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Letters to the editor should be addressed to Fernando Gouvêa, Colby College, Dept. of Mathematics, Waterville, ME 04901, or by email to fqgouvea@colby.edu.

Subscription and membership questions should be directed to the MAA Customer Service Center, 800-331-1622; e-mail: maahq@maa.org; (301) 617-7800 (outside U.S. and Canada); fax: (301) 206-9789.



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# FOCUS

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## AAAS Meeting to Offer Strong Mathematics Program

By Warren Page

The 2003 AnnuaI Meeting of the American Association for the Advancement of Science, February 13–18, in Denver, CO, will feature many outstanding expository talks by prominent mathematicians. These include the following three-hour symposia sponsored by Section A (Mathematics) of the AAAS.

Predictability and Randomness in Weather Forecasting, organized by Cecile Penland, Prashant Sardeshmukh, and Matthew Newman, NOAA-CIRES/Climate Diagnostics Center.

Math Inside!… An Industrial View, organized by Brenda Dietrich, IBM: Research and Fadil Santosa, University of Minnesota.

Game Theoretic Aspects of Internet Computation, organized by Joan Feigenbaum, Yale University.

Mathematical Models for Traffic Flow: Phantom Jams and Real Data, organized by Paul Nelson, Texas A & M University.

Opening the Mind with Mathematics, organized by Carson C. Chow, University of Pittsburgh.

Modeling the Internet and the World Wide Web, organized by Jennifer Tour Chayes and Christian Borgs, Microsoft Research

Other symposia that will be of interest to the mathematical community include: Challenges in the Statistical Analysis of Genome Data, Science and Mathematics Education of American Indians and Alaskan Natives, Face and 0bject Recognition in Man, Monkey, and Machine, The Physics of Extra Dimension, and Security for Life: The Science Behind Security Technologies.

The above symposia are only a few of the 150 or so AAAS program offerings in the physical, life, social and biological sciences. For further details about the 2003 AAAS program, see the November 1st, 2002, issue of Science.

The AAAS annual meetings are showcases of American science. AAAS encourages participation by math-ematicians and mathematics educators. In representing mathematics-related themes to the AAAS Program Committee, I have found the committee to be genuinely interested in offering symposia on mathematical topics of current interest. Thus, the Section A Committee seeks organizers and speakers who can present substantial new material in an accessible manner to a large scientific audience. I invite you to attend the Section A Committee business meeting at 7:45–10:45 p.m. on Friday, February 14th, 2003 in the Molly Brown Room of the Marriott. I also invite you to send me and to encourage your colleagues to send me symposia proposals for future AAAS annual meetings.

Warren Page (wxpny@aol.com) is Secretary of Section A of the AAAS.

## Reviews Wanted!

How do you search for the right textbook for your course? Do you just look at the books that publishers' representatives bring around? Do you wander around to each publisher's booth at the Joint Meetings? Do you type in "abstract algebra texts" at amazon.com? Do you wish there were an easy way to find out whether particular texts would be appropriate for your students? The MAA wants to help you.

We now have online a Catalog of Commercial Materials as part of MathDL, the Mathematics Digital Library. You can access the Catalog through a link from MAA Online or go to it directly at http://www.mathdl.org/lcp.html. There you will find a listing of most textbooks available for any given course. Each textbook has a link to the publisher's home page, where you will find a description (written by the publisher's PR department) and where you can order an examination copy.

Unfortunately, although there is also a link to "user reviews," reviews are not yet available for most books posted. So to make this Catalog useful to all of us, we need your help in writing reviews. If you have taught from any of the books listed in the Catalog in the past few years – or are teaching from one of them this semester – please consider writing a brief review using the form that can be found on pages 23-24 of this issue of FOCUS. The form is also available online; see http://www.maa.org/news/reviews_wanted.html. Tell everyone the strengths and weaknesses of the book, the responses of your students, and whether you plan to use the book again. We will then post the review online so that others can access it. Even if your textbook is not listed in the Catalog, you can still write a review. In that case, we can add the book to the Catalog and try to get a link to the publisher. With your help, this Catalog of Commercial Materials will become a valuable resource for all of us and will help us immensely in choosing a book that meets our students' needs.

# Catch the Buzz: Staging an Integration Bee

By Jonathan Rubin

To generate excitement about mathematics at the University of Pittsburgh, we decided to stage an Integration Bee. On March 22, 2001, the First Annual University of Pittsburgh Integration Bee took place. Over 100 students, faculty, and family members gathered to cheer on 30 Pitt undergraduate participants in a suspenseful and competitive display of integration talent and skill under pressure. On March 21, 2002, the Second Pitt Integration Bee met with similar success, despite snowy Pittsburgh streets and competition from a surprise Pitt NCAA men's basketball tournament appearance that night.

The Integration Bee has raised the profile of mathematics on campus and has given a range of Pitt undergraduates, from freshman calculus students to senior mathematics majors, a much-appreciated opportunity to showcase, and be cheered for, some of their mathematical abilities. An integration bee is a fun, exciting event that could be staged by groups on any campus; as one example, the University of South Carolina Math Honor Club held a successful integration bee based on our model, last spring. In this article, I describe the logistics of the Pitt Integration Bee, as one example of the form a successful integration bee can take.

The idea for the Pitt Integration Bee derived from the Integration Bee held between semesters at MIT; a similar event has also been held at the University of North Texas. After Carson Chow, a mathematics faculty member, staged a successful trial in his Honors Calculus class, Chow recruited fellow mathematics faculty Jonathan Rubin and Bill Troy to join him in preparing for a campus-wide version.

Pitt's spring semester starts in early January. We decided to schedule the Integration Bee for late March, late enough in the academic year that the first-year calculus sequence would have finished its treatment of integration techniques, but still well separated from final exams. We were quite pleased, however, that the Pitt Honors College enthusiastically provided $500 in support, which turns out to be more than is needed to stage an integration bee without skimping. We decided to devote $200 to bookstore gift certificates, as prizes for winners.

In parallel to our minor fundraising efforts, we planned the format of the integration bee, scaled up to be held in an auditorium for what we hoped would be a large group. We set a date and then reserved a room; we set the event time at 8 PM, based partially on the availability of the room that we wanted and partially on the schedule of evening math classes at Pitt. We arranged for catering and notified campus security, as required for large campus events. For the format we envisioned, we reserved a variety of equipment items that our campus has available as teaching resources. These included microphones and a ProfCam (see below). We made sure to test out the equipment ahead of time!

We recruited as many graduate students and staff members as we could get our hands on to help out in the staging of the event. In the bee's second year, we began recruitment efforts earlier and put students to work. We had students pick up refreshments and door prizes, which we awarded in drawings to audience members, each of whom was handed a prize ticket upon arrival. Additionally, students helped in a variety of promotional roles.

In terms of promotion, we felt it would be crucial to the success of our integration bee to get the word out to as many people as possible, as many times as possible. We used electronic mailing lists to inform all Pitt math majors, faculty members and adjunct instructors, staff members, and graduate students about the event. We strongly encouraged everyone having any contact with undergrads, particularly instructors in their math classes, to spread the message that the Integration Bee was coming, to emphasize that it would be fun and exciting, and to encourage people to sign up as participants or to plan to attend in the audience. Every time I saw an undergrad student in the halls of our building, I asked if the student had signed up for the Integration Bee yet, and I mentioned it almost daily in my Calculus II class. (For an initial staging of an Integration Bee, having an organizer who teaches Calc II may be helpful; a little bit of extra credit can go a long way towards boosting turnout.) We made sure that the date was set early and that sign-up information for potential participants was clearly distributed. We also made sure that students knew that cash prizes would be given to winners; however, we did not advertise the amount of these prizes ahead of time, and anecdotal evidence suggests that the high sign-up rate we achieved related more to en-thusiasm about an actual math competition than excitement over prize money. Other important publicity efforts included setting up a website, with rules laid out, posting fliers clearly displaying relevant information (see http://www.math.pitt.edu/~rubin), and contacting campus and city media.

We have been quite pleased with how the two Pitt Integration Bees have run. In the format we designed, the first two rounds are single elimination. In later "lightning rounds," everyone races to solve the same problem. To start each of the elimination rounds, one participant comes forward to attempt to evaluate an integral within a two-minute time limit, similar to a traditional spelling bee. If the participant evaluates an integral correctly, then the next participant is assigned a new integral. Otherwise, the next participant has one minute to attack the same integral. Upon a second failure, the troublesome integral passes on to a third participant, with thirty seconds allotted. Three strikes on one integral, and the subsequent participant gets a new integral and a full two minutes. The job of the timekeeper, filled by a graduate student, is an important one! The inactive participants are given paper on which to work each assigned integral if they wish, to help them all keep their brains active (and nerves down) and to allow a head-start to the participants near the front of the line in case the "active" integral is passed along to them.

Participant order is set randomly before the start of the competition. The integrals themselves, which we compiled over about two months (but mostly during a focused couple of days), are divided into relatively easy first-round problems, intermediate second round problems, and harder problems. We made sure that all integrals could be evaluated using what have been traditionally considered as Calculus II methods. No path integrals, multivariable integrals, or complex integrals were included, for example. However, we did include integrals requiring such methods as partial fractions and trigonometric substitutions, which may no longer be emphasized in many Calc II classes. Here we took our lead from spelling bees, which certainly are not restricted to words that are commonly used! Examples of first round integrands are

$$\frac{x+1}{x},\ \frac{x}{x+1},\ \cos x\left(1+\sin^2 x\right),\ \frac{e^x}{\sin\left(e^x\right)}.$$

Second round integrals have included

$$e^{x+e^x},\ \ln\left(x^x\right),\ \frac{\cos^2\left(\sqrt{x}\right)}{\sqrt{x}},\ \frac{2x^2}{x^2+1}.$$

The lightning round last year featured

$$\frac{\sqrt{x}}{1+x^3} \text{ and } \frac{x^2}{(x+1)^3}.$$

The audience appreciates "trick" problems, such as the indefinite integral of $\cos^2 x + \sin^2 x$ or the integral of $e^{x^2} \sin x$ from $-\pi$ to . Complete lists of integrals used in past University of North Texas Integration Bees are available online at http://www.math.unt.edu/IntegrationBee/IntegrationBee.html.

We used a ProfCam, a chalkboard, and a supply of pens and papers to keep the audience involved in the action. A ProfCam projects an image, taken from a platform that sits on a desktop, onto a projection screen. Participants are required to work on their integrals on paper on top of the ProfCam platform. The effectiveness of the ProfCam projection has been varied—some students accidentally obscure their writing with their hands or move their papers out of view—but audience reaction to it has been positive. A nice idea from the University of South Carolina is to project correct answers on ProfCam, after students fail to evaluate a given integral correctly. The chalkboard is used simply to display, in large, clear writing, the integral being considered by the active participant. Audience members use the pens and paper to attempt integrals themselves, an option that has been appreciatively received.

Spectators' attempts to evaluate integrals were in most cases done for their own amusement. However, in some cases these efforts entered into the competition. Each participant was allowed to use one "lifeline" in the bee, either in the first or the second round; this idea may be familiar from the television show, "Who Wants to be a Millionaire." The lifelines could be anyone not on the organizing committee, including faculty members. During a lifeline consultation, a participant's time countdown was suspended. The lifeline came up to join the participant and was given 20 seconds to convey, on microphone, any information desired to the participant. The participant was not allowed to write during this consultation. Interestingly, despite being told about the lifeline provision ahead of time, many participants spontaneously selected lifelines from the audience, which made for some surprisingly suspenseful moments. For future competitions, we may decide to prohibit lifelines from directly stating answers; we are still tinkering with this issue.

In designing our integrals, we aimed for about half of the participants to make it through the first two rounds successfully. Customized certificates of participation were awarded to all participants. We decided to cap participation at 30 undergraduates the first year, to try to finish in two hours. Of these, 12 made it through single elimination to the third round. The second year, we held participation down to 25 to aim for a slightly faster finish.

All subsequent rounds were lightning rounds, which quickened the pace of the competition. The basic idea of a lightning round is that all remaining participants compete head-to-head on the same integral, with the first n correct answers leading to promotion to the next round, for some specified n. We had to improvise here, as far as actual numbers, depending on how hard the integrals turned out to be for the students. We also imposed time limits; in one case, an integral was thrown out, when no correct evaluations were completed in the allotted time. Both years, every student who made it to the fourth round ended up with a monetary prize, with the student evaluating the fourth round integral fastest winning the competition and earning the coveted title of Integration Champ.

Acknowledgments: I thank Carson Chow for conceiving of having an integration bee at Pitt, and I appreciate feedback on this article from Carson and from Ellen Rubin. I also thank all of the members of the University of Pittsburgh community who have helped to make this event a success.

Jonathan Rubin is Assistant Professor of Mathematics at the University of Pittsburgh. His research interests are in dynamical systems and computational neuroscience.

# Curriculum Foundations Workshop in Engineering

By David Bigio and Susan L. Ganter

The MAA Committee on Curriculum Renewal Across the First Two Years (CRAFTY) is conducting the Curriculum Foundations (CF) Project, a major analysis of the first two years of the undergraduate mathematics curriculum. The goal of the project is to develop a curriculum document that will assist college mathematics departments as they plan their programs for the next decade. Much of the information for this curriculum document was gathered between Fall 1999 and Spring 2001 through a series of invitational disciplinary workshops, funded and hosted by a wide variety of institutions. This article, focusing on engineering, is part of a series of reports from these disciplinary workshops.

**Format of the Curriculum Foundations Workshops**

Each CF workshop focused on a particular partner discipline or on a group of related disciplines, the objective being a clear, concise statement of what students in that area need to learn in their first two years of college mathematics. The workshops were not intended to be dialogues between mathematics and the partner disciplines, but rather a dialogue among representatives of the discipline under consideration, with math-ematicians present only to listen to the discussions and to provide clarification on questions about the mathematics curriculum. For this reason, almost all of the individuals invited to participate in each workshop were from the partner disciplines.

The major product of each workshop is a report or group of reports summarizing the recommendations and conclusions of the workshop. These were written by the representatives from the partner disciplines and address a series of questions formulated by CRAFTY. The reports from each workshop have been widely circulated within the specific disciplines as well as the mathematics community in order to solicit a broad range of comments. A curriculum conference that included invitees from all disciplines was convened in November 2001 to synthesize the workshop findings.

**The MAA Engineering Workshop at Clemson University**

One of the MAA Curriculum Foundations workshops was sponsored and hosted by Clemson University on May 4-7, 2000. This workshop focused on the needs of engineering from the first two years of college mathematics instruction. The workshop had thirty-eight invited participants, with roughly equal representation from each of four areas in engineering (chemical, civil, electrical, mechanical) and mathematics. The workshop resulted in four documents, one for each of the four engineering areas, addressing the MAA questions specified at the outset of the workshop.

This report focuses on the aggregate recommendations of the four groups at the engineering workshop. It is not intended to be a definitive document, but rather a working paper that generates discussion among mathematicians and engineers in order to provide additional feedback for the mathematics community. Therefore, the authors welcome comments and additional ideas.

**Desired Student Outcomes**

Before identifying any guiding principles for the mathematics curriculum, the workshop participants developed a list of general learning outcomes that should be achieved by all engineering students. Specifically, the workshop participants want students to be able to:

- learn in context
- conceptualize
- set up equations
- think about and solve problems
- use logic to reason through problem situations
- translate mathematical results
- work with both the language of mathematics and the language of engineering, transferring readily between the two in any given problem
- use mathematical models to assist in solving problems, and
- manipulate complex equations.

Engineering students need to understand the physics of a wide variety of problems and how mathematical equations can be used to describe the physics. Then, they need to solve these problems using the appropriate tools, understand the solution, and interpret the results.

**Content and Timing**

The issue of content is a complex one across the engineering disciplines. In general, the study of engineering can be divided into three areas:

1. Statics, including large scale stresses and integration principle directions;
2. Dynamics, or a phenomenon in time; and,
3. Non-deterministic problems; i.e., those utilizing statistics and probability.

Discussions at the engineering workshop made it clear that each of these areas requires different mathematical concepts at different times in the learning curve. And since mathematics is the language of engineering, then as with any "foreign" language, students that learn mathematics years before their current engineering class may no longer be facile with the language. So, the workshop participants believe it is critical to integrate mathematics with applications in specific engineering disciplines. This "just-in-time" approach requires co-ordination between mathematics and engineering departments, perhaps resulting in a reconfiguration of the current collegiate mathematics curriculum for the first two years.

In engineering disciplines, problem solving requires the ability to understand a physical problem, place it in a mathematical context, solve the necessary equations, and interpret the results. Particularly in the first two years, students are more comfortable and adept at using sample problems to understand concepts. However, a full understanding of the problem solving process requires students to move through Bloom's Taxonomy from mechanics to con-ceptualization to integration. This learning process can be solidified by extending the required mathematics courses for engineers into the third year, so that the material can be coordinated with major engineering courses.

**Instructional Techniques**

Instruction should be done in the context of physical concepts, not as isolated theoretical exercises. Students with mathematical training that focuses on symbolic techniques have great difficulty moving to more complex engineering problems. These students generally are too dependent on methodology and are unable to conceptualize based on broad principles.

Active learning is an important method for helping students to learn about open-ended problems. It also prepares them for real problems they will encounter in their future engineering careers.

**Team Work and Interdisciplinary Collaboration**

Educational reform in engineering—being driven in large part by ABET2000, the new standards of the Accreditation Board for Engineering and Tech-nology—supports the use of active learning, problem-based experiences, and team work. This has led to the use of problems that are open ended in engineering courses. The paradigms for teaching in engineering are evolving to include more varied methods, and to address a wide variety of student learning styles. If mathematics is taught in a way that does not support these new methodologies, it will not be effective in preparing students for engineering courses. Interdisciplinary team teaching can be used to promote the integration of mathematics and engineering content. Student teams also can help instructional effectiveness.

To accomplish these objectives, the workshop participants propose that mathematics departments consider developing small projects within mathematics courses that require team work and active learning so that the students have more opportunities to learn fundamental mathematics principles, beyond simple examples. One such project could utilize ordinary differential equations, moving from simple to complex mathematical situations. Projects also could cut across multiple engineering areas to further develop connections between disciplines.

**Summary**

The engineering workshop of the Curriculum Foundations Project certainly raised more questions than the answers it produced. For example, is it better pedagogically to teach mathematics to engineers as a homogeneous group, or together with non-engineering students? There was general consensus among the workshop participants that the mathematics community should look closely at the heterogeneous approach to the first two years—as well as other established traditions of the current course organization.

But one thing is clear: regardless of what new teaching methods are utilized, the needs of students and their learning processes are different than even just ten years ago. Students will work in a complex technological world and interface with problems from many disciplines. They need to understand how to use fundamental concepts in a variety of settings—and to appropriately integrate calculators, computers, and other technologies when solving physical problems.

Although this report is very general, the engineering workshop participants have provided more specificity and detail about specific mathematics topics in the full workshop reports (see http://academic.bowdoin.edu/faculty/B/barker/dissemination/Curriculum_Foundations; there are four reports from this workshop, covering Civil, Chemical, Mechanical, and Electrical Engineering). The basic mathematical foundations presented in the reports are mostly the same as a decade ago, but the methods for helping students learn the ideas promoted by the reports implies the need for a pedagogical transformation that is critical to the training of engineers for the future.

David Bigio is a member of the Mechanical Engineering Department at the University of Maryland. Susan L. Ganter is in the Department of Mathematical Sciences at Clemson University.

This issue includes two articles on Curriculum Foundations, a project of CRAFTY, the MAA Committee on Curriculum Renewal Across the First Two Years. Earlier articles have described the project as a whole (November 2000), the workshop on the mathematics courses needed by physics students (March 2001), computer science students (May/June 2002), chemistry students (September 2002), students engaged in interdisciplinary programs (September 2002), students in the Life and Health Sciences (November 2002), and students in technical programs in two-year colleges (November 2002). All of these reports can also be found on MAA Online, at http://www.maa.org/features/currfound.html. Future articles will focus on other client disciplines. CRAFTY is a subcommittee of CUPM, the Committee on the Undergraduate Program in Mathematics, which is undertaking a review of the whole undergraduate curriculum.

# The Curriculum Foundations Workshop in

By Tom Moore, Roxy Peck, and Allan Rossman

Readers of FOCUS are well aware of the pedagogical reform that has impacted collegiate mathematics in the past 15 years, especially in calculus. These same readers may be less aware of a similar reform in statistics education, which by and large, the statistics community has embraced. Richard Scheaffer, the past president of the American Statistical Association (ASA), said in 1997, "With regard to the content of an introductory statistics course, statisticians are in closer agreement today than at any previous time in my career." (Moore, D. S. and discussants, "New Pedagogy and New Content: The Case of Statistics," International Statistical Review, 65 (1997), page 156.)

In a seminal 1992 article ("Teaching Statistics," in Heeding the Call for Change: Suggestions for Curricular Action, Lynn A. Steen, ed., MAA Notes #22, The Mathematical Association of America, pages 3-43), George Cobb articulated the principles of statistics reform pedagogy that are so much in evidence today:

- "More data and concepts, fewer derivations and recipes; automate calculations using a modern statistical package."
- "Emphasize statistical thinking: the omnipresence of variability and the importance of data production."
- "Foster active learning: student projects, group work, activities, writing, oral presentations."

A recent article (Garfield, J., Hogg, B., Schau, C., and Whittinghill, D. "First Courses in Statistical Science: The Status of Educational Reform Efforts," Journal of Statistics Education, Volume 10, Number 2, (2002), online at http://www.amstat.org/publications/jse/v10n2/garfield.html) surveys the extent to which these recommendations have been implemented.

On October 12-15, 2000, 22 statisticians and 5 mathematicians met for a Curriculum Foundations (CRAFTY) Workshop at Grinnell College. The group included statisticians from academia, business, and government and from two- and four-year colleges and universities.

The workshop considered two sets of questions. The first—considered by all CRAFTY workshops—asked what aspects of the undergraduate math-ematics curriculum are of most value to statistics. The second set came from our belief that statistics—is unique as a partner discipline in that—statistics is a part of the mathematical sciences and should be represented within the curriculum of a mathematics department. Indeed, at many institutions, statistics resides within the mathematics department. So we asked, what is the role of statistics in the mathematics curriculum?

The workshop participants achieved consensus on all issues considered, of which we give here some highlights. The full report can be found at: http://academic.bowdoin.edu/faculty/B/barker/dissemination/Curriculum_Foundations/.

### What do statisticians need from mathematics?

The two highest priority needs of statistics from the mathematics curriculum are to:

(1) Develop skills and habits of mind for problem solving and for generalization. Such development toward independent learning is deemed more important than coverage of any specific content area.

(2) Focus on conceptual understanding of key ideas of calculus and linear algebra, including function, derivative, integral, approximation, and transformation.

Given our principles of good statistics pedagogy, it seems fitting that we would not make strict content demands of the mathematics curriculum. We were much more concerned with conceptual understanding and with the experiences students had in mathematics courses. For example, courses that include some real, applied examples help students learn to draw connections between the language of mathematics and the context of an application, a skill that is invaluable for statistical work and that is better learned incrementally than through a single statistics course. But, including such examples may mean covering fewer topics. Similarly, statisticians routinely turn to technology to explore properties of proposed statistical procedures and so we recommend that early mathematics courses give students experiences in using technology to explore.

### What can statistics contribute to the mathematics curriculum?

Here we considered the role of statistics in both the mathematics major and in general education. Regarding general education, we urge mathematics departments to consider that students who take only one college course in quantitative reasoning may be better served by a modern course on introductory statistics than by a traditional college algebra or pre-calculus course.

For the mathematics major, we dusted off an old recommendation from the 1991 CUPM Report, which said: "Every mathematical sciences major should include at least one semester of study of probability and statistics at a level which uses a calculus prerequisite."… The major focus of this course should be on data and on the skills and mathematical tools motivated by problems of collecting and analyzing data…. any statistics course taught now should use a nationally available software package."

Even though this recommendation has been almost universally ignored, our workshop re-affirmed it. We felt there were even more compelling reasons for the recommendation today than there were 10 years ago: (1) Data analysis plays a crucial role in many aspects of academic, professional, and personal life. (2) The job market for mathematics majors is largely in fields (e.g., business) that use data. (3) Future teachers will need knowledge of statistics and data analysis to be current with the new NCTM Standards and with the new and highly popular AP Statistics course. (4) The study of statistics provides an opportunity for students to gain frequent experience with the interplay between abstraction and context that we regard as critical for all mathematical sciences students.

We agreed with the 1991 recommendation's emphasis on real data. A first statistics course for majors should adhere to the principles of good statistics pedagogy in order to show students the essence of statistics. We felt strongly, however, that we need not mandate a calculus prerequisite. Those principles leave room for a variety of first statistics courses and in the full report we describe several innovative courses from around the country that differ greatly in their focuses: a time series course, a course that applies statistics to archeology, a course in Bayesian analysis, and a course in experimental design, among others. In other words, just as we argued for development of conceptual under-standing and habits of mind with mathematics courses, we similarly do not believe in prescribing specific content for this statistics course. We hope that relaxing the calculus prerequisite and providing curricular models will enable more institutions to implement this important recommendation. We also trust that this is one way in which statistics and mathematics can cooperate to their mutual benefit.

Tom Moore is in the Dept. of Mathematics and Computer Science at Grinnell College. Roxy Peck and Allan Rossman are in the Dept. of Statistics at California Polytechnic State University at San Luis Obispo. Together they organized the CF Workshop in Statistics at Grinnell College.

**What does statistics need from mathematics?** Students with the habits of mind and skills to solve problems, generalize, and model. We are less concerned with specific content coverage.

**What can statistics do for mathematics?** Develop data-driven courses of two kinds: (1) Those that fulfill the general education requirements of the non-major, and (2) Those that fulfill the statistics requirement that we see as vital for all undergraduate majors in our data-intensive world.

# Proposal Reviews at the National Science Foundation

By Kevin Charlwood

In July, I had the opportunity to participate on an NSF review panel for proposals designed to improve one or more aspects of undergraduate science, technology, engineering, and mathematics education. It all took four days, including travel to and from Arlington, VA. As it was my first such experience, I was very curious to see how the review process worked, and to get a first-hand look at what qualities separate those proposals that get funded from those that do not.

There were about 300 total reviewers for proposals from across the sciences–biology, chemistry, engineering and mathematics. In the mathematical sciences, reviewers were placed on five different panels: teacher education; developmental and precalculus mathematics; lower division courses (calculus, linear algebra, differential equations); upper-division courses, and one for large, national dissemination models. The panel of eight reviewers on which I served was responsible for 13 proposals.

The first meeting gathered all reviewers with NSF staff to introduce us to the review process. The second was a meeting of reviewers from individual disciplines with NSF program directors in that discipline. Next, individual panels met to set meeting times for the next day and to decide which proposals reviewers would discuss in detail. Once the preliminaries were determined, it was time to read proposals and rate them individually. We did this for two full days, then on the fourth day we double-checked our entries on the NSF system. We left our copies of proposals and notes behind for later destruction.

Across the sciences, 580 proposals were received by NSF, 35 of which were for "national dissemination" funding and the rest of which were two-year""proof-of-concept" proposals designed to do preliminary studies. The former tended to be three years in length, and requests for funds approached $500,000. The latter proposals sought funds averaging between $25,000 and $50,000 per year. Of the 35 national dissemination proposals, five were to be funded. Only about $20 million in funding was to be awarded out of roughly $108 million requested.

The rating system works as follows: Excellent–should receive top priority for funding; Very Good–strong proposal in most respects, deserving of funding if at all possible; Good—worthy of support; Fair—proposal is lacking in one or more areas; Poor–seriously deficient. Our panel was set up for us to give individual ratings to each proposal, but not a panel rating. As we read each proposal, we noted the project's "intellectual merits" and""broader impacts" and wrote individual summaries to share at our panel meeting. Each proposal also had one panelist assigned to serve as "scribe", who took complete notes on the panel's discussion and entered the panel's summary into the NSF system for later review, along with their own personal summary and rating.

Each proposal contained some initial pages with the name(s) of PI(s), a one-page proposal summary, 15 pages of project description, a budget along with justification, PI(s) qualifications for the study, and references to related work. For me, the one-page summary was of vital importance—the overall essence and scope of the project needed to be clear up front. With a high volume of proposals to read and limited time to digest each one, it is incumbent on the proposal's writers to get the critical details across coherently and succinctly. The 15-page description needed sufficient detail about the project's goals and objectives for me to develop a feel for how strong an impact the project would have. Concrete examples of learning modules, abbreviated sample text materials, etc., were helpful, as were web links to computer-based learning materials to be incorporated in the study.

According to the panel discussions we had for each proposal, the 15-page project description was the make-or-break for most panelists. The budget was important, but only caused concern if costs appeared high. There were proposals where one or more of the PIs' backgrounds did not appear to be a good fit for the project, in terms of prior grant work, publications, and related activities. In this case, it seems wise for PIs to explain that their proposed project will take them in a new direction, rather than leaving the panel to wonder why exactly they are applying for funding in the first place. In one instance, it appeared that a PI was planning a project at someone else's behest, and that caught the eyes of several panelists.

For those seriously thinking about committing to writing a grant proposal, it is important to research other similar projects. Laying out specifics of how your work will forge a new path, together with statements showing how your work will be distinct when compared with similar projects will not only help the reviewing panel to understand the nature and scope of your proposal, but higher ratings should result. Two proposals that we read contained lengthy details about prior successful grant work; several panelists viewed parts of that as superfluous. Succinctness is crucial, so as not to eat up too much of the allotted 15 pages discussing past work instead of carefully detailing the new project. Since obtaining funding is so difficult, first-time applicants should be prepared for rejection and to read reviewer's comments to help them rewrite and resubmit their proposals to a future call.

The entire experience was extremely worthwhile. Although there is no current plan to obtain external funding in my department for a project, knowing how the review process works will be invaluable to us if and when the need arises. The NSF is always looking for new reviewers; if you are interested in reviewing proposals for DUE please visit: http://www.nsf.gov/pubsys/ods/getpub.cfm?form428a. Another useful link is http://www.ehr.nsf.gov/ehr/due/programs/general/advice.asp.

Kevin Charlwood is assistant professor in the Department of Mathematics and Statistics at Washburn University in Topeka, Kansas.

# NSF Beat: Centers for Learning and Teaching

By Sharon Cutler Ross

The infrastructure of mathematics education, like that of the nation, is aging and requires attention and support. Action is being taken in many venues to deal with the shortage of classroom teachers, both K-12 and collegiate, but another piece of the enterprise also needs replenishment—the leadership cadre. This group includes not only teachers and instructors, but also curriculum and materials developers, education researchers, supervisors and co-ordinators, teachers of education and discipline courses, and leaders of professional associations. It will not be enough to put bodies in front of the classroom; well-prepared teachers with a new vision of possible career paths in education are a critical need. And those who prepare these teachers are a key component of the infrastructure. Another key is research into what a well-prepared and effective teacher is.

The Centers for Learning and Teaching program (CLT) of the NSF is a substantial commitment by the Foundation to improve the infrastructure of mathematics education. The specific goals of the program are (1) the increased number of well prepared K-12 teachers in mathematics and science through pre- and in-service activities; (2) the replenishment of the leadership cadre in mathematics and science education, especially at the doctoral level; and (3) augmented opportunities for research into teaching and learning. Proposals for the CLT program must integrate these goals by making connections among graduate programs in mathematics and science education, mathematics and science departments, and school systems.

The NSF is seeking to fund centers with non-overlapping areas of focus that will together cover the spectrum of needs related to reinvigorating the mathematics and science education infrastructure. All projects must be collaborative efforts of institutions and groups involved in the professional development of mathematics or science teachers. Proposals may request up to $2 million a year for five years. The Foundation's current budget request contains increased funding for CLT.

At present there are ten CLT funded projects including four in mathematics education and one in mathematics and science. The Mid-Atlantic Center for Mathematics Teaching and Learning (University of Maryland College Park, lead institution) began in fall, 2000, with the first round of grants. Its major activities are the design, implementation, and evaluation of a specialist degree program utilizing the strengths of the partner institutions, and the development, evaluation, and dis-semination of models for the mathematics education of pre-service and in-service K-12 teachers.

In the second year of the CLT program, three mathematics-related projects were funded: the CLT in the West (Montana State University); Appalachian Collaborative Center in Learning, Assessment, and Instruction in Mathematics, ACCLAIM, (University of Tennessee Knoxville), and Diversity in Mathematics Education CLT, DiME-CLT (University of Wisconsin Madison). CLT-West addresses issues related to the mathematics education of under-represented students, in particular those in inner city or rural schools.

By increasing the number of qualified mathematics and science teachers and improving support for teachers in low-income, high-minority schools, the project aims to build an infrastructure that is likely to be institutionalized in the three states involved. In a different cultural setting, ACCLAIM also focuses on rural education with commitments to increase both capacity and expertise through advanced degree programs and to develop collaborative networks for middle and high school mathematics teachers. One feature of this project is the creation of a newsletter related to rural mathematics education to help publish and disseminate best practices. DiME-CLT has three components, doctoral/postdoctoral, teacher and instructional leader education, and research. These components will be integrated through a focus on the ideas of algebra and issues related to learners from diverse backgrounds.

The most recent CLT award for a mathematics related center was to the Center for Proficiency in Teaching Mathematics (University of Georgia). This center will conduct research into the nature of mathematical knowledge that is important to teaching proficiently and use this knowledge to strengthen pre- and in-service education.

As the mathematics teaching community reaches the retirement bump created by the Baby Boomers, as mathematics departments hire more faculty with mathematics education degrees, as new knowledge about effective instruction becomes available, and as more demands are made on mathematics educators, a strengthening of the mathematics education infrastructure through the collaborative efforts of mathematics departments, schools of education, school systems, and other stakeholders is not an option, but a necessity.

A revised call for CLT proposals is expected in December 2002.

## Correction

The deadlines for applications to the student paper sessions and the PME sessions at the 2003 MathFest given on page 11 of our November issue were incorrect. Both deadlines are June 27, 2003.

# PREP Workshops – 2003

By Victor J. Katz

There are many wonderful opportunities available to you through the MAA's PREP program to spend a week in a congenial atmosphere learning about mathematics or mathematics education during this coming summer. We are sure that all of you will find at least one of these workshops to be of great value in your future teaching. You may learn new ways of teaching old courses, develop ideas for research projects for yourself or your students, or learn how to teach entirely new courses that your students are demanding.

If you missed the workshop in Knot Theory last summer, you now have another chance to take it. Colin Adams will repeat this highly successful program this coming summer at Wake Forest University. Whether you want to be able to teach an undergraduate course in knot theory, or direct student research in knot theory, or even begin to do research yourself, you will learn enough about the subject in five intensive days to enable you to get started. There are lots of open problems in the subject that can be understood by those with only a minimal background in the field. You will be introduced to many of these and have the opportunity to start work on them. Of course, knot theory is not learned just through books and pictures. There will be plenty of opportunity to play with real knots, and you will be encouraged to experiment and make wild conjectures. You will even be able to make "human knots."

Did you ever wonder why your automobile insurance was so much more expensive than your cousin's insurance? Or why your rates went up so much last year? Then come to the workshop Topics in Applied Casualty Actuarial Science, led by Tom Struppeck this coming summer in Austin. You will work through the process of ratemaking, which computes insurance rates from prior history, and see how actuaries estimate the credibility of past experience. Then, working in small teams, you will determine the rates for a particular population of drivers. Once you have determined the rates, you will run a simulation and find out whether your "insurance company" will survive or fail. After you use these ideas in your own classes, you will be able to share your results with others at the Joint Mathematics Meetings in 2004.

Since regression analysis is The Heart of Statistical Methodology, Richard Scheaffer and Jeffrey Witmer will be conducting a workshop with that title at Oberlin College. If you teach statistics, the material in this workshop will help you develop the principles of both classical and modern regression methods with your students and provide you with a large number of good examples. You will work with real data from observational studies and designed experiments, using various types of statistical software. You will then plan your own lessons and be able to discuss these by email with the other participants and the directors during the school year.

Do you teach prospective computer science majors? If you do, you need to be aware of the new recommendations of the ACM/IEEE for a course in Discrete Mathematics. These recommendations, as well as the complementary recommendations of the Curriculum Foundations Project of CUPM, will be discussed in the workshop Discrete Mathematics: An early foundation for the study of Computer Science. This workshop will be offered by William Marion, Henry Walker, Susanna Epp, and Peter Henderson at Valparaiso University. Given that computer science departments now demand an early course in Discrete Mathematics and that prospective mathematics majors need to be exposed to the same material, it is imperative that mathematics de-partments take the lead in developing a course which meets the ACM guidelines. This workshop will explore the role of discrete mathematics and algorithmic thinking in the undergraduate mathematics major, expose under-graduate faculty to the thinking of computer science departments, and begin development of outlines and syllabi for an appropriate course.

If you are the chair of a mathematics department, or about to become one, you should come to Tina Straley's workshop on Leading the Academic Department: A Workshop for Chairs of Mathematical Science Departments. Through a series of case studies ranging from dealing with adjunct faculty to creating departmental strategic plans, you will learn how experienced department chairs have dealt with these issues and how your fellow participants would do so. At times during the workshop, you will have the opportunity to discuss problems with participants in institutions like yours, while at other times, you will be in sessions with chairs from all types of institutions. In general, the workshop will concentrate on the leadership skills so necessary to becoming a successful chair. The participants in last year's workshop all felt they had strengthened these skills and highly recommend that others experience the same professional growth.

Do you teach algebra or precalculus? Would you like your students to understand some important applications of the mathematical ideas in the course to real-world problems such as population growth, fuel economy, or carbon dioxide concentration? Then consider the workshop A Versatile Technology-Intensive Earth Math to be conducted by Nancy Zumoff, Chris Schaufele, and Paul Latiolais at Portland State University. You will work through the earth math materials that have been developed over the past several years and learn how to incorporate them into your classes. You will then have the opportunity to identify other en-vironmental concerns, especially those of particular interest to your students, and begin to develop your own materials to implement these ideas in classes. Professor Schaufele himself is modifying the materials for use in tribal schools of the Navaho nation, so this workshop will be of particular importance to those of you having substantial populations of Native Americans in your classes. And if you cannot come to the workshop in person, you will also be able to participate online.

Although we have all been using technology in our mathematics classes over the past decade, many of us are still not completely convinced of its effectiveness. One place to learn more about new technology from those who have used it effectively in lower level courses is at the workshop Integrating Technology into Classroom Activities: A Focus on Precalculus/Calculus, organized by Jacqueline Giles and directed by Wade Ellis in Houston. The program will focus on case studies of successful technology-based mathematics courses and help participants learn how to create their own effective lessons using technology. In particular, the presenters and participants will deal with the implications of the use of CAS systems in precalculus and how this use forces some real changes in the curriculum and in our expectations for that course.

An emerging focus in the college mathematics community is the notion of Quantitative Literacy, the idea that all educated adults should be "numerate" enough to participate in the important decisions in our society that involve numbers. Quantitative literacy is not something that can be accomplished solely in mathematics courses, so Emily Decker, Gillies Malnarich, and Kim Rheinlander are leading two workshops in Quantitative Literacy Across the Curriculum: Everybody's Project, one in the northeast and one in the northwest. Participants will enroll in teams of 2 to 4 people, with at least one participant in each team being a non-mathematician. After discussing the ideas in two recent books, Mathematics and Democracy: The Case for Quantitative Literacy, edited by Lynn Steen, and Radical Equations, by Robert Moses, the participants will begin to develop quantitative literacy materials for use at their own institutions. Presenters from several successful quantitative literacy programs will help the participants not only with curricular issues but also with practical con-siderations such as working with colleagues across the institution.

With the mathematics of biology assuming increasing importance, both for educating biologists and for doing research in biology, it is imperative that mathematics departments meet the needs of their biology colleagues in providing the appropriate mathematical education for biologists. Janet Andersen and Eric Marland will offer a workshop entitled Creating and Teaching Courses that Integrate Biology and Mathematics at Hope College.

Typically biology majors were required to take a course in calculus and perhaps one in statistics. But since our calculus courses were geared toward engineers and our statistics courses toward social scientists, these courses were often not very useful. But this is changing. Colleges around the country are developing new courses for biologists that more closely meet their needs in such areas as data analysis and linear algebra.

To be most effective, these courses should be developed with and, ideally, co-taught with members of the biology department. But establishing inter-disciplinary courses is difficult. This workshop will address the issue of developing strategies for cooperation with biologists as well as give you an introduction to some current topics in biology that use interesting mathematics. You will then be encouraged to work with others to develop course syllabi or even just course modules that incorporate both biology and mathematics. A list-serve of participants will be established to facilitate ongoing discussions of participants' progress at their home institutions.

If you have taught the "liberal-arts" mathematics course and have been frustrated with its outcome, you should attend the repeat of the workshop Presenting Mathematics Masterpieces and Powerful Techniques of Effective Thinking to Non-Science Students, to be conducted by Edward Burger and Michael Starbird. They will introduce you to methods of presenting the great ideas of mathe-matics to students with a limited mathematics background. For instance, you will play Dodge Ball as a method of introducing the concepts in Cantor's proofs about infinity. Before, during, and after the workshop, you will develop your own presentations of some important ideas and then discuss these with the other participants as well as with the directors.

If you are teaching pre-service teachers, you will have the choice of two workshops this summer. Those teaching pre-service secondary teachers should consider the repeat of the successful Mathematical Methods and Modeling for Secondary Mathematics Teacher Education workshop, led by John Dossey, Frank Giordano, and Sharon McCrone. In this workshop you will discuss the latest NCTM and CBMS re-commendations for the mathematical education of secondary teachers, and then develop ideas for a methods class featuring modeling. Since learning how to apply mathematics to real-life situations is crucial for secondary students, you will exlore techniques of developing methods for modeling such situations with your pre-service teachers. By the end of your week in this workshop, you will already have a supply of models, with many more coming over the next months via the e-mail network. Many of these will be usable in your methods course and, with slight modification, in the secondary classroom. And perhaps Terror Bird will again be one of the models.

If you are teaching pre-service elementary or middle school teachers, then this new workshop is for you: Active Learning Approaches to Teaching Mathematics Content Courses for Elementary and Middle-School Teachers, led by Laurie Burton and Maria Fung. You have probably read Liping Ma's Knowing and Teaching Elementary Mathematics and perhaps wondered how to integrate her insights into your teacher preparation courses. Burton and Fung will enable you to do so, by helping you create new lesson materials, structure activities, and develop effective assessment techniques. You will also be able to view some actual classroom vignettes on a video developed by the presenters. Since we would all like our future teachers to understand elementary mathematics like most of the Chinese teachers described by Ma, we owe it to ourselves, our students, and our children to develop better methods at the college level. This workshop will help you do so.

If you cannot get away this summer, you can still sign up for a workshop to be offered entirely online. If you have wanted to teach your abstract algebra course using constructivist principles, but did not have enough material available for your students to explore, you should consider the online workshop on Abstract Algebra with GAP led by Julianne Rainbolt and Russell Blyth. After learning how to use the GAP software, which you can download for free, you will work through several computer projects as if you were a student. For example, you will see why the alternating group on six elements is simple and discover that the number of Sylow p-subgroups of a group is congruent to 1 modulo p. You will even work through a project that often leads students to formulate an incorrect conjecture. The online software will be set up so you can communicate directly with the director and the other participants. And by the end of the workshop week, you should have enough project material to use weekly in your own course.

A second online workshop, directed by Lang Moore, David Smith, and Frank Wattenberg, is designed to get you Authoring Online Interactive Materials in Mathematics. The directors will assume that you know the basics of web page construction. Then you and a partner or two from your institution should plan a project to be developed. With the help of the directors and the other participants, you will use some flexible applets to create and demonstrate the usability of an interactive web page designed to teach some interesting piece of mathematics.

There are other workshops still in the planning stage as of this writing. So check MAA Online frequently under Professional Development for the latest information, including dates, locations, and application forms. And since many of last summer's workshops were over-subscribed, you should sign up as early as possible to assure yourself a place. You and your students will benefit enormously.

Victor J. Katz is spending this year as Visiting Mathematician at the MAA. His article on this year's PREP workshops appeared in the November FOCUS.

# AP Calculus at the Amusement Park and on the Web

By Susan Kornstein

Calculus will always conjure images of limits, derivatives, and integrals, but for the 153,721 students who took the AP Calculus AB Exam and the 40,840 students who took the AP Calculus BC Exam this year, they will probably also be thinking about attendance at an amusement park. Question 2 on both the Calculus AB Exam and the Calculus BC Exam asked students to apply many important concepts of the calculus, including the Fundamental Theorem, to a problem involving functions which model the rates at which people enter and leave an amusement park.

Of course, this is not the first time that AP Calculus Exam questions have asked students to apply calculus concepts to real world situations. There were problems concerning a trough (1987), an oil well (1989), the Jay and Tee building (1991), the wolf population (1993), cola (1996), the Crescent Island (1996), a skydiver (1997), air conditioning (1998), a pond's temperature (2001), just to name a few of the more'"famous" free-response problems. All of these problems are in keeping with the goals of AP Calculus for students to understand multiple representations of functions, communicate mathematics in well-written sentences, mathematically model a physical situation, and appreciate calculus as a coherent body of knowledge.

David Bressoud of Macalester College (and current Chair of the AP Calculus Development Committee) has written an article to help the mathematics community–AP Calculus teachers, as well as college faculty–understand how AP Exam questions are written, edited, scored, and evaluated. "Adventures in the Amusement Park: AB2/BC2 from the 2002 AP Calculus Exam" gives an inside look at the multi-year process of exam question development. The article can now be found on the College Board website, AP Central, http://apcentral.collegeboard.com/.

AP Central, launched in December 2001, is part of the College Board mission to support and connect AP Professionals. With now over 110,000 registered members (registration is free!), including at least 12,000 registered for Calculus AB, AP Central provides a wealth of information on the Advanced Placement Program, as well as the free-response questions and scoring standards from recent AP Exams for all 35 courses (including Calculus AB, Calculus BC, Statistics, Computer Science A, and Computer Science AB.) This year 657 Readers (341 college faculty and 316 AP teachers) graded AP Calculus Exams at Colorado State University in June. The Reading is a unique collegial experience where exam questions are scored, ideas are exchanged, and friends are made. AP Central has information on the opportunities to be a Reader and to serve as a workshop consultant.

The website also spotlights teacher profiles and feature articles and has a Teachers' Corner for each subject. Some of the articles of interest to mathematics teachers are Larry Riddle's "Women in Mathematics," Bernie Madison's "Math at the School-to-College Transition," David Bressoud's series of articles'"The History of Calculus Before Newton and Liebniz," Janet Anderson's "Try This! Calculus Teaching Tips," George Rosenstein's "A Century of Calculus Teaching in the US," Mark Howell's "Lies My Calculator Told Me," and a teacher profile titled "A Calculus Family." All of these are available in the Calculus AB and Calculus BC Teachers' Corner at AP Central.

A highlight of AP Central is the Teachers' Resource Catalog–a searchable database of reviews of articles, books, calculators, professional associations, software, textbooks, videos, websites, etc. with complete information on how to access each resource. The reviews for the mathematics resources (there are over 350 for each of the AP Calculus courses) have been written by over 50 high school and college teachers–short bios are provided with the reviews. And with a common goal to support excellence in mathematics teaching, the College Board is collaborating with MAA to promote professional development opportunities and share reviews in AP Central's Teachers' Resource Catalog and MAA's MathDL, http://www.mathdl.org, Catalog of Commercial Products. The College Board is a member of the Mathematical Sciences Conference Group on Digital Educational Resources.

This collaboration is part of an ongoing and fruitful relationship between the College Board and MAA. Twenty-five years ago, the two organizations formed The College Board – Mathematical Association of America Committee on Mutual Concerns. The Committee meets annually at the Joint Mathematics Meetings to consider topics of mutual interest and has addressed issues such as changes to AP Calculus, the introduction of AP Statistics, SAT calculator use policy, and various mathematics content issues related to SAT, CLEP, and AP.

Working together with MAA, the College Board always has been and continues to be in agreement with the position articulated in its statement of September, 1986 (and the National Research Council in its 2002 report) that when calculus is taught in high school, this should only be as a college-level course that prepares students to place out of a comparable college class, and that calculus taught in high school should never replace or shortchange instruction in algebra, geometry, or trigonometry.

So now while students learn the calculus of amusement park admission, teachers can read reviews of teaching resources. AP Calculus and AP Central reflect the efforts and expertise of college faculty and high school teachers working together to enhance the teaching and learning of calculus.

Susan Kornstein is Senior Content Editor for AP Central/Associate Director at the College Board.

# History of Computer Science on the Web

By Linda Becerra and Ron Barnes

Since computer science courses are taught in a number of mathematics departments or combined mathematics and computer science departments, and often by mathematics faculty, information on the history of computing web resources may be of considerable interest to readers of FOCUS. If one thinks the web is a good starting point to find information on the history of computing, one will not be disappointed. A recent Google search on "history of computing" came up with over 39,500 hits in 0.26 seconds! From general history sites to special sites dedicated to one individual or topic, the selections vary not only on subject matter but also on the types of materials available, including timelines, virtual museums, photographs, videos and emulators. Moreover, many of the sites are hyperlinked to numerous other useful and relevant sites. We have compiled here an annotated short list of useful web sites to help the interested reader navigate the vast array of available materials.

The **Charles Babbage Institute (CBI)**, http://www.cbi.umn.edu/index.html, is a historical archives research center of the University of Minnesota. Among its missions it maintains archives of materials relating to the history of information technology including records of professional associations, oral history interviews, photos, films, videos and other reference materials. CBI holds over 300 research grade oral history interviews (history in the making) relative to the history of computers, software and networking. The website also has three pages of links for "finding aids for archives and manuscript collections", which range from the ENIAC Trial Exhibits Master Collection to various ACM and Association of Women in Computing sites. In addition, there are numerous corporate sites including IBM, Digital, Sperry Rand-Univac, and CDC ("collection finding aids"). While the institute holds almost 150,000 photographs, only photos from the Burroughs Corporation collection can be searched online.

**The Computer History Association of California**, http://www.chac.org/chac/chhistpg.html, has among its objectives: to collect and archive computer hardware, software and documents significant to their history; to participate in an informal network of institutions specializing in computer history; and to correspond electronically, through the USENET newsgroup alt.folklore.com-puters, with computer historians worldwide. The CHAC "History Pages" consist of a list of web pages that cover various topics in computer history, pre-electronic computing and electronic calculator history. The topic index alone for these "History Pages" is 13 pages long and breaks down each subject into almost every possible subcategory. For example, the computer category breaks down the hardware machines subcategory into: general, mainframe, supercomputer, mini, micro, laptop, sublaptop (although the last two categories are just being addressed). The topic index includes hardware, software documents, museums (physical and virtual) and folklore. The virtual museums include survey history and chronology, oral and video history and images. An entire page of links is given to just survey history and chronology resources. This is a very rich environment with many fascinating resources and sites. CHAC is also active in plans to develop a major public Museum of Computing to be located in Silicon Valley. This is an excellent website and has many interesting, well-written links. In addition, CHAC through its informal network of institutions and the USENET subgroup noted above facilitates correspondence among computer historians both regionally and worldwide.

The **History of Computing Project,** http://www.thocp.net/, is a site being developed and maintained by the History of Computing Foundation. It was formed in 2000 to secure the continuity of the project "The History of Computing" initiated by Cornelis Robat in 1986, in Holland. Among the most interesting sections of this site is the "Chronology of Computing History" which consists of 31 chapters divided into 4 sections: Pre-Historic Era, Antiquity, Pre-Industrial Era and Industrial Era. Clicking on specified dates within each section result in corresponding annotated timelines of development in that time frame, often with pictures and other related links. The final page in the Industrial Era consists of a three dimensional color pie chart of the Languages of the World Wide Web. An addition – History of Computing by Country was to appear in November 2002. The site also includes a "Biographies of Computer Pioneers" section. An Index of Hardware is also given. The site notes "There are not always active or linked pages present as yet, but they will be added in the future". This is a new and evolving site and shows real promise and is actively seeking more editors and contributors to continue its development.

**The Internet Society**, http://www.isoc.org/internet/history/, in ad-dition to imformation about its organization and membership, also has two pages of Histories of the Internet that include related histories such as of the Web, email, USENET and more. There is also material on the Internet development worldwide including some on its growth in Austria, Germany and Central Europe. This site is updated often.

**The History of Computing,** http://ei.cs.vt.edu/~history/, was initiated by J.A.N. Lee as part of a course at Virginia Tech University. A large, varied and rich collection of materials and links (over 200) is available at this site. It includes biographical sketches of pioneers in computing, the history of programming languages and the Internet, computer history organizations and museums, university courses in computer history, archives and collections, emulators of historical systems, and general histories of computing. The links are organized into several categories and many of the links are annotated as to content and type of materials available: biographies, virtual museums, videos, timelines, simulations, conferences, publications, games, etc.

**The Computer History Museum**, http://www.computerhistory.org/, is a non-profit entity that maintains a broad range of artifactual, documentary, and media-based sources in computer history. One of the main components of its website is a timeline that explores the history of computing from 1945 to 1990. Features include innovations in hardware and software technology, biographical sketches of the responsible pioneers and numerous photos of these individuals, as well as of hardware and other relevant items. The timeline is conveniently organized by year and by topic. In addition, it is a host for both real and virtual exhibits. Currently there are two Computer History Online Exhibits: a History of the Internet and the Microprocessor Evolution. Also, the History Center is digitizing its collections catalogs on an ongoing basis.

**The Living Internet**, http://ww.livinginternet.com, was developed by Bill Stewart, a systems engineer, to make available comprehensive and in-depth information about the history and other aspects of the Internet. There are brief biographical sketches of computing pioneers, photographs and many links to other relevant sites.

A History of Computers, http://www.maxmon.com/history.htm, is maintained by Maxfield & Montrose Interactive Inc. and are notes abstracted from the book Bebop BYTES Back. The site is organized as a chronological index or timeline with information on the development of numbers, the introduction of mechanical aids to calculation, the evolution of electronics, and the impact of electronics on computing with photos and biographical sketches.

As noted by Professor Andrew Leahy in his article on the "History of Math-ematics" on the Web in FOCUS (February 2002), peer review of web sites and evaluation of web-based materials are probably the biggest issues facing the development and use of websites. While we found the websites reviewed here to be rich resource materials, we of course cannot vouch for the accuracy of every page nor of every single link.

To help address these issues, we offer for consideration two suggestions. A metasearch engine searches other search engines and often searches smaller, less well-known search engines and specialized sites. For example, we utilized the metasearch engine ixquick, http://www.ixquick.com, to search for the "history of computing." It found 18 unique top ten pages selected from at least 73,947 matching results. Half of our reviewed sites were listed in ixquick's' top ten compilation and each of these was listed in the top ten of one or more search engines. To the extent that top ten listings of search engines reflect relevance or comparative value of websites, the ixquick search may indicate the value and quality of our reviewed websites. Criteria for evaluation of Internet information and resources have also been developed. For example, see the website: http://www.vuw.ac.nz/~agsmith/evaln/index.htm. Brian Smith and Mary Robinson compiled related useful materials for their short course, Teaching the History of Mathematics Using the World Wide Web (MAA Winter Meeting 1998) that can be adapted to a "teaching the history of computer science using the world wide web".

The authors have compiled a more extensive bibliography of history of computer science websites which is avail-able at http://cms.dt.uh.edu/Faculty/BecerraL/Mycourses/HIS-TORY_WEB%20SITES.htm. Many of these websites are overloaded with information and so this presents a new challenge: how to effectively utilize "dense" websites? The authors are currently carrying on investigations along these lines—for example, integrating such websites into the History of Mathematics and Computer Science course.

Linda Becerra (BecerraL@uhd.edu) and Ron Barnes (BarnesR@uhd.edu) are members of the Department of Computer and Mathematical Sciences at the University of Houston-Downtown.

## Fifteen Theorem Makes Bhargava One of the "Brilliant Ten"

Popular Science, in the November issue, introduced its "first annual celebration of scientists who are shaking up their fields, PopSci's "Brilliant 10." Among these groundbreaking researchers was Manjul Bhargava, the winner of the 1996 AMS-MAA-SIAM Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student. Since winning the prize as an undergraduate at Harvard, Bhargava has completed his Ph.D. at Princeton, where he is currently a visiting research scholar with a joint appointment at the Institute for Advanced Study. His Ph.D. adviser, Andrew Wiles, considers Bhargava's dissertation dealing with the "Fifteen theorem" as "one of the strongest he's seen in 20 years."

The Fifteen theorem, originally proved by Conway and Schneeberger in 1993, states that if a positive definite quadratic form whose associated symmetric matrix has integer values represents all positive integers less than or equal to 15, then it is "universal," that is, it represents all positive integers. However, the discoverers were not happy with their proof, so never published this result, a far-reaching generalization of Lagrange's theorem that $x^2 + y^2 + z^2 + w^2$ represents all positive integers. Bhargava not only simplified the proof, but also generalized the result in several ways.

Popular Science reports that Bhargava's preferred place to contemplate the beauty of mathematics is in the woods near the Institute pond, a locale frequented by many other famous mathematicians. The MAA congratulates Manjul on his honor and looks forward to learning more number theory from our member of the "brilliant 10." The"Popular Science article can be found online at http://www.popsci.com/science/article/0,12543,364881,00.html.

# Treasurer's Report—2001 Financial Year

John W. Kenelly, Treasurer

This report covers an overview of the MAA Operating Funds, the Building Fund, the Endowment fund[1] and brief summary statements on Externally funded projects and the General Fund Balance. The Board of Governors approved a combined budget for 2001 that had a $140,801 deficit. The MAA finished the year with a surplus of $105,838. The Association is financially healthy and we have survived a crisis of monumental proportions – 9/11 and the major cost of the computer software conversion. The good news is that as a result of the improved software we are starting to see real savings in several operations and we are dealing with the new economy while staying financially healthy.

As we continue to improve our accounting systems we have had to make adjustments in the manner that some income and expenses items are allocated and labeled. If you compare the 2000 numbers in this report to last year's treasurer's report you will notice some differences. We have elected to construct the 2000 numbers in this report with the same guidelines that we use in constructing the 2001 numbers given here. Thus this report is consistent within itself even if there are differences between it and earlier reports.

**What happened to income in 2001**

A number of factors caused income to increase in 2001 by 15.2% to $7,112,790. Increased income typically reflects a counterbalancing increase in services, i.e.; expenses, and I will attempt to detail the changes in the individual sections for income and expenses. A dues increase of 3.5% was joined with a 15.2% growth in paid membership to give an overall 5.5% increase in dues income. Two major bequests increased contributions by $210,000. In addition, the Akamai Foundation became a major sponsor of the MAA and its American Mathematical Competitions program. This gave an additional $270,000 increase in contributions and a $300,000 increase in AMC income. Advertising revenues were down and non-subscription journal income was down as was much in the economy. However non-member subscriptions were the same. Income from meetings was improved as a result of an increased surplus in the joint meeting ($46,000) and a 27% difference between the Los Angeles ($142,000) and the Madison, Wisconsin ($181,000) MathFests. Building Management now includes new income assigns and the growth in that line is an accounting change. The staff continues to implement more effective short time surplus cash management methods and this is seen as a real income increase in the miscellaneous item.

**Where the money came from**

- Dues includes member dues, institutional dues, corporate dues, and a payment from the Life Membership Fund for life members.
- **Contributions** include the Greater MAA Fund, the dues supplement and other contributions to the Operating Fund but does not include contributions to the endowment or to the Building Fund.

| | 2000 | 2001 |
|---|---|---|
| Dues | $2,096,376 | $2,212,275 |
| Contributions | $103,679 | $633,247 |
| Journals (other than member subscriptions)[2] | $966,171 | $938,298 |
| Publications other than journals | $1,182,179 | $1,059,359 |
| American Math Competitions/Olympiad | $1,174,324 | $1,462,860 |
| Transfer from Investments and Trusts | $84,062 | $83,365 |
| Allocated Indirect Cost Recovery | $89,822 | $88,000 |
| Indirect Costs on Grants | $152,205 | $150,786 |
| Meetings/Minicourses/Short Courses | $287,223 | $379,995 |
| Building Management Fee | $35,000 | $67,197 |
| Miscellaneous | $3,012 | $37,408 |
| **TOTAL** | **$6,174,053** | **$7,112,790** |

- **Journals** include non-member subscriptions, sales of back issues, advertising, and royalties received. It does not include the portion of dues allocated to journals (see footnote[2]).
- **Publications** income includes sales of MAA books and reports, and videotapes.
- **Investments and Trusts** are funds that are transferred from Investment Funds and Trusts to support specified prizes and other activities.
- **American Math Competitions and Olympiad** The MAA manages two high school and a junior high school national mathematics competitions. These activities are managed from our office in Lincoln, Nebraska. Students who perform well on the high school examination are invited to compete for participation on the U.S. Math Olympiad team. This competition takes place through two additional exams, the AIME and the USAMO. Income comes from sales of the exams and registrations.
- **Indirect Cost on Grants** is income on externally funded activities that support MAA administrative activities. Not all grantors pay indirect costs.
- **Meetings and Courses** are registration fees from minicourses, shortcourses, and the online courses, net income from the Joint Meeting and all income from the summer MathFest.
- **Building Management Fee** is a transfer from the Building Fund to the General Fund for management services.
- **Miscellaneous** includes various fees that we receive for managing activities.

### What happened to expenses in 2001

Accounting changes were made between journal expense and membership retention allocations and the result is a $730,000 shift between the two items. Internal cost allocations of the overhead in the publications department were improved to better reflect activities and that caused a significant shift in the Books and Pamphlets expense item. However real expense reductions are reflected in the general programs item and the staff is to be especially commended for the “belt tightening” that has taken place throughout the headquarters operation. At the same time, our Information Technology needs continues to grow and we see this realized in a true increase in real expenses here. The increase in expenses in development is an accounting construct. Restricted contributions have to be entered as income and then expensed out as development charges. Accordingly this change is somewhat “artificial” and a similar thing took place in 2000 when $120,000 from Akamai and $180,000 from a major bequest were shifted. AMC had an $110,000 increase in expenses as a result of expanded programs that grew out of the Akamai sponsorship. Operational overhead is a new item created in the 2001 accounting changes. It is an aggregate of all the general service items that support all the departments.

- **Journals** include the cost of publishing and distributing the Monthly, Mathematics Magazine, the CMJ, FOCUS, and Math Horizons.
- **Books and Pamphlets** is the cost of our book and video publication program.
- **General Programs and Services** includes the cost of awards, minicourses, MAA portions of the Joint Meeting, the summer MathFest, section support, SUMMA, student chapters, and project support.
- **Executive, Finance and Human Resources** includes staff salaries in these departments.
- **Information Technology**department salaries and expenses.

**Where the money went**

| | 2000 | 2001 |
|---|---|---|
| Journals | $1,761,201 | $1,030,238 |
| Books and Pamphlets | $715,268 | $1,045,845 |
| Inventory Allowance | $14,960 | $12,395 |
| General Programs, Services and Projects | $735,806 | $695,985 |
| Executive, Finance and Human Resources | $831,513 | $831,275 |
| Information Technology | $145,971 | $296,093 |
| Governance | $159,268 | $163,748 |
| Membership Retention/Recruitment | $165,144 | $882,517 |
| Development | $256,282 | $430,778 |
| Transfer to Investments | $171,287 | |
| Operations Overhead | | $284,322 |
| American Math Competitions/Olympiad | $1,120,342 | $1,231,183 |
| Miscellaneous | $90,889 | $102,573 |
| **TOTAL** | **$6,167,931** | **$7,006,952** |

- **Governance** includes Board of Governor and governance committee support.
- **Membership Retention/Recruiting** includes cost of operating the membership department.
- **Development** includes solicitation and staff cost.
- **American Math Competitions and Olympiad** The 2001 expenses include cost of preparing and distributing the examinations plus support for the Math Olympiad Dinner and the summer training program.

### Externally Funded Projects

During 2001 the MAA received external project support of $3,090,510. This was up from $1,069,600 received in 2000 but the number first noted above includes Akamai funds of $950,000 designated for 2001. The appropriately comparable number for 2001 and 2000 are respectively $2,140,510 vs. $1,069,600 – a substantial increase that reflects well the level of MAA program activities. Indirect cost recovery of administrative expenses was $150,786 up from $137,585 in 2000. This is a positive reflection of the increased program activities and high visibility that the MAA has in the collegiate mathematics activities in the nation.

### Building Fund

The Association owns two adjoining townhouses and a “carriage house” at 1527 and 1529 Eighteenth Street NW, Washington, DC. The MAA Washington office occupies 1529, all of the carriage house and a small amount of 1527. The remainder of 1527 is rented to other organizations including the AMS and CBMS. In 2001, we “charged” ourselves $225,000 for the space that we occupied. That amount is included in Building Fund income. The rent we “charge” ourselves and the rents that we charge the other occupants are designed to reflect market conditions in the neighborhood.

In 2001 depreciation on the building was $73,026 and the building fund received contributions of $1,230. Substantial renovations are needed on the carriage house and a proposal is being prepared that will detail the cost of the needed renovations and new plans for using the facility. The long-term financial health of our building operations needs constant attention and additional revenues. Currently, the building fund balance is not growing enough to cover the future renovation needs that are inevitable.

| Building Fund | 2000 | 2001 |
|---|---|---|
| Building Fund Income | $335,709 | $309,176 |
| Building Fund Expense | $326,282 | $297,518 |
| Net | $9,427 | $11,658 |
| | | |
| Cummulative Building fund balance | $14,925 | $26,583 |

### Endowment Fund

The MAA Endowment Fund includes both restricted and unrestricted funds. At the end of 2001 the Endowment was valued at $2,513,610. During 2001, $53,662 was transferred from these funds to support prizes and other activities designated by the original donors to the MAA. An additional, $37,203 was transferred from the Sliffe Trust.[3]

| Endowment Fund | December 31, 2000 | December 31, 2001 |
|---|---|---|
| Unrestricted Board Designated | $1,820,382 | $1,958,178 |
| Temporarily Restricted | $475,312 | $437,222 |
| Permanently Restricted | $118,210 | $118,210 |
| TOTAL | $2,413,904 | $2,513,610 |

The last will and testament of Edith May Sliffe established a fund (The Sliffe Fund) to provide awards to selected teachers whose teams qualified in the American Mathematics Competitions. The MAA was selected as the Trustee of this fund. On December 31, 2001 the Sliffe Fund had a value of $557,154. The MAA is also the trustee of a trust established by Clinton B. Ford in memory of Walter B. Ford. This trust had a value of $100,908 on December 31, 2001.

The MAA is also the beneficiary of two Charitable Remainder Unitrusts. At the end of 2001 these were carried on our balance sheet at a value of $364,211 in conformance with IRS rules.

### General Fund Balance

The General Fund Balance is the cumulative sum of yearly balances in the General Fund. It is a measure of how the Association has done over time. The decrease last year by $125,839 as a result of the troubled national economy and a continuation of the association absorbing significant cost in our software conversion.

This is my first report as the treasurer of the association. I want to thank the MAA for the confidence that it has placed in me. The fiscal health of the association is sound. Our financial management team of officers and staff is exceptionally able and experienced. We will continue to improve our reporting systems and keep our focus on reports that inform and improve operations. As the years progress, I hope to see the MAA make major improvements in its endowment, use effective building management practices to increase its maintenance reserves, and find new income streams that will fund growth in services while reducing our heavy reliance on dues income. I would also like to acknowledge the special appreciation that I have for the members of the budget committee, Jim Daniel and Dan Maki and the tremendous assistance that we all receive from the Finance staff headed by Neil Beskin.

1 We use the name "Endowment Fund" to distinguish these assets from the MAA Investment Fund which consists of Endowment assets plus two trusts that the MAA administers.

2 Dues income allocated to journals was as follows: American Mathematical Monthly $458,720.37, Mathematics Magazine $222,077.93, College Math Journal $208,035.27, FOCUS $141,263.23.

3 Investment and Trust Income in 2001 $90,865 were allocated to Sliffe $25,772, awards $28,839, joint meetings $3,541, MathFest $1,654, sections $11,524, finance department $3,035, Publications$8,500, AMC $3,000 and Public Awareness $5,000.

## Short Takes

### National Academies Call for Incentives for Teaching Careers

A recent report from the National Academies Center for Education calls for the development of a national fellowship program to attract science and mathematics Ph.D.s to teaching careers. The report responds to a projected shortage of science and mathematics teachers by arguing that a fellowship program would attract more Ph.D.s to get involved with K–12 education. The proposed fellowships would last for two years. During the first year, fellows would get training in K–12 education and would be entirely funded by the program. The second year would involve actual teaching, with the schools providing all or part of the funding. The full report is online at http://www.nap.edu/catalog/10433.html?onpi_newsdoc07302002.

### "All Talk, No Action"

The Education Trust has issued a report entitled"All Talk, No Action: Putting an End to Out-of-Field Teaching. It offers a state by state analysis of the extent to which high school classes are being taught by teachers who have no formal training in the relevant field. The report defines formal training as having a college major or minor in the subject. While it is well known that out-of-field teaching is a common problem in high schools, the report argues that the problem is even worse in middle schools, "where very high rates of misassignment suggest a staggering disregard for whether teachers have the minimal academic foundation necessary to teach classes in core academic areas." The report also argues that the problem has gotten worse in the last decade and that it is particularly acute in schools that serve low income and/or minority students. See http://www.edtrust.org/main/main/index.asp for more information and the full text of the report.

### ZetaGrid Computes 100 Billion Zeros

ZetaGrid is an internet site that organizes large-scale distributed computations. Its major project at the moment is the computation of zeros of the Riemman Zeta function, which provides an empirical check of the Riemman Hypothesis. ZetaGrid provides a program that can run in participants' computers, allowing them to take part in the computation. As of late September, there were almost 2500 computers involved. The results so far confirm the Riemann hypothesis for the first 100 billion zeros, verifying that they are all of the form $1/2 + it$ and that they are all simple zeros (for $|t| < 29{,}538{,}618{,}432.236$).

This computation is intended as a "proof of concept" project, to show that the ZetaGrid system works. Other projects are being planned. To join in or to get more information, visit http://www.zetagrid.net.

**NRC Planning Assessment of Doctoral Programs**

The National Research Council has created a committee to plan a new assessment of doctoral programs at research universities. A description of the committee's goals can be found online at http://www7.nationalacademies.org/bhew/ResDocs_about.html. The NRC last surveyed doctoral programs in 1995. See http://bob.nap.edu/html/researchdoc/index.html and http://www.nap.edu/catalog/4915.html for more information about the 1995 report, entitled "Research Doctorate Programs in the United States: Continuity and Change."

**Report Sees Decline in Computational Skills**

The Brookings Institution's Brown Center on Education Policy recently released the 2002 edition of How Well Are America's Students Learning?, its annual report on American education. A major section of the report deals with arithmetic skills. The report argues that because the National Assessment of Educational Progress (NAEP) makes basic math skills only a small part of the overall test, the problem has not been noticed or taken seriously. Tom Loveless, the director of the Brown Center and editor of The Great Curriculum Debate: How Should We Teach Reading and Math?, argues that "these data warn the nation that there are consequences to de-emphasizing computational skills in the elementary grades." He also feels that the 1989 NCTM Standards are partly to blame for the problem, because they argued that basic arithmetic received too much attention in elementary classrooms. For more on the report, see http://www.brookings.org/gs/brown/bc_report/2002/2002report.htm.

**DoE to Establish "What Works Clearinghouse"**

The US Department of Education has chosen the Campbell Collaboration of Philadelphia and the American Institutes for Research to establish a national clearinghouse to collect evidence on the effectiveness of various educational programs and projects. The goal of the What Works Clearinghouse is to collect "the best available research evidence" about programs, products and strategies used in education. The goal is to provide educators and education decision-makers with solid data that can inform their choices. The creation of the clearinghouse is an attempt to implement a portion of the "No Child Left Behind Act" that requires school districts to use "scientifically based research" to support their curricular decisions. For more information, go to http://www.campbellcollaboration.org.

**What Are the MAA Sections Doing?**

The MAA Committee on Sections has made available information on the activities of the sections. The reports are on MAA Online at http://www.maa.org/sections/officer-info.html. Check it out to see highlights and data about the activities of MAA sections throughout the country.

**Congress Establishes Institute of Education Sciences**

On October 16, Congress approved a bill that replaces the Office of Educational Research and Improvement of the Department of Education with an Institute of Education Sciences that is expected to be more independent of DoE. (When FOCUS went to press, the bill had not yet been signed by the President.) The new institute is expected to use scientifically sound studies to assess what teaching methods are truly effective. A new National Board for Education Sciences, with members appointed by the President, will oversee the work of the Institute.

NSF Announces Math and Science Partnership Awards

Early in October the NSF announced the Math and Science Partnership awards and issued the call for proposals for the next round. Abstracts of all the winning proposals, the guidelines for new proposals, and other useful information and links many be found at http://www.ehr.nsf.gov/msp. More detailed coverage of the MSP awards will appear in a future edition of the "NSF Beat" column.

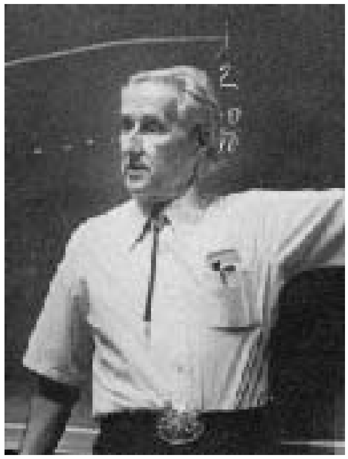
# In Memoriam
# Arnold E. Ross, 1906–2002

Arnold Ephraim Ross died on Wednesday, September 25, at the age of 96, after a long and distinguished career in which he made significant contributions to mathematics education. His summer program for talented high school students profoundly influenced many people early in their lives. Many of them eventually became scientists and mathematicians themselves.

Ross was born in 1906 in Chicago, IL, but spent a large part of his youth in Russia. He finished his pre-college education there and was admitted to the University of Odessa when he was 16. Shortly after, he returned to the United States and attended the University of Chicago, where he went on to earn his Ph.D. in mathematics. He wrote his thesis under L. E. Dickson, but he seems to have been most influenced by the pedagogical ideas of E. H. Moore, who emphasized a discovery method of teaching mathematics.

After spending some time at the California Institute of Technology and at the People's Junior College in Chicago, he joined the faculty of mathematics at the University of St. Louis. In 1946, after working for the Navy during the war, he went to the University of Notre Dame, where he was professor and chair of the mathematics department until 1963. He moved to Ohio State University in 1963. He remained at OSU as chair of the mathematics department until his retirement in 1976.

Ross's summer program was first started when he was at Notre Dame, and subsequently followed him to Ohio State. The program was initially aimed at high school teachers, but slowly changed its focus to talented high school students. Ross decided that number theory was accessible with little background and at the same time offered significant challenges, so he chose to center the lectures in his program on that subject. In addition to the lectures, students engaged in lots of problem solving.



Arnold E. Ross

Ross directed his program every year until 2000, when he was forced to retire by poor health. He took his program to other countries, and several alumni of his program created similar programs of their own. The Ross program for talented high school students continues to thrive at Ohio State. See http://www.math.ohio-state.edu/ross for more information.

In addition to the summer program, Ross was involved in many other aspects of mathematics education. His contributions to the MAA and to mathematics education earned him the Association's Award for Distinguished Service in 1985. A description of his career up to that point can be found in the April 1986 issue of the American Mathematical Monthly.

The Ross family has asked those who wish to make gifts in Arnold Ross's memory to make contributions to the Ross Mathematics Program, Department of Mathematics, The Ohio State University, 231 West 18th Ave., Columbus, Ohio.

# Remembering Arnold Ross

By Daniel Shapiro

Arnold Ross told stories about his early life in Czarist Russia, his study of mathematics as a "youngster" under the direction of Professor Shatunovsky, his success in convincing the Bolshevik authorities that he should be allowed to travel to Chicago in 1923, finding jobs in Chicago, taking courses with E.H. Moore, working with L.E. Dickson. He told further anecdotes of his accomplishments at the University of St. Louis, his work on proximity fuses for the U.S. Navy, his nearly thirty years as department chairman at Notre Dame and Ohio State, and perhaps most of all, the founding of his summer mathematics program for talented high school students. Most of those stories seemed to have a moral: if you focus persistently on your goals you can achieve them.

Arnold Ross had strong feelings about what was right and important and he devoted his considerable energy and talents toward promoting those goals. One way he accomplished his aims was his amazing ability to convince others to share his vision of what should be done. I went to his office one day in 1975 feeling overwhelmed with research and teaching obligations. After twenty minutes of discussion I left with the happy conviction that I could help make a difference by teaching math to elementary school kids on Saturdays. After hearing several colleagues' stories of similar experiences, I realized that Arnold Ross had a gift for convincing others to share his goals, by being passionately devoted to what he knew was important.

Daniel Shapiro is Professor and Vice Chair at the Department of Mathematics of Ohio State University, and is currently the Director of the Ross Mathematics Program.

# Review Form
## Listing of Commercial Materials

**The Reviewer**

Name of Reviewer ____________________

Institutional Affiliation ____________________

Mailing Address ____________________

Email address ** ____________________

Telephone Number ** ____________________

** For internal use only.

**The Book**

Title of Book ____________________

Author(s) ____________________

Publisher ____________________

ISBN ____________________

Relationship(s), if any, to the author(s) of the text.

Close friends and arch rivals of the authors should not submit reviews. ____________________

____________________

**The Course**

Title of the course in which the book was used ____________________

Other materials used in course ____________________

Description of class

Length of course ____________

Meetings per week ____________

Number of students ____________

Instructional style(s) ____________

Technology used ____________

Other comments about the class (e.g., general purpose of the course, general level of the students, etc.)

**The Review**

General Comments (including accuracy, clarity of exposition, coverage, quality of exercises, and particularly strong or weak points)

Comments on supplementary materials

Other Comments

Will you be using the book again?

Reviews should be emailed to:

Professor Lang Moore of Duke University: lang@math.duke.edu

## Employment Opportunities

### ARIZONA

**NORTHERN ARIZONA UNIVERSITY**
Department of Mathematics and Statistics
Tenure Track Assistant Professor in Mathematics Education beginning August 2003. Requirements: Doctoral degree completed by 8/03, evidence of high quality teaching, potential for a productive research program. Review begins Nov. 15, 2002. Send letter, CV, graduate transcripts, teaching and research statements, a teaching evaluation summary, if available, and three re-commendation letters to: Mathematics Education Screening Committee, Box 5717, Northern Arizona University, Flagstaff, AZ 86011-5717. See http://math/nau.edu for further details. Position subject to availability of funds. NAU is an EOE/AA employer; women and minorities are encouraged to apply.

### CALIFORNIA

**CALIFORNIA STATE UNIVERSITY, FULLERTON**
Mathematics The Department of Mathematics at California State University, Fullerton, has an opening for two tenure track positions at the assistant and/or associate professor levels, beginning August 18, 2003. Responsibilities include teaching courses in Mathematics and/or Mathematics Education, and being active in research related to Mathematics or Mathematics Education. Doctorate in an area directly related to Mathematics Education or in Mathematics awarded by the appointment date, and a Masters Degree or equivalent in Mathematics, or a Bachelors Degree or equivalent in Mathematics with substantial graduate coursework in Mathematics is required. Rank and salary will be commensurate with experience. The Department has a significant number of faculty who are active in all aspects of teaching and research in Mathematics Education (please visit us at http://math.fullerton.edu). Candidates should send a letter summarizing their background in teaching and research, along with a curriculum vita and three letters of reference. Please include a personal Mission Statement describing specific interests and background in work related to Mathematics Education, along with transcripts of graduate and undergraduate work. Women and minorities are especially encouraged to apply. Please send all materials to:
Chair, Search Committee in Mathematics Education
Department of Mathematics
California State University, Fullerton
Fullerton, CA 92834
Applications will be reviewed beginning January 6, 2003.

**CALIFORNIA STATE UNIVERSITY, LOS ANGELES**
Department of Mathematics - Applications are invited for a tenure track position in Mathematics at the level of Assistant/ Associate professor, starting June or September 2003. Ph.D. in Mathematics with a strong background in Algebra is required. Doctorate degrees must be from an accredited institution of higher education. Successful candidate should be able to teach a range of undergraduate mathematics classes. Publications in peer reviewed journals and/or grant activity is required. CSULA is on the quarter system. Review of applications will start January 22, 2003 and continue until position is filled. Send a letter of application and vita to Dr. P. K. Subramanian, Chair, Department of Mathematics, California State University at Los Angeles, 5151 State University Drive, Los Angeles, CA 90032. An Equal Opportunity, Title IX, Disabled, Employer. All qualified applicants are encouraged to apply.

**CAL STATE POLYTECH. UNIV., POMONA**
Department of Mathematics
Four tenure-track positions
Mathematics Education (Two positions: Assistant Professor and Associate/Assistant Professor). Teach undergraduate courses in math education, collaborate with others on campus involved in math education. Opportunity to teach lower and upper division math courses, provide in-service programs for local schools, help to develop master's in math teaching, advise students seeking secondary teaching credential. Minimum qualifications: Doctorate in math education with master's degree in mathematics (or equivalent) or Ph.D. in mathematics, with strong background in math education. ABD's will be considered. Must know about trends in math education, uses of technology in math education. Preference to those able to supervise student teaching. Mathematics (Two positions: Asst Prof) Teach undergraduate, graduate, and service courses in math, participate in curriculum development, and advise undergraduate and graduate students. Preference to those with expertise in one or more of: algebra, control theory, differential equations, estimation theory, geometry, number theory, stochastic differential equations, topology. Minimum qualifications: Ph.D. in Mathematics or Statistics. Completion of terminal degree by 9/03. All positions: Expected to serve on department and university committees, engage in scholarly activities. Required: Evidence of, or potential for, teaching excellence, directing master's theses, engaging in scholarly activities, working with diverse student body. Salary dependent on qualifications. Initial review of applications 1/8/03. Review will continue until position is filled or closed. Submit application form indicating position area (available at http://www.csupomona.edu/~academic/faculty/open_faculty_positions.htm), curriculum vitae, transcripts, and minimum of three reference letters to Faculty Search Committee, Mathematics Department, CSPU Pomona, 3801 W. Temple Ave., Pomona, CA 91768-4007; lmborchert@csupomona.edu; 909-869-4008; Fax: 909-869-4904; http://www.csupomona.edu/~math. AA/EEO.

**CAL POLY, SAN LUIS OBISPO**
Mathematics Education. Tenure-track positions beginning Fall 2003.
Salary commensurate with qualifications and experience.
Responsibilities include teaching content courses for prospective K-12 teachers, teaching other mathematics classes, teaching methods courses for prospective secondary teachers, supervising student teachers, running teacher in-service programs, and working with the teacher education programs of the university. Excellence in teaching and a strong commitment to continued scholarly activity are expected. Requirements: Doctorate in mathematics education with the equivalent of a master's degree in mathematics, or a doctorate in mathematics with demonstrated com-mitment to teacher education. Pre-college teaching experience is desired.

**CAL POLY, SAN LUIS OBISPO**
Cal Poly, part of the state university system of California, is noted for its programs in the sciences and engineering. The campus is located on the central coast of California and has an enrollment of 18,000 students in undergraduate and masters degree programs. The Mathematics Department has 32 tenure-track faculty, 15 graduate students, and 250 undergraduate majors with half of the students preparing to teach secondary mathematics. Currently there are three full-time faculty in the area of mathematics education and the department has a goal to increase that number to six. There is a computer equipped classroom devoted to math education and plans for a future math education center. The department web site is http://www.calpoly.edu/~math.

Submit Cal Poly application form (request via math@calpoly.edu), rÈsumÈ, statement of professional goals, teaching statement, three letters of reference, and transcripts (unofficial for initial screening and official for final candidates) to: Math Ed Screening Committee, Mathematics Department, Cal Poly, San Luis Obispo, CA 93407. (Refer to Recruitment Code #4622 on all correspondence.) Review of applications will begin 1/2/03, and applications received after that date may be considered. Cal Poly is strongly committed to achieving excellence through cultural diversity. The university actively encourages applications and nominations of all qualified individuals. EEO.

MATHEMATICS. Tenure-track positions beginning Fall 2003. Assistant professor appointments anticipated, but higher levels will be considered. Salary is commensurate with experience and qualifications. Excellence in teaching and an active program in research/professional development are expected. Doctorate in mathematics or closely related field is required. Preferred areas of interest are algebra, numerical analysis, applied mathematics, combinatorial and discrete mathematics, and dynamical systems. However, well-qualified candidates in other areas represented in the department will be considered.

Submit Cal Poly application form (request via math@calpoly.edu), resume, brief statement of professional goals, teaching statement, three letters of reference (at least one of which addresses teaching experience), and transcripts (unofficial acceptable initially) to: Chair, Screening Committee, Mathematics Department, Cal Poly, San Luis Obispo, CA 93407. Review of applications will begin 1/2/03,and applications received after that date may be considered. Refer to Recruitment Code #4623 on all correspondence. Cal Poly is strongly committed to achieving excellence through cultural diversity. The university actively encourages applications and nominations of all qualified individuals. EEO.

## CONNECTICUT

TRINITY COLLEGE
Hartford CT
Lecturer in the Math Center
Full-time, contract position beginning late August 2003.
The Math Center at Trinity College is a math resource center for the college that administers Trinity's quantitative literacy requirement, offers courses by which students can meet the requirement as well as upper level quantitative literacy courses, works with non-mathematics faculty to enrich the quantitative content of their courses, and houses a peer tutoring center.

Lecturer responsibilities include teaching small sections of quantitative reasoning courses, developing courses and course materials, working with faculty at the college to provide quantitative support for their classes, initiating and participating in Math Center programs and appropriate professional activities.

Initial one-year contract; contract renewal and multi-year contract possible. Five courses per year teaching load. Ph.D. preferred, Master's degree in Mathematics and college teaching experience required. Experience in creating curricula and working with faculty across departments is particularly desirable.

Please send a vita, letter of application, and three letters of recommendation on teaching and professional activities to:
Donna Small, Administrative Assistant
Mathematics Center
Trinity College
Hartford, CT 06106.
Evaluation of applications will begin December 1 and continue until the position is filled. Applicants who will be at the January math meetings should so note. Trinity College is an EO/AA employer. Women and minority candidates are particularly encouraged to apply.

## GEORGIA

**GEORGIA COLLEGE & STATE UNIVERSITY**
Department Chair, Department of Mathematics and Computer Science
Applications are invited for Department Chair, Department of Mathematics and Computer Science. At least five years of teaching experience is required and administrative experience is desirable. Applicants must have a doctorate in mathematics, computer science or related field. The department offers undergraduate degrees in mathematics and computer science and minors in mathematics, computer science, actuarial science and quantitative analysis and has excellent teaching and laboratory facilities. There are twenty-one faculty positions in the department distributed as follows: five computer science, two mathematics education, thirteen mathematics, and one chair. As the University System of Georgia's designated public liberal arts university and a member of the Council of Public Liberal Arts Colleges (COPLAC), GC&SU is committed to combining the educational experiences typical of esteemed private liberal arts colleges with the affordability of public higher education. GC&SU is an Equal Opportunity/Affirmative Action Employer. Review of applications will begin December 6, 2002 and continue until the position is filled. For additional information and the application procedure, go to: http://www.gcsu.edu/facultyjobs

## ILLINOIS

**NORTH PARK UNIVERSITY**
Professor of Mathematics
North Park University, located on the north side of Chicago, invites applications for a department chair/tenure-track position in mathematics. Rank dependent upon qualifications. Responsibilities include teaching introductory and advanced courses in mathematics, functioning as the chair of the department, and supervising undergraduate research in mathematics. Ideal candidates will have demonstrated excellence in teaching and administration. Ph.D. in mathematics required.

North Park is sponsored by the Evangelical Covenant Church and we seek applicants with a personal commitment to diversity and our mission of Christian higher education.

Interested applicants should submit a letter of intent, current vita, transcripts, and four names and addresses of references to: Alice Iverson, North Park University, 3225 W. Foster, Chicago, IL 60625-4895. By fax to: 773-244-4952 or email to: aiverson@northpark.edu. 773-244-5654 (phone) Review of applications will begin immediately and continue until the position is filled. For more information on North Park access our website at: www.northpark.edu

North Park is an equal opportunity employer.

## INDIANA

**BUTLER UNIVERSITY**
**Lecturer, Mathematics and Actuarial Science**
Three-year lectureship available, fall 2003. Ph.D. preferred with demonstrated excellence in teaching required. Area of specialization is open. Butler University is a regionally ranked, comprehensive, medium-sized, liberal-arts-based institution, with a beautiful campus located in a residential area of Indianapolis. More information is available at http://www.butler.edu. Send vitae and three letters of recommendation, at least one addressing the applicant's teaching effectiveness and capabilities, by January 1, 2002 to: Dr. Judith H. Morrel, Department of Mathematics and Actuarial Science, Butler University, 4600 Sunset Avenue, Indianapolis, IN 46208, e-mail: jmorrel@butler.edu, fax: 317-940-9363.
Butler University is an equal opportunity employer and is committed to enhancing the diversity of the student body and its faculty and staff; therefore, women and minorities are strongly encouraged to apply.

## IOWA

**UNIVERSITY OF NORTHERN IOWA**
Head, Department of Mathematics
Applications are invited for the position of Head of the Department of Mathematics to begin on or about July 1, 2003. We are seeking an effective leader of a diverse department. The ideal candidate will be capable of leading a large department consisting of mathematicians, applied mathematicians, statisticians, and mathematics educators.

Required: Doctorate in Mathematics, Applied Mathematics, Statistics, or Mathematics Education with a strong background in mathematics, excellence in communication and administration, qualifications to teach all levels of undergraduate mathematics, credentials warranting a senior level position, substantial evidence of excellent undergraduate and/or graduate level teaching.

Duties: Leading and serving the Department; some teaching, advising, and scholarly activity; budgeting and planning; assigning and evaluating faculty; facilitate faculty development; conducting external relations; recruiting mathematics majors.

The Department of Mathematics consists of 26 tenured and tenure-track faculty members and offers undergraduate degrees with concentrations in mathematics, applied mathematics, statistics and actuarial science, and mathematics education (both elementary and secondary). The department offers masters degrees in mathematics and mathematics education (both elementary and secondary).

The University of Northern Iowa is one of three state universities in Iowa and has the principal mission of providing high-quality education to undergraduates. Located in a metropolitan area with a population of about 125,000, the University serves a student population of approximately 14,000.

Complete applications received by January 6, 2003 will be given full consideration. Salary will be commensurate with qualifications and experience. The Department encourages applications from minority persons, women, disabled veterans, and Vietnam-era veterans. Send a letter describing in pertinent detail how your qualifications and experience match our mission and requirements, a curriculum vitae, and the names, mail addresses, e-mail addresses and telephone numbers of three references to: Mathematics Head Search Committee Chair, BRC 50, University of Northern Iowa, Cedar Falls, IA 50614_0181. E-mail inquiries may be sent to math_head_search@uni.edu. See our website at www.math.uni.edu. Applications by e-mail will not be accepted.

The University of Northern Iowa is an Equal Opportunity Employer with a comprehensive plan for affirmative action.

## MASSACHUSETTS

**WILLIAMS COLLEGE**

The Williams College Department of Mathematics and Statistics invites applications for two positions in mathematics and one position in statistics, beginning fall 2003, all at the rank of assistant professor (in exceptional cases, more advanced appointments may be considered). We are seeking highly qualified candidates who have demonstrated excellence in teaching and research, and who will have a Ph.D. by the time of appointment.

Williams College is a private, residential, highly selective liberal arts college with an undergraduate enrollment of approximately 2,000 students. The teaching load is two courses per 12-week semester and a winter term course every other January. In addition to excellence in teaching, an active and successful research program is expected.

To apply, please send a vita and have three letters of recommendation on teaching and research sent to the Hiring Committee, Department of Mathematics and Statistics, Williams College, Williamstown, MA 01267. Teaching and research statements are also welcome. Evaluations of applications will begin on or after November 25 and will continue until the positions are filled. Williams College is dedicated to providing a welcoming intellectual environment for all of its faculty, staff and students; as an EEO/AA employer, Williams especially encourages applications from women and underrepresented minorities. For more information on the Department of Mathematics and Statistics, visit http://www.williams.edu/Mathematics.

## MICHIGAN

**HILLSDALE COLLEGE**

Mathematics and Computer Science
Two Positions Available
1.) Applied Mathematics and
2.) Mathematics
Applications are invited for positions in Applied Mathematics and in Mathematics. Entry-level, tenure-track positions with initial ap-pointments made at the assistant professor level beginning in August 2003.

Candidates for Applied Mathematics position required to have a Ph.D. in mathematics with specialty in applied mathematics and willing to teach especially mathematical modeling, differential equations, numerical analysis, and vector analysis in addition to other undergraduate mathematics courses.

Candidates for Mathematics position required to have a Ph.D. in mathematics and be willing to teach various undergraduate mathematics courses.

Candidates for either position must have a strong commitment to excellence in teaching undergraduate mathematics. Duties for each position include a 12 hour (3 course) teaching load per semester which will include teaching all levels of undergraduate mathematics, academic advising, college service, and continued mathematical activity.

Hillsdale College, founded in 1844, is an independent, coeducational, four-year liberal arts college of 1,200 students. Hillsdale has traditionally upheld two concepts: academic excellence and institutional independence. For additional college information check our web site: http://www.hillsdale.edu.

Send a letter of application, which should include a personal statement addressing the applicant's teaching philosophy and qualifications for the position, curriculum vitae, graduate transcript, a short summary of teaching evaluations, and at least three letters of recommendation to: Professor Mark J. Watson, Chair, Department of Mathematics and ComputerScience, Hillsdale College, Hillsdale, Michigan 49242. Review of applications will begin November 1, 2002, and will continue until the positions are filled. EOE

## NEW HAMPSHIRE

**DARTMOUTH COLLEGE**

John Wesley Young Research Instructorship
The John Wesley Young Instructorship is a two-year post-doctoral appointment intended for promising Ph.D.'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. Instructors teach four ten-week courses distributed over three terms, though one of these terms in residence may be free of teaching. The assignments normally include introductory, advanced undergraduate, and graduate courses. Instructors usually teach at least one course in their own specialty. Nine-month salary of $43,800.00 supplemented by summer research stipend of $9,733.00 for instructors in residence for two months in summer. To be eligible for a 2003-2005 Instructorship, candidate must be able to complete all requirements for the Ph.D. degree before September, 2003. Applicants should get a copy of the application information and the required response-form at http://www.math.dartmouth.edu/recruiting/. Or, sub-mit a letter of application, curriculum vitae, graduate school transcript, thesis abstract, statement of research plans and interests, and at least three, preferably four, letters of recommendation to Donna Black, Department of Mathematics, Dartmouth College, 6188 Bradley Hall, Hanover, New Hampshire 03755-3551. Applications received by January 5, 2003 receive first consideration; applications will be accepted until position is filled. Dartmouth College is committed to diversity and strongly encourages applications from women and minorities.

**DARTMOUTH COLLEGE**

The Department of Mathematics seeks to recruit at the senior level in Applied Mathematics with an initial appointment in the 2003-2004 academic year. The successful candidate will be acknowledged leader in his/her field with proven ability to work across disciplines and attract outside funding. Applicants with any of a wide variety of interests ranging from traditional applied fields and backgrounds, e.g. signal processing, mathematical statistics, PDE's, as well as new application areas such as informatics, quantum computing or applied algebra, are encouraged to apply. Various projects are currently funded by NSF NIH, NIMH, and DoD. Active collaborations with the medical and engineering schools, and programs in computer science and cognitive neuroscience exist. Collaborations and/or appointments in Dartmouth's M.D./Ph.D. program, as well as Dartmouth's Institute for Secure Technologies Studies, are also possible. Lab space in the new mathematics building will also be available and future hirings in applied mathematics are anticipated

Candidates must be committed to outstanding teaching and interaction with students at all levels of undergraduate and graduate study and be willing to advance applied mathematics across campus.

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 two courses per quarter for two ten-week quarters or one course for each of two quarters and two courses for one quarter. The combination of committed colleagues and talented, responsive students encourages excellence in teaching at all levels.

To apply, a copy of the application information and required response form may be obtained online from our web site at http://www.math.dartmouth.edu/recruiting/. Or, send a letter of application, curriculum vitae, and a brief statement of research results and interests; and arrange four letters of reference, at least one of which specifically addresses teaching, to Donna Black, Recruiting Secretary, Department of Mathematics, Dartmouth College, 6188 Bradley Hall, Hanover, New Hampshire 03755-3551. Applications received by December 6, 2002 will receive first consideration. Dartmouth College is committed to diversity and strongly encourages applications from women and minorities. Inquiries about the progress of the selection process may be directed to Dan Rockmore, Professor of Mathematics and Computer Science, Dartmouth College, Hanover, NH 03755 or via email at Daniel.Rockmore@Dartmouth.edu.

**DARTMOUTH COLLEGE**

The Department of Mathematics anticipates a tenure-track opening with initial appointment in the 2003-2004 academic year. The position is an Assistant Professorship in number theory, or "applicable mathematics." The work of candidates in applicable mathematics should straddle the line of pure and applied mathematics. The successful candidate will be a researcher working in core mathematics who has a proven track record in pursuing both the theoretical development of his/her subject, as well as potential applications. Examples would include (but are not limited to) number theorists with interests in cryptography or coding theory, representation theorists who work in signal processing, combinatorialists with interests in computing, probabilists with interests in statistics, as well as more classical applied mathematicians. Various projects are currently funded by NSF and DoD. Active collaborations with the medical and engineering schools, and programs in computer science and cognitive neuroscience exist. Collaborations and/or appointments in Dartmouth's M.D./Ph.D. program, as well as Dartmouth's Institute for Secure Technologies Studies, are also possible. In number theory, we have interests in both algebraic and analytic number theory.

Candidates for the position must be committed to outstanding teaching and interaction with students at all levels of undergraduate and graduate study, and must demonstrate an exceptional potential for research. Candidates with several years of experience should be able to give evidence of a research program that has achieved peer-recognition and which promises future research leadership in the mathematical community. Candidates who do not have this level of experience must have demonstrated the potential for future mathematical research leadership in their Ph.D. work.

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 two courses per quarter for two ten-week quarters or one course for each of two quarters and two courses for one quarter. The combination of committed colleagues and bright, responsive students encourages excellence in teaching at all levels.

To apply, get a copy of the application information and the required response-form at http://www.math.dartmouth.edu/recruiting/. Or, send a letter of application, curriculum vitae, and a brief statement of research results and interests; and arrange four letters of reference, at least one of which specifically addresses teaching, to Donna Black, Recruiting Secretary, Department of Mathematics, Dartmouth College, 6188 Bradley Hall, Hanover, New Hampshire 03755-3551. Applications received by January 5, 2003 will receive first consideration.

Dartmouth College 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 may be directed to Dwight Lahr, Recruiting Chair.

## NEW YORK

**ST. JOHN'S UNIVERSITY**

St. John's University, with campuses in the Hillcrest- Jamaica and Staten Island sections of New York City, is an independent Catholic co-educational institution in the Vincentian tradition.The Department of Mathematics and Computer Science, St. John's College is seeking applications for a tenure-track position at the Assistant or Associate Professor rank in Mathematics on the Queens campus for September 2003. Applicants should possess a Ph.D. in Mathematics. A commitment to teaching and research is essential.Send letter of application, resume, three letters of recommendation and undergraduate and graduate transcripts to: Search Committee, Dept of Mathematics & Computer Science SJH 334, St. John's University 8000 Utopia Parkway, Jamaica, NY 11439 or email: trainac@stjohns.eduSt. John's University is an Equal Opportunity Employer and encourages applications from women and minorities.

**SUNY POTSDAM**

SUNY Potsdam invites applications for one anticipated full-time tenure-track position effective September 1, 2003, at the rank of Assistant Professor. Responsibilities of the position include teaching twelve hours per semester of undergraduate through first year graduate courses. Required qualifications are a Ph.D. in any area of mathematics with a strong interest in and preparation for teaching undergraduate major mathematics courses. Candidates from all areas of mathematics are encouraged to apply. Applications, which must include a letter of interest, a teaching statement, a curriculum vitae, three letters of recommendation at least one of which addresses teaching experience and abilities, and a transcript (a copy is acceptable) should be sent to Dr. Victoria Klawitter, Staffing Committee Chair, Department of Mathematics, SUNY Potsdam, Potsdam, NY 13676 or email at klawitv@potsdam.edu. To ensure full consideration, complete applications must be received by January 22, 2003. For information about the College and the department, you may go to http://www.potsdam.edu/. SUNY Potsdam is an equal opportunity employer committed to excellence through diversity.

**NEW YORK CITY COLLEGE OF TECHNOLOGY**

Position: Instructor/Assistant Professor
Department of Mathematics
Instructor/Assistant Professor

For appointment as an assistant professor must appropriate earned doctorate, research experience and interest, college level teaching experience . Competence to teach introductory mathematics through differential equations, expertise with computers and instructional technology in math courses. Expertise in curriculum development, instructional technology and innovative pedagogy is desirable. Salary: Instructor: $32,133 - $52,123; Asst. Prof: $35,031 – 61,111. Resumes to: Michelle Harris, Human Resources, New York City College of Technology, 300 Jay Street, Namm 321, Brooklyn, N Y 11201. EOE

## OHIO

**COLUMBUS STATE UNIVERSITY**
Assistant Professor of Mathematics (Tenure track) Begins August 2003. PhD required. (Possible multiple positions). Responsibilities include teaching lower and upper level mathematics courses. The specialty area is open. Faculty are encouraged to continue their research and grow professionally. Previous teaching experience is preferred and at least one reference should be capable of addressing teaching experience of the candidate. http://math.colstate.edu

Applicants should submit letter of application, current vita, statement of teaching philosophy and research plans and the names and contact information of three references to Dr. Arthur Cleveland, Dean, College of Science, Columbus State University, 4225 University Ave., Columbus, GA 31907-5645 (or to: Cleveland_Art@colstate.edu) Review will begin immediately and continue until the position is filled. Additional information may be found at www.colstate.edu. CSU, an AA/EEO employer, is committed to diversity and equality in education and employment.

**OTTERBEIN COLLEGE**
Otterbein College invites applications for a tenure-track, Assistant/Associate Professor position in Mathematics, beginning Sept. 1, 2003. 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, particularly those who have demonstrated success in introductory courses. Strong commitment to quality teaching and to the objectives of liberal arts education is essential. The faculty member will be expected to teach 35 credit hours per academic year (7-8 courses, quarter system). These will include primarily introductory-level courses, with upper-level courses selected according to the candidate's background and interests. Scholarship should complement the subdisciplines currently represented in the department: topology, analysis, fuzzy mathematics, control theory, graph theory, operations research, actuarial science, and mathematics education. 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, OH 43081; e-mail inquiries to SNeal@otterbein.edu. Deadline: December 31, 2002.

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

## PENNSYLVANIA

**MILLERSVILLE UNIVERSITY OF PENNSYLVANIA**
Full-time, tenure-track assistant professorship to begin August 2003, in a department of 20 faculty and approximately 175 majors in mathematics and mathematics education. Area of expertise in discrete mathematics with specialization in computational or applied aspects of finite fields, geometry, or number theory is required. Ph.D. (or completion by second year reappointment) in mathematics is required. Must exhibit evidence of strong commitment to excellence in teaching and continued scholarly activity. Must be prepared to teach a broad spectrum of undergraduate mathematics courses and have potential to contribute to the department's programs. Must provide evidence of teaching effectiveness and must complete a successful interview and teaching demonstration. Duties include an annual 24-hour teaching load, scholarly activity, student advisement, supervision of student research, curriculum development and committee work. Salary/benefits are competitive. Full consideration given to applications received by January 24, 2003. E-mail applications will not be accepted. Send letter of application addressing qualifications, curriculum vita, copies of undergraduate and graduate transcripts and three current letters of reference (at least two of which attest to recent teaching effectiveness) to Dr. Hisa Tsutsui, Search Chair/FO1202, Department of Mathematics, Millersville University of Pennsylvania, P.O. Box 1002, Millersville, PA 17551-0302. An AA/EO Institution.

**ROBERT MORRIS UNIVERSITY**
Department of Mathematics
Moon Township, Pennsylvania
Applications are invited for two fulltime renewable positions in mathematics at Robert Morris University. The starting date is August 22, 2003. These positions will be filled at the rank of Assistant Professor or above, with a minimum qualification of a doctoral degree.

Priority will be given to (1) applicants with background and experience in applied mathematics with an actuarial, financial or decision-sciences orientation, and (2) applicants with background and experience in mathematics education. Responsibilities include teaching 12 credit hours per semester in courses supporting the schools of business and engineering as well as majors in applied mathematics and/or mathematics education, continuing scholarly activity, and service to the department and the university.

Candidates should have documented evidence of excellence in teaching across a wide spectrum of mathematics. Application review will begin November 8, 2002. All candidates must have documentation and authorization to work in the United States. EOE.

Send materials, including a c.v, a cover letter specifically addressing qualifications and interests, and three letters of reference, at least one of which addresses teaching ability, to:
Len Asimow, Ph.D., A.S.A.
Robert Morris University
881 Narrows Run Road
Moon Township, PA 15108
(asimow@rmu.edu)

## SOUTH CAROLINA

**COASTAL CAROLINA UNIVERSITY**
Department of Mathematics and Statistics
Assistant Professor
Applications are invited for at least one tenure-track position at the rank of Assistant Professor in the Department of Mathematics and Statistics. Employment would begin in August 2003. Applicants must have a Ph.D. in Mathematics or by August 2003. The teaching load will be 12 credits per semester with the possibility of a course reduction in the second semester for candidates with a strong research program. Candidates from all research areas will be considered, but preference will be given to those applicants whose research complements the current composition of the department. In particular, candidates with a background in Analysis or Industrial Mathematics are encouraged to apply.

Coastal Carolina University is a public, predominantly undergraduate liberal arts institution, located approximately 10 miles from Myrtle Beach, South Carolina. The Department offers a Major in Applied Mathematics and several Minors including Statistics and Actuarial Science. In Addition, the University offers a Master in Education and a Master in the Art of Teaching, both with the option of a concentration in Mathematics.

Each applicant should submit the standard AMS cover sheet, a letter of application, curriculum vitae, statement of teaching and research interests, and three letters of reference, at least one of which should address the candidate's teaching, to Dr. Prashant Sansgiry, Chair, Department of Mathematics and Statistics, Coastal Carolina University, P.O. Box 269154, Conway, SC 29528-6054. Deadline for initial consideration is December 15, 2002 and the search will continue until the position is filled. Please indicate if you will be attending the annual meeting in Baltimore in January 2003.

Coastal Carolina University is an AA/EO employer, and encouragesapplications from women and minorities. Additional information can be accessed at: www.coastal.edu.

**THE CITADEL, MILITARY COLLEGE OF SOUTH CAROLINA**

Department of Mathematics and Computer Science

Faculty Position: Department Head at the Rank of Associate or Full Professor Level

THE CITADEL: The Department of Mathematics and Computer Science invites applications and nominations for the head of the department at the rank of associate or full professor level, beginning in the fall 2003 academic year. Qualifications for the position include an earned Ph. D. in an area of mathematics or computer science, administrative experience, a demonstrated commitment to excellence in teaching and service, and an established record of research. Salary and benefits will be competitive.

Applicants should submit a letter of application, curriculum vita, a statement of administrative philosophy with details about personal administrative experience, and the names of at least three references. Applications will be reviewed as they are received, beginning January 15, 2003, and the position will remain open until filled. For more information about the college and the department, please see http://www.mathcs.citadel.edu. Further questions about the position should be directed to the chair of the search committee. Applications and supporting materials should be addressed to: Dr. Peter Greim, Chair, Search Committee, Department of Mathematics and Computer Science, 171 Moultrie Street, The Citadel, Charleston, SC 29409: phone: 843-953-5035; fax: 843-953-7391; e-mail: peter.greim@citadel.edu. You may also submit application and materials online at http://citadel.edu/hr. Please reference job #F02-17MAA. Applications from women and minorities are especially encouraged. The Citadel is an AA/EOE institution. (006135)

The Citadel is an affirmative action/equal opportunity employer, dedicated to multi-cultural diversity in campus leadership positions.

## TEXAS

**R. L. MOORE INSTITUTE**

Executive Director

Austin, TX

The Educational Advancement Foundation, a nonprofit organization supporting mathematical education through inquiry-based learning, seeks a full-time Executive Director for the R. L. Moore Institute (our new multi-program office situated near The University of Texas campus, which will be headquarters for the Legacy of R.L. Moore Project).

Applicants should have a strong mathematics background (preferably a current or former faculty member), including recent administrative or leadership experience in academic societies or professional associations. In addition, a history of "entrepreneurial" (i.e. sole proprietorship or small business) type management accomplishment is desirable.

Duties: Strong "hands-on" managerial leadership and personal involvement carrying out non-routine activities is essential. The Executive Director will coordinate workflow and assign "priority" while working actively with a small staff and a large, diverse group of consultants/volunteers/constituency members and outsiders. The candidate shall have exceptional communication, organizational and executive skills as well as an ability to articulate a mission-focused vision to diverse con-stituencies. It is essential that the Executive Director be able to manage actively and conclude multiple non-routine projects on a timely basis.

Requirements: Advanced degree in mathematics or science desirable, with over 10 years educational/administrative experience. The prospective Executive Director must demonstrate accomplishment in combining leadership with administrative controls and support, while sustaining entrepreneurial initiatives. Applicants must be adaptable and flexible to rapidly changing priorities; a self-starter and self-responsible individual with a successful history working with both small groups and larger organizations/associations.

Excellent benefits (health, life, and long-term disability insurance, retirement, etc.) and stimulating cross-discipline working en-vironment with demanding workload. Compensation includes an early merit bonus for exceptional performance.

R. L. Moore Institute is an equal opportunity employer.

Email cover letter and resume to: personnel@edu-adv-foundation.org

**ST. MARY'S UNIVERSITY OF SAN ANTONIO**

The Department of Mathematics at St. Mary's University of San Antonio, Texas, invites applications for two tenure-track faculty positions at the assistant professor level beginning Fall 2003. Ph.D. in mathematics, mathematics education, statistics, or applied mathematics, quality teaching of various undergraduate courses, and evidence of scholarly activities required. All areas considered. Review of applications will begin immediately. Positions open till filled. Send application letter, resume, statements of teaching and research interests, and three letters of reference to: Dr. Mary Wagner-Krankel, Department of Mathematics, St. Mary's University, San Antonio, TX 78228-8560. St. Mary's University is an equal opportunity/affirmative action employer