldwin-Wallace is a liberal arts oriented college located in Berea, Ohio, a suburb of Cleveland. See www.bw.edu for more information. The Department and the College seeks to attract an

active, culturally and academically diverse faculty of the highest caliber, skilled in the scholarship of teaching, research, application and integration of knowledge. We are particularly interested in receiving applications from members of underrepresented groups and strongly encourage women and persons of color to apply for the position. We are primarily a teaching College and are looking for applicants with well developed teaching skills.

Please send a letter of application stating teaching experience and research interest, curriculum vita, and three letters of recommendation to Dr. Timothy Riggle, Chair, Department of Mathematics and Computer Science, Baldwin-Wallace College, 275 Eastland Road, Berea, OH 44017-2088. Applications will be reviewed beginning December 15, 2000. On-campus interviews of the most qualified candidates will begin January 15, 2001. Email inquiries may be directed to triggle@bw.edu. I arts oriented college located in Berea, Ohio, a suburb of Cleveland.

BOWLING GREEN STATE UNIVERSITY

Assistant Professor, Mathematics

Bowling Green State University's Firelands College is conducting a search for a tenure-track position, available August 2001, in the Natural and Social Sciences Dept., teaching 12 hours per semester of mathematics courses, in the areas of algebra, trigonometry, statistics, calculus, and related courses. Possess a doctorate in mathematics, mathematic education, or equivalent. Info on BGSU Firelands available at www.firelands.bgsu.edu. Send letter of application, resume/vita, official transcripts of all undergraduate & graduate courses, and at least 3 recent letter of reference to: Office of the Dean, BGSU Firelands College, Attn: Mathematics Search Committee, One University Drive, Huron, OH 44839. Must be postmarked by January 19, 2001. Electronic and fax applications cannot be considered. BGSU is an AA/EO institution.

OTTERBEIN COLLEGE

**Mathematical Sciences Department
Mathematics**

Otterbein College invites applications for a tenure-track, Assistant/Associate Professor position in Mathematics, beginning September 1, 2001. A Ph.D. in Mathematics is required. ABD candidates will be considered if completion of dissertation requirements is imminent. Preference will be given to individuals with prior teaching experience at a variety of levels in the breadth of the field. Strong commitment to quality teaching and to the objectives of liberal arts education is essential. The faculty member will be ex-

pected to teach 35 credit hours per academic year (approximately 7-8 courses, quarter system). These will include courses at all levels of the mathematics program, including entry-level service courses. Send application letter, vita, and three (3) letters of recommendation to: Dr. Patricia A. Frick, Vice President for Academic Affairs, Otterbein College, One Otterbein College, Westerville, 01-1 43081. Deadline: January 15, 2001.

Otterbein College is an equal opportunity, affirmative action employer. Women and minorities are encouraged to apply. (Web page: <http://www.otterbein.edu>).

OREGON

PORTLAND STATE UNIVERSITY

Applications are solicited for a possible postdoctoral position (max 3 years) as an assistant professor in mathematical sciences, starting September 16, 2001. Applicants must have (or complete by September, 2001) a doctoral degree in pure or applied mathematics or statistics, demonstrated excellence in teaching, and evidence of outstanding research potential. Strong consideration will be given to candidates whose research interests most closely complement existing faculty and support a new professionally based Ph.D. program. Postdoctoral duties include teaching one course per term and being an active participant in the initiation of the new Ph.D. program.

Further program information is available on the department's home page, www.mth.pdx.edu. Qualified applicants are invited to submit an application including (1) a letter of intent including AMS application cover page, (2) a curriculum vitae, and (3) three letters of recommendation.

Send materials to:
Search Committee
Department of Mathematical Sciences
Portland State University
P.O. Box 751
Portland, OR 97207-0751

Review of files will begin February 15, 2001 and continue until the position is filled. Portland State University is an Affirmative Action/Equal Opportunity Institution.

Southern Oregon University
Tenure-track Assistant Professor, Southern Oregon University, starting Fall 2001
Application review begins February 15, 2001.

Requirements: Ph. D. in Mathematics, excellent

teaching and communication skills, strong commitment to teaching undergraduate mathematics. Applicants must be well qualified to teach upper division Analysis. See <http://www.sou.edu/math/jopen/> for complete position description. Send vita, statement of teaching philosophy, description of professional goals, brief summary of teaching evaluations, transcripts and 3 letters of recommendation to: Personnel Committee, Department of Mathematics, SOU, Ashland, OR 97520. SOU is an Affirmative Action/ Equal Opportunity Employer.

PENNSYLVANIA

**LA SALLE UNIVERSITY
Department of Mathematics
and Computer Science**

Tenure-track Mathematics Position

La Salle University invites applications for a tenure-track Mathematics position effective Fall, 2001. La Salle is a Roman Catholic institution of higher Education in the tradition of the De La Salle Christian Brothers. The university strives to offer, through effective teaching, quality education founded on the idea that intellectual and spiritual development go hand in hand mutually complementing and fulfilling one another. Candidates should hold the Ph.D. in Mathematics or Applied Mathematics. The duties of this position are those typically associated with a faculty position including teaching twelve hours each semester, undergraduate advising, and committee assignments.

Please submit a curriculum vita and three letters of recommendation (with at least one addressing the applicant's teaching experience) to Linda J. Elliott, Chair, Department of Mathematics and Computer Science, La Salle University, 1900 West Olney Avenue, Box 258, Philadelphia, PA 19141-1199 (elliott@lasalle.edu). Review of applications will begin immediately and continue until the position is filled.

La Salle University is an Equal Opportunity, Affirmative Action employer.

URSINUS COLLEGE

Ursinus College invites applications for a tenure-track Assistant Professor of Mathematics position in the Department of Mathematics and Computer Science to begin Fall 2001. A Ph.D. in mathematics is required by the date of commencement of teaching. All specialties will be considered, but preference will be given to candidates with the ability to teach number theory, graph theory, analysis, or introductory computer

science. The successful candidate will demonstrate interest in and potential for excellence in teaching and research in a liberal arts setting. Responsibilities include teaching (three courses per semester) departmental courses or appropriate interdisciplinary courses, such as freshman seminar, as well as establishment of a research program and supervision of undergraduate research and internships. Ursinus College is a highly selective, nationally ranked, independent, co-educational residential liberal arts college of 1250 students located 25 miles northwest of center-city Philadelphia. Ursinus College is an equal opportunity employer (AA/EOE). In keeping with the college's historic commitment to equality, women and minorities are encouraged to apply. Send letter of application, resume, statement about undergraduate research in mathematics, transcripts and three letters of recommendation to Search Committee co-Chairs, Professor Nancy Hagelgans and Professor Peter Jessup, Department of Mathematics and Computer Science, Ursinus College, Collegeville, PA 19426. Review of applications will begin mid-November, and continue until the position is filled. Preliminary interviews will take place at the Joint Mathematics Meetings in January 2001.

WESTMINSTER COLLEGE

Mathematics

Assistant Professor: Department of Mathematics and Computer Science seeks applications for a tenure-track position in mathematics beginning August 2001. Applicants must possess a Ph.D. for appointment as assistant professor, be committed to excellence in teaching in an undergraduate liberal arts environment, and be prepared to engage in continuing scholarly activity. The Department seeks candidates with broad intellectual interests. Candidates interested in developing new courses in statistics and directing undergraduate research projects are particularly encouraged to apply. Please send letter of application, a curriculum vita, three letters of recommendation, teaching evaluations, and graduate and undergraduate transcripts to Barbara T. Faires, Chair, Department of Mathematics and Computer Science, Westminster College, New Wilmington, PA 16172. (724) 946-7158. Email: mathsearch@westminster.edu. Applicant review will begin December 1. Westminster is an Equal Opportunity Employer.

TENNESSEE

THE UNIVERSITY OF THE SOUTH

Applications are invited for two tenure-track positions in mathematics at the assistant professor or associate professor level to begin in the Fall of the year 2001. The positions require a

Ph.D. in mathematics. Candidates must be committed to both teaching and research in a four-year liberal arts college.

The University of the South, commonly known as Sewanee, is a highly selective church-related (Episcopal) liberal arts college of 1300 students located on a 10,000-acre forested domain in the Tennessee uplands. The student faculty ratio is 10.6 to one and the endowment per student is among the highest in the nation.

The Department of Mathematics and Computer Science offers majors in both mathematics and computer science as well as the respective minors. The department also offers service courses for students majoring in other programs and teaches courses which are part of the core curriculum of the college.

A complete application will include a letter stating one's professional aims and giving reasons for interest in a liberal arts college, a resume, graduate and undergraduate transcripts, and three letters of recommendation. All should be sent to Laurence Alvarez, The University of the South, 735 University Avenue, Sewanee, TN 37383-1000. For more information about the University of the South see our web pages at <http://www.sewanee.edu>. For more information about these positions send email to lavarez@sewanee.edu. Applications received by December 15, 2000 will have first consideration.

The University of the South is an equal-opportunity employer. Women and minorities are encouraged to apply.

UNIVERSITY OF TENNESSEE KNOXVILLE

The Mathematics Department of The University of Tennessee seeks to fill a tenure-track assistant professorship in partial differential equations. A Ph.D. is required. Some postdoctoral experience is preferred but not required. Substantial research promise as well as dedication to teaching are paramount. Employment begins August 1, 2001.

Applicants with research experience in any area of partial differential equations are encouraged to apply, including: dynamical systems, differential geometric problems, curvature-driven flows and applications, variational methods and geometric measure theory, mathematical physics, spectral problems, materials science, inverse problems, and control theory.

Interested applicants should arrange to have a vita, three reference letters, a research statement (including abstracts), and evidence of quality teaching sent to Professor John B. Conway, PDE Search, Mathematics Department, University of

Tennessee, Knoxville, TN 37996-1300. Electronic applications are not acceptable. Use of the AMS application form is appreciated. Review of applications will begin December 1 and will continue until the position is filled. Information about the department can be found at <http://www.math.utk.edu/>.

UTKnoxville is an EEO/AA/TitleVI/TitleIX/Section504/ADA/ADEA institution in the provision of its education and employment programs and services.

TEXAS

ABILENE CHRISTIAN UNIVERSITY

Abilene Christian University invites applications for a tenure-track position in Mathematics available fall 2001. Applicants must have a Ph.D. in mathematics. In addition, the successful candidate will have a commitment to teaching in an undergraduate environment and demonstrated professional development and/or research activities.

Abilene Christian is a private independent university affiliated with the fellowship of the Church of Christ. All full-time faculty members must be active members of a congregation of the Church of Christ.

To apply, send a letter of application, CV, names and addresses of three references including one reference regarding church activity to

Dr. David Hughes, Chair
Department of Mathematics
and Computer Science
ACU Box 28012
Abilene, Texas 79699-8012

Abilene Christian University does not discriminate on the basis of race, color, age, sex, disability, or national or ethnic origin in employment opportunities, in keeping with applicable state and federal laws. Nominations of and applications from women and minorities are especially encouraged. Applications will be accepted until the position is filled. Additional information about the mathematics program can be found at <http://www.csmath.acu.edu/>.

VIRGINIA

ROANOKE COLLEGE

Applications are invited for an entry level tenure track position of Assistant Professor in the department of Math, Computer Science, and Physics beginning August 2001. Ph.D. in Statis-

tics or related areas required. Salary commensurate with qualifications and experience. Excellent teaching emphasized, active scholarship encouraged. Commitment to liberal learning expected. Roanoke College is a private liberal arts college affiliated with the Lutheran church and is located in the Roanoke Valley of Virginia. A completed application consists of a vitae, graduate and undergraduate transcripts, and 3 letters of reference (at least one about teaching). Applications should be sent to Dr. Jane Ingram, Chair of the Search Committee, Roanoke College, 221 College Lane, Salem, VA 24153. Applications completed by January 15, 2001 will receive first consideration. Roanoke College encourages applications from qualified women and minority candidates. An affirmative action, equal opportunity employer.

WASHINGTON

UNIVERSITY OF WASHINGTON

Department of Mathematics

Applications are invited for the position of Director of the Mathematics Study Center. The Math Study Center (MSC) provides group study opportunities and assistance for students in pre-calculus and calculus. The title of the position is Senior Lecturer in Mathematics, and the initial appointment is for a period of three years. Full details about the position are available at <http://www.math.washington.edu/~sheetz/Appts/dmsc.htm>. Priority will be given to applicants whose completed applications are received by February 1, 2001. Applicants are encouraged to apply online at: <https://www.mathjobs.org/>. Applications which are not submitted online should be sent to: Appointments Committee Chair (DMSC), Department of Mathematics, Box 354350, University of Washington, Seattle, WA 98195-4350. The University of Washington is an affirmative action, equal opportunity employer. The University is building a culturally diverse faculty and strongly encourages applications from female and minority applicants.

WEST VIRGINIA

WEST VIRGINIA UNIVERSITY Eberly College of Arts and Sciences Department of Mathematics Faculty positions in the Institute for Math Learning

Applications and nominations are invited for up to four faculty positions starting August 16, 2001, to be part of a new "Institute for Math Learning". The Department of Mathematics seeks mathematicians with excellent teaching skills and strong commitment to extending and developing effective, efficient ways of teaching students

in courses before calculus, generating new initiatives with the K-12 community, aggressively competing for nationally-awarded grants that would support the pedagogical dimension of the Institute, and working toward an Institute that is regarded for its national leadership in innovative and effective math learning models. The Institute will be part of the Department of Mathematics, with its own Director, and with operational governance that will allow tenured and tenure track faculty to be rewarded and recognized for their roles in teaching excellence and in scholarship associated with the goals of the Institute and pedagogy associated with math learning. All applicants should have professional credentials qualifying for a tenure-track appointment at least at the rank of Assistant Professor. One appointment of a dynamic and innovative individual with outstanding leadership abilities may be made at a higher rank with administrative responsibilities as Director of the Institute. A truly outstanding individual will be considered for appointment at the rank of Associate/Full Professor as an Eberly Professor, with benefits accorded to the Eberly Family Distinguished Professors in the Eberly College of Arts and Sciences.

West Virginia University is the Land Grant institution in the State of West Virginia, enrolling 23,500 students. It is a Doctoral/Research University-Extensive in the Carnegie Classification of Institutions of Higher Education, based on the complexity and breadth of the institution's mission. The Department of Mathematics has 24 full-time faculty members and approximately 30 M.S. and Ph.D. students. The Department is housed in newly refurbished facilities which include networked offices and the University's Mathematics Library. The University is located in Morgantown, an award winning small city with a metropolitan population of about 50,000. Morgantown has a large federal research presence, diverse cultural and recreational opportunities, excellent medical facilities, and a favorable location with ready access to the urban areas of Pittsburgh, PA and Washington, D.C.

Applicants should provide a letter of application, a statement of teaching philosophy and any experience and vision you may have related to achieving the goals of the Institute; a vitae; and the names and contact information of five references. Applications and inquiries should be sent to

Sherman D. Riemenschneider
Chair, Department of Mathematics
320 Armstrong Hall
West Virginia University P.O. Box 6310
Morgantown, WV 26506-6310
(sherm@math.wvu.edu)

Priority will be given to applications received by January 15, 2001.

West Virginia University is an Equal Opportunity/Affirmative Action Employer. Minorities, disabled, and women candidates are urged to apply.

WISCONSIN

UNIVERSITY OF WISCONSIN-LA CROSSE

The Mathematics Department at the University of Wisconsin-La Crosse invites applications for one (or more) tenure-track assistant professor position(s), beginning August 26, 2001, contingent upon availability of funding. Responsibilities: Teach both introductory and advanced mathematics or statistics courses (average 12 hours per semester); maintain a productive program of research in mathematics or statistics; contribute to departmental, college and university service activities. Qualifications: Ph.D. in mathematics or statistics (anticipated by August 2001); evidence of successful college/university teaching; experience (or demonstrated potential) in directing undergraduate students on research projects is desirable. Applications from all areas of pure or applied mathematics or statistics are encouraged. Current areas of strength within the department include computational mathematics, graph theory, and applied statistics. Applicants should submit an AMS Cover Sheet, a letter of application, a curriculum vitae, undergraduate and graduate transcripts, and arrange to have three letters of recommendation (at least one commenting on teaching) sent to: Bruce Riley, Mathematics Department, University of Wisconsin-La Crosse, La Crosse, WI 54601. All application materials must be received by January 22, 2001. The department will conduct preliminary interviews at the Mathematical Sciences Employment Center during the Joint Mathematics Meetings in New Orleans, January 10-13, 2001; thus, applicants are encouraged to submit their applications well in advance of the Meetings. UW-La Crosse is an affirmative action/equal opportunity employer.

WYOMING

UNIVERSITY OF WYOMING Department of Mathematics

We invite applications for an Academic Professional Lectureship position to begin August 2001. The position is defined by a probation period followed by extended-term, renewable appointments. Minimum requirements are three years teaching experience with evidence of exceptional dedication and success with students, a strong mathematical background and a graduate degree in mathematics or a complementary area such

as Curriculum and Instruction. A strong commitment to outreach instruction and service is necessary.

Preference will be given to applicants who have experience in the use of technology and innovative curriculum in mathematics instruction. Preference will be given to applicants with a strong commitment to continued scholarly and professional growth. Duties will include instruction, supervision, and staff development for instructors in two of three entry-level service courses in algebra and trigonometry. See our web site (math.uwyo.edu) for a current description of our department and these courses, Math 1400/1405/1450.

Applicants should send a vitae, a statement of teaching philosophy, evidence of outstanding teaching merit, and three letters of recommendation to the APL Search Committee, Department of Mathematics, University of Wyoming, P.O. Box 3036, Laramie, WY 82071-3036. Review of applications begins March 1, 2001.

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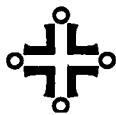
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Application information: IAS/PCMI, Institute for Advanced Study,
Einstein Drive, Princeton, NJ, 08540; 1-800-726-4427;
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Send resume, teaching statement, research summary and plans, and three letters of recommendation (at least one addressing teaching excellence) to:

Dr. Thomas Wangler
Department of Mathematics,
Benedictine University,
5700 College Road,
Lisle, IL 60532-0900

Primary Consideration will be given to applications received before 12/15/00.
EOE

**MAA Section Meetings—
Spring 2001**

ALLEGHANY MOUNTAIN

April 6-7, 2001—Penn State Altoona, Altoona, PA

EASTERN PA & DELAWARE

April 21, 2001—Bloomsburg University,
Bloomsburg, PA

FLORIDA

March 2-3, 2001—Florida Gulf Coast University,
Fort Myers, FL

ILLINOIS

March 22-24, 2001—University of Illinois at
Urbana-Champaign, Urbana, IL

INDIANA

March 23-24, 2001—University of Indianapolis,
Indianapolis, IN

IOWA

April 6-7, 2001—Drake University, Des Moines, IA

KANSAS

March 30-31, 2001—Emporia State University,
Emporia, KS

KENTUCKY

April 6-7, 2001—University of Kentucky,
Lexington, KY

LOUISIANA-MISSISSIPPI

March 23-24, 2001—University of Mississippi,
Oxford, MS

MD-DC-VA

April 20-21, 2001—Virginia Military Institute,
Lexington, VA

METRO NEW YORK

May 5, 2001—Webb Institute, Glen Cove, NY

MICHIGAN

April 27-28, 2001—Hope College, Holland, MI

MISSOURI

April 6-7, 2001—University of Missouri-Rolla,
Rolla, MO

NEBRASKA-SOUTHEAST SOUTH DAKOTA

March 30-31, 2001—Doane College, Crete, NE

NEW JERSEY

April 21, 2001—Rowan University, Glassboro, NJ

NORTH CENTRAL

April 2001—Gustavus Adolphus College, St. Peter,
MN

NORTHEASTERN

June 8-9 OR June 15-16, 2001—Norwich
University, Norwich, VT

NORTHERN CALIFORNIA

March 3, 2001—Santa Clara University, Santa
Clara, CA

OHIO

March 23-24, 2001—Bowling Green State
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Lincoln, NE 68588-0323

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OKLAHOMA-ARKANSAS

March 30-31, 2001—Oklahoma Christian
University, Oklahoma City, OK

PACIFIC NORTHWEST

April 7, 2001—Seattle Pacific University, Seattle,
WA

ROCKY MOUNTAIN

April, 20-21, 2001—Western State College,
Gunnison, CO

SOUTHEASTERN

March 30-31, 2001—Huntingdon College,
Montgomery, AL

SOUTHERN CALIFORNIA

March 17, 2001—California State University,

Fullerton, CA

SOUTHWESTERN

April 6-7, 2001—New Mexico State University, Las
Cruces, NM

SEAWAY

April 6-7, 2001—SUNY at Binghamton,
Binghamton, NY

TEXAS

March 29-31, 2001—University of Houston-Clear
Lake, Houston, TX

WISCONSIN

April 20-21, 2001—St. Norbert College, De Pere,
WI

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- JOSEPH ADDISON

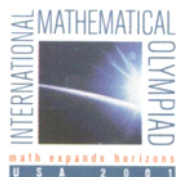


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