

FOCUS

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An Aperiodic Convex Space-filler is Discovered

Earlier this year, Princeton mathematician John Horton Conway discovered a convex polyhedron that will fill space, but only aperiodically. The space-filler is a biprism, that is, two slant triangular prisms fused together (its faces are four congruent triangles and four congruent parallelograms). Several years ago, Peter Schmitt, at the University of Vienna, described a non-convex aperiodic space-filler, and Conway's biprism fills space in a similar manner. First, copies of the tile fill a layer (and in this single layer, the tiling is periodic), and layers are stacked to fill space. However, adjacent layers must be rotated with respect to each other by a fixed irrational angle, thereby ensuring that the tiling is aperiodic.

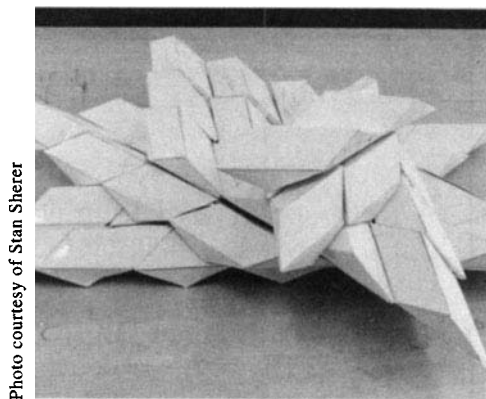


Photo courtesy of Stan Sherer

An example of Conway's tiling built at the Regional Geometry Institute at Smith College

Conway's discovery was announced at the Regional Geometry Institute held this past summer at Smith College. There, the participants (over 100, including undergraduate REU participants, graduate students, high school teachers, and research mathematicians) assembled cardboard models of the biprism and stacked them to witness the aperiodic space-filling. One participant, Ludwig Danzer, of the University of Dortmund, noted that Conway's tiling was not face-to-face, and quickly devised an "improved" version. The parallelogram faces of Danzer's biprism are inscribed with congruent triangles (which are considered as faces) and when his polyhedron is stacked in the same manner as Conway's, the tiling is aperiodic and also face-to-face.

Inside the New Employment Register

S. Brent Morris

The Mathematical Sciences Employment Register (ER) underwent a major change at the 1993 San Antonio meeting: it has a new algorithm for scheduling interviews between employers and applicants. The two-day ER, held annually at the joint meetings, usually comes in the middle of a new Ph.D. mathematician's job search, sometime after the fall's first optimistic mailing of applications, but before the spring's cold panic. In recent years, the ER has offered only slight comfort to applicants, even as it has changed dramatically to serve the community better. A more thorough understanding of the new ER will not necessarily help an applicant find a job, but it may reduce some frustration during the process.

The ER is the responsibility of the Joint Committee on Employment Opportunity (JCEO). The MAA, AMS, and SIAM ap-

point two members each to the JCEO. AMS staff see to the day-to-day functions of the ER, whose mission is to serve as an honest and fair broker in the mathematical job market, bringing together interested applicants and employers.

Prior to the 1993 San Antonio meeting, the ER utilized rather aged "black box" software to generate the interview schedules. Data was fed into a black box, an algorithm ran, and schedules were spit out.

This old scheduling algorithm was procrustean in its treatment of requests: all were equally likely—employers and applicants, one-way and mutual.

As long as the numbers of employers and applicants were approximately equal, the ER's system worked well. Because of the tightening job market, however, the paradigm had recently changed, and employers had been expressing concern over seeing too

few of their requested candidates.

The JCEO recognized that the ER's effectiveness was eroding, and that employers had begun to drift slowly away. Since the ER treated applicant and employer requests equally, a larger supply of applicants meant fewer scheduled interviews initiated by employers. Applications inundated math departments, especially larger ones, whose members found little marginal value in sitting through 48 fifteen-minute interviews in San Antonio while 200-plus applications awaited them at home.

After a careful review, the JCEO decided to refocus its efforts. The purpose of the ER no longer would be merely scheduling interviews, but would be scheduling interviews most likely to lead to a campus interview or further actions toward employment for an applicant. The new policy statement reads:

Please see Employment Register on page 4



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Cincinnati Meetings Update

The annual joint meetings of the American Mathematical Society and the MAA will be held in Cincinnati during January 12-15, 1994. The program announcement appeared in the October issue of FOCUS and also in the October issue of the AMS Notices.

Additions

The MAA Teaching Awards Presentations on Friday will be followed by a recital at 8:45 P.M. honoring MAA Sectional and National Teaching Awardees; Jane Price, violin, and Ruth Price, piano, will be performing *Sonata in D minor* by Brahms. The Association for Women in Mathematics will present its Louise Hay Award for Contributions to Mathematics Education during the Joint Prize Session on Thursday afternoon rather than at the AWM business meeting. The title of the AWM panel discussion on Wednesday afternoon

is "Are women getting all the jobs?"

David A. Smith, Duke University, will be a participant in the Wednesday morning panel discussion on "Revising the AP calculus syllabus."

The Mathematical Sciences Education Board is sponsoring a "Focus Group on the Draft NCTM Assessment Standards," scheduled from 5:15 P.M. to 6:30 P.M. on Friday. The Assessment Standards will help determine how schools measure what students are learning in mathematics. The purpose of the meeting, organized by Susan Forman, is to gather comments and advice about the Standards from members of the AMS and MAA, which will then be sent on to the leadership of NCTM. Copies of the Standards document (or a summary thereof) will be available at the registration area. Please attend all or part of the session and share your

thoughts about this crucial area of school mathematics.

Corrections

The panel discussion, *Life After Retirement*, organized by Andrew Sterrett, Denison University and the MAA, will be held on Thursday, 5:45 P.M. to 6:45 P.M.

The Two-Year College Reception will be held at 5:45 P.M. to 7:00 P.M. on Thursday.

John A. Dossey will not be able to participate in the Assessing Calculus Reform Efforts panel scheduled for Saturday, 1:00 P.M. to 2:00 P.M.

Summer Joint Meetings Vancouver, Canada

Members of three North American mathematical societies converged on the campus of the University of British Columbia, in Vancouver, Canada, in August, as the MAA, the American Mathematical Society, and the Canadian Mathematical Society held their first ever three-way joint summer meeting.

Sir Michael Atiyah was this year's Earle Raymond Hedrick Lecturer. Sir Michael, who is Master of Trinity College Cambridge and Director of the Isaac Newton Institute for Mathematical Sciences in Cambridge, chose as the theme for his three lectures: *Recent Developments in Geometry and Physics*. A capacity audience listened to Sir Michael concentrate on historical matters in his first lecture, turning to three dimensional space in the second, and four dimensions in the third.

The Hedrick Lectures, established by the MAA in 1952, are named after Earle Raymond Hedrick, the first President of the Association, who died in 1943.

Also of particular note to MAA members, among the many and varied events at the meeting, was the awarding of a number of Association prizes.

The Carl B. Allendoerfer Award, for authors of expository articles published in *Mathematics Magazine*, went to Xun-Cheng Huang, of the New Jersey Institute of Technology, for his article *From Intermediate Value Theorems to Chaos*, which appeared in MM 65 (1992), 91—103.

The Lester R. Ford Awards, given to authors of expository papers published in the *American Mathematical Monthly*, went to Donald E. Knuth, Professor Emeritus at Stanford University, for his paper *Two Notes on Notation*, which appeared in AMM 99 (1992), 403—422, and to Carsten Thomassen of the Technical University of Denmark, for his article *The Jordan-Schönflies Theorem and the Classification of Surfaces*, AMM 99 (1992), 116—130.

The George Pólya Awards, for authors of expository papers published in the *College Mathematics Journal*, went to Lester H. Lange and James W. Miller, respectively Professor Emeritus at San Jose State University and a Ph.D. student at Southern Methodist University in Dallas, Texas, for their paper *A Random Ladder Game: Permutations, Eigenvalues, and Convergence*

of *Markov Chains*, CMJ 23 (1992), 373—385, and to Dana N. Mackenzie, of Kenyon College, for his paper *Triquetras and Porisms*, CMJ 23 (1992), 118—131.

The Merten M. Hasse Prize is designed to encourage younger mathematicians to take up the challenge of expository writing, and is awarded by the Association every two years for an expository paper published by the Association where at least one of the authors is younger than forty years of age. It was given to Jonathan M. Borwein, Peter B. Borwein, and David H. Bailey, for their paper *Ramanujan, modular equations, and approximations to pi, or how to compute one billion digits of pi*, AMM 96 (1989), 201—219. The two Borwein brothers are at Simon Fraser University, Bailey is at the NASA Ames Research Center.

Three of the Association's Section Awardees for Distinguished Teaching, honored at the January meeting in San Antonio, gave displays of the classroom skills that had led to their awards. They were V. Frederick Rickey (Bowling Green State University), Doris Schattschneider (Moravian College), and Philip D. Straffin, Jr. (Beloit College).

Meetings Deadlines

Kenneth A. Ross
MAA Associate Secretary

These days our Joint Annual Meetings in January and our Joint MathFests in August have rich programs. The planning and scheduling is quite complicated. Many program elements come from various MAA committees; a few are suggested by interested individuals. Several people have asked me what the deadlines are. Here are the general restrictions; minicourses and sessions of contributed papers are discussed in the next paragraph. In order to keep our membership fully informed, it is essential that all program elements for the January meetings be set and announced in the October issues of FOCUS and the AMS NOTICES. Therefore, the absolute deadline for arranging all program elements for January meetings is **August 1**. However, I encourage everyone to submit their pro-

posals to me by June 15 so that I can start making the schedule and have an idea of how the program will evolve. These remarks apply to the program elements that are solely my responsibility: panel discussions, special presentations, workshops, readings, plays, recitals, etc. Similarly, the absolute deadline for arranging all program elements for August meetings is **February 1**, and I encourage everyone to submit their proposals to me prior to or at the January meetings.

Minicourses and sessions of contributed papers are monitored by committees to which proposals have to be submitted. There are advantages to having these important program elements carefully monitored, but a disadvantage is that it takes committees longer than individuals to process propos-

als. These committees have considered "late" proposals, and probably will in the future, but they prefer to avoid this because then the decisions are made by the committee chairs rather than the full committees.

The Committee on Minicourses (Joan Weiss, chair) does its planning a year in advance, and so proposals are due **thirteen months prior to the meeting**. The extra month is needed so that the proposals can be circulated to the committee and studied prior to the actual committee meeting at which they are discussed. The Committee on Sessions of Contributed Papers (Elizabeth J. Teles, chair) also does its planning well in advance. Proposals are due **at or prior to the AMS-MAA Joint meeting held twelve months prior to the meeting to which the proposal refers**.

Employment Register from page 1

The Employment Register should schedule interviews with the highest *a priori* probability of producing a job, and this is most likely to occur when the employer has requested the interview. The Employment Register best serves applicants by attracting as many employers as possible, and this is most likely to occur when employer requests are given priority.

To implement this policy, a new scheduling algorithm was needed. The JCEO contracted with R. Jarvis, D. Shier, and M. Myers of Clemson University for the software; appropriate software was not available commercially or from any other professional society.

The Clemson-produced software was delivered on schedule; it is robust, flexible, and can handle all situations the JCEO presently foresees facing the ER.

In essence, here is how the Jarvis-Shier-Myers algorithm schedules interviews during forty periods over two days:

- Employers request up to twenty interviews.
- Applicants request up to twenty interviews, marking four as "high priority."
- Interviews are scheduled in the following order:

1. Mutual requests
2. Employer requests
3. Applicant "high priority" requests
4. Applicant normal requests

After each interview is scheduled, applicants are reordered so those with the fewest interviews are given priority for the next round.

The algorithm contained a few potential traps, however. During past ERs there had always been a small number of "hot" applicants (those particularly well-qualified and requested by dozens of schools). For the most part, the new algorithm allowed market forces to determine scheduling and did not try to create an artificial equality of applicants. Since the order of scheduling interviews strongly favored employers, this meant employers would get most of their requests, some applicants would have many interviews, and a number of applicants would have only two or three.

Was this the fairest way to run the ER?

After a great deal of debate, the JCEO decided this was indeed the best way to run the ER. If the ER ignored market forces, then the market would ignore the ER. The ER serves no one well by scheduling interviews of low interest to employers; employers become frustrated and can deny inter-

views to other applicants. To counterbalance employers' requests, applicants' high priority requests are most likely to be scheduled. Average applicants may not get as many interviews, but the interviews should be their top choices.

Despite extensive testing of the new algorithm, the atmosphere was tense on the first night the software went to work. When a program is run only once a year, there is a scant margin of error. The old, discredited algorithm was on line as an emergency backup, on the assumption: better poor schedules than none.

But there was no need to worry. The software performed flawlessly, and the results exceeded our highest expectations. The 1993 ER scheduled as many interviews as it had in previous years, but the quality (as measured by the desirability of the interview) increased.

There were 491 applicants and 68 employers (representing 92 positions) at the 1993 ER. Here are some figures showing the performance of the Jarvis-Shier-Myers scheduling algorithm:

- 100% of mutual requests were satisfied.
- 100% of employer requests were satisfied.

Please see Employment Register on page 14



Secretary's Report and Notice of Proposed Bylaws Revisions

G. L. Alexanderson, Secretary

At the Vancouver meetings in August the Board of Governors, in addition to covering the usual agenda, heard reports on electronic services and discussed at some length ways in which the Association can enhance the flow of information through improved electronic services for the membership. This discussion will guide the newly appointed Committee on Electronic Services in formulating recommendations for action.

Kenneth Ross, Associate Secretary, reported to the Business Meeting in the absence of the Secretary. One of the items reported on was the success of the current Coordinating Council structure in facilitating the appointment of MAA Committees. Representation on committees is broader now than it has been in the past, due in part to a wider range of recommendations for committee membership. The Committee on Committees is still soliciting names of MAA members who would like to serve the Association in this way. Those interested should write me or contact me by e-mail (galexanderso@scuacc.scu.edu).

At the Business Meeting the membership approved a bylaws change shortening the time between the mailing of ballots and the close of the election for President-Elect, First Vice-President, and Second Vice-President. (See FOCUS, April 1993, page 3.)

In Vancouver the Board of Governors approved another series of bylaws revisions proposed by the ad hoc Committee on Bylaws and recommended by the Executive and Finance Committees. The following are the proposed changes, and this constitutes formal notice to the membership that these changes will be proposed at the Business Meeting in Cincinnati on January 13, 1994.

(1) **Terms of Office** The current Bylaws specify that terms of officers, some Board members, and most committee members begin and end at the adjournment of the annual (January) business meeting. This was appropriate when the business meeting of the Association took place on the last day of the annual meetings, but with the recent format for the joint meetings, this provision leads to the curious problem of having committees that meet at the annual meeting fall technically into two categories: those that

meet before the business meeting and that cannot have the newly appointed members attend as official members of the committee and those committees that meet after the business meeting and hence have the newly appointed members officially on the committee but not the retiring members of the committee. This awkward problem has, in fact, been avoided by having committee chairs invite both retiring members and newly appointed members to attend such meetings. This has sometimes led to confusion, however, in the Meetings Department in Providence. The current practice also means that the Association has two presidents at every other January meeting, one before the business meeting and another one after. The Board of Governors recommends that the word "business" be deleted from the first sentence of Article IV, Paragraph 1(d), and the word "conclusion" be substituted for "adjournment" so that the sentence currently reading

"The beginning and end of the term of every officer and member of the Board (except as provided in Section (b) of this Article) shall occur at the adjournment of the annual business meeting."

would in the future read

"The beginning and end of the term of every officer and member of the Board (except as provided in Section (b) of this Article) shall occur at the conclusion of the annual meeting."

(2) **Changes in Wording** The Board of Governors recommends the following. They are stylistic changes only.

In Article V, Paragraph 4, the paragraph that now reads

"At all business meetings of the Association a quorum shall consist of not less than fifty (50) members and no business may be validly transacted at a meeting at which fewer than a quorum are present."

would be changed to

"At all business meetings of the Association a quorum shall consist of fifty (50) members and no business may be validly transacted at a meeting at which fewer than a quorum are present."

Similarly, the first sentence of Article VI, Paragraph 5, which now reads

"A group of not less than twenty-five members of an existing Section may petition the Board to partition the area and the Section into two or more Sections."

would be changed to

"A group of twenty-five members of an existing Section may petition the Board to partition the area and the Section into two or more Sections."

And similarly, the first sentence of Article VI, Paragraph 6, which now reads

"A group of not less than twenty-five members residing or employed in that part of the area of an existing Section which they desire to become part of another existing Section may petition the Board to redefine the geographic boundaries of the Sections affected."

would be changed to

"A group of twenty-five members residing or employed in that part of the area of an existing Section which they desire to become part of another existing Section may petition the Board to redefine the geographic boundaries of the Sections affected."

(3) **New Business at a Business Meeting**

There is concern that the current Article of the Bylaws on business meetings of the Association (Article V) could permit binding action on items brought to the floor without prior notice, providing a quorum of fifty (50) members were present.

Here is the current article covering business meetings of the Association:

"Article V. Business Meetings of the Association

1. A business meeting of the Association shall be held annually, at such time and place as the Board may direct. Other business meetings of the Association may be called from time to time by the Board or by the President of the Association to be held at such time and place as may appear from the call.

Please see *Bylaws* on page 6



Minority Students in Southeast Get Boost Toward Mathematics Careers

Sylvia T. Bozeman

Given the excitement and enthusiasm of the students, it could have been a festival of any kind. Fifty students from twenty colleges and universities located in nine states gathered at Spelman College in Atlanta, GA to hear mathematicians discuss their research and to explore the possibility of becoming mathematical scientists. Over a three day period during March 1993 the second MATHFest for undergraduate mathematics majors was held to encourage minority students to enter graduate school and pursue careers in the mathematical sciences.

The lineup of dynamic speakers who generated unquestionable excitement about mathematical research included several rather recent recipients of doctoral degrees in the mathematical sciences: Iris Mack (*Financial engineering to aerospace engineering*), Danielle Carr (*Mathematical biology*), Nathaniel Dean (*Graph theory*

in communications), Freda Porta-Locklear (*Numerical analysis with partial differential equations*), and Wanda Patterson (*Geometry in Banach spaces*). Another highly informative and motivational speaker was Johnny Houston (*Minorities in the mathematical sciences*). Students were also able to attend a lecture given by Professor Aderemi Kuku, President of the African Mathematical Union, whose visit to Atlanta was jointly hosted by the institutions of the Atlanta University Center. In addition to the content of the presentations, students were equally impressed by the lineup of mathematicians with whom they could identify as role models. One commented that the "speakers were very passionate about their subjects" while others felt that the main strength of the conference was the diversity of the speakers, both in their backgrounds and their presentations.

Another very effective aspect of the conference was the interaction of undergraduates with mathematics graduate students. Minority graduate students from the University of Maryland, the University of Massachusetts-Amherst, Wesleyan University, Georgia Institute of Technology, Clark Atlanta University, and Clemson University presented part one of the panel discussion, *Straight Talk About Graduate School*. For the remainder of the conference, graduate students could be seen during breaks with small groups of intense listeners close by. Students even requested an additional lunch time session with the graduate students to continue discussions on issues raised earlier. Students and non-students praised the informality and friendly atmosphere which enhanced interactions between students, presenters, faculty and graduate students, and promoted networking which could continue after the conference.

To give balance to the conference, stu-

Please see Careers on page 21

Bylaws from page 5

2. Notice of any business meeting of the Association shall be given by the Secretary to each member of the Association at least thirty (30) days prior to the date set for each meeting.

3. Any member of the Association may waive notice with the same effect as if due notice had been given.

4. At all business meetings of the Association a quorum shall consist of not less than fifty (50) members and no business may be validly transacted at a meeting at which fewer than a quorum are present."

To this article the Board of Governors recommends adding the following Section 5:

"5. An item can be formally acted upon at a business meeting of the Association only if: (1) it has been proposed by the Board of Governors, (2) it has been submitted to the Secretary thirty (30) days in advance of the meeting, or (3) it receives unanimous consent at the business meeting for consideration for approval by acclamation."

(4) **Rules of Order Bylaws** should include a reference to the rules by which the meetings of the organization are to be conducted. Ours do not. The Board of Governors therefore proposes the addition of a new Article X that would read as follows:

"Article X. Parliamentary Authority

The rules contained in the current edition of Robert's Rules of Order Newly Revised shall govern the Association in all cases to which they are applicable and in which they are not inconsistent with these bylaws and any special rules of order the Association may adopt."

The current Article X would then be renumbered Article XI.

(5) **Changes in Election of Members of the Finance Committee** The current Bylaws specify that when there is an opening for one of the two elected members of the Finance Committee, the Executive Committee will send the names of two nominees to the Board. This works well when the incumbent is not running for re-election, but when the Executive Committee nominates an incumbent and one other person, an

awkward situation is created. An able and conscientious incumbent may feel uncomfortable having to compete in a contested election. And, on the other hand, it may be difficult for the Executive Committee to find someone who is willing to run against a current member of the Finance Committee where people will likely assume that the incumbent will be re-elected. The Board of Governors therefore recommends that Article IV, Paragraph 1(g), be changed. The second sentence which currently reads

"At least two nominations shall be made for each office to be filled in the case of Governors (except Sectional Governors) and members of the Finance Committee."

would be changed to

"At least two nominations shall be made for each office to be filled in the case of the Governors (except Sectional Governors) and members of the Finance Committee, except in the case in which the Executive Committee wishes to nominate for re-election a current member of the Finance Committee. In this case only one nomination by the Executive Committee is required."

SUMMA Grants for Intervention Projects Available

The MAA plans to award small grants for development of mathematics-based intervention projects in spring 1994. SUMMA is soliciting college and university mathematicians and their department and institution to submit planning proposals for the advance work necessary to host mathematics-based intervention projects for middle and high school students, targeting underrepresented minority students. Projects may replicate an already successful project, adapt components of other projects, or be entirely innovative. Planned activities should include those characteristics in successful projects such as *Lessons for HBCUs from Precollege Mathematics and Science Programs*. These lessons are summarized at the end of this announcement. The goal of the planning should be a formal proposal for a project to be submitted to public or private agencies for funding.

Objectives

Specific objectives of the SUMMA small grants program are to:

- Encourage mathematicians to develop projects to increase minority participation in mathematics;
- Provide funds for directors' visitations to established projects;
- Enable the director to work with the host institution to recruit faculty and further develop the foundation for the project through other methods;
- Carry out a feasibility study;
- Provide the director the opportunity to participate in a proposal writing workshop;
- Secure technical assistance in proposal writing and fundraising;
- Make it possible for the project director to contact private foundations, public agencies, and industry for additional support.

Nature of the Grant

Grants are a maximum of \$5000 and will be awarded to the project director's institution. Grants must be spent within the year. Project directors have obligations in accepting the grants. They must design a project and submit versions of a proposal beginning in May 1994, until funded, with the assistance of the SUMMA staff.

To provide maximum flexibility, unexpended funds may be carried forward. An institution is expected to supply matching funds or in-kind support as an indication of commitment to the development of the project. While the MAA will fund the planning activities, it will not fund the project itself. These grants will not support any indirect institutional costs.

Who May Apply

- Minority institutions; or
- colleges and universities which have student bodies with a high percentage of underrepresented minorities (at least 20%) and a successful track record in developing minority students' interests in mathematics and science; or
- colleges and universities in which the institution or department has demonstrated that the faculty have the willingness and capacity to replicate or adapt successful projects.

Evaluation of Proposals

Proposals will be evaluated by members of the MAA Committee on Minority Participation in Mathematics, the Director of SUMMA, and the Executive Director of the MAA.

The single-spaced, three-page-maximum proposed plan should include:

- Concept: What ideas and philosophy do you have for a project?
- Rationale: Why will your institutions be a welcoming host for the project?
- Objectives: What are the objectives of your planning project?
- Activities: What tasks do you plan to undertake to design your project?
- Personnel: What are the name, position and qualifications of the proposed project director? Who else will be involved in the planning? How?
- Evaluation: How will you judge the success of this planning?
- Budget: How will your planning funds be spent, (personnel, travel, materials, telephone, workshop attendance, release time, etc.)?
- Commitment: What is the host institution's potential for long-term commitment?
- Future funding: What is the likelihood

of institutionalization through local or state funding (perhaps after start-up federal funding from a variety of programs)?

- Support: Can you demonstrate an ability to mobilize internal and community resources to sustain an intervention project?
- Adaptation: How might a successful existing project be adapted to your local conditions, or what is the need for innovation?
- Timeline: When will you carry out the planning activities?

Submission of Proposals

Proposals should be submitted as soon as possible, but no later than February 1, 1994. All proposers will be notified by February 15, 1994. Mathematicians receiving grants are expected to attend a workshop at MAA Headquarters February 25-27, 1994. The MAA intends to award ten to twelve grants. The SUMMA staff is available to discuss your potential proposal at any time.

For further information, contact:

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Characteristics of Effective Projects

What has been learned? Despite the differences among current highly successful intervention projects, there are some characteristics which all effective projects targeting minority students seem to have in common. These have been identified in several reports and are synthesized in this list of *Characteristics of Effective Precollege Intervention Projects*.

- Project goals are clearly articulated and measurable;
- Strong academic component; focus on enrichment, not remediation;
- Hands-on learning opportunities and use of computers;
- Highly competent teachers who believe that students can learn the material;
- Heavy emphasis on every-day applications of mathematics and on careers

Please see *Small Grants* on page 8



Mathematician, Musician, and Cook

A Personal Retrospective of Jean Dieudonné, 1906-1992, by Chantal Shafroth

Aspacious apartment overlooking the Eiffel Tower, a bright study containing a full wall bookcase decorated with antique *boiseries* and facing a large desk, a music room including a grand piano and a hi-fi system—such is the environment where Jean Dieudonné spent the last 12 years of his life. The calendar upon the desk shows the last day he sat here, a week before he died on November 29, 1992 at the age of 86. The Greek dictionary reveals his last endeavor: learning Greek in order to read Euclid and Aristotle in their original texts.

Jean Dieudonné was born in Lille, France, on July 1, 1906. His father was a self-made man who, in spite of a modest beginning, became CEO of a large textile company. He was very demanding of himself and others, had a keen sense of duty, and spent his leisure time studying on his own. He showed his son what “effort and willpower can accomplish.”¹

Jean Dieudonné’s passion for mathematics began when he encountered Algebra at the age of fourteen. This led him to enter *l’Ecole Normale Supérieure de Paris* in 1924. His

teachers at *Ecole Normale* were eminent mathematicians such as Picard, Cartan, Lebesgue, Montel, Denjoy, and Julia; and his fellow students became his colleagues, collaborators, and friends for life. After studying at Princeton, Berlin, and Zurich, Dieudonné completed his doctoral dissertation in 1931 on the theory of analytic functions of a complex variable, under the direction of Paul Montel.

In his words, “the two most important events of his life” occurred in the fall of 1934. He met his future wife Odette, who, for almost 60 years, gave him the love and support he needed. When Jean would be lost in the clouds, thinking about a proof, Odette would choose the suit and tie he needed to attend a meeting. When frustrated, Jean would have one of his legendary tantrums, and Odette would show patience and understanding. And when he wanted to entertain, she was always a very gracious hostess.

The other important event of that year was the birth of the Bourbaki group. Dieudonné was *mâitre de conférence* at the University of Rennes. His friends from *Ecole Normale* had similar positions in other French provincial universities. Most commuted to Paris twice a month to attend a *séminaire de Mathématiques*, led by Gaston Julia. The Julia Seminar differed from other existing seminars: each year it concentrated on a special topic, such as group theory or Hilbert spaces, and speakers were required to choose the simplest approach in their presentations. This forced them to synthesize existing information, creating a great impetus in their research. A group composed of Cartan, Chevalley, Delsarte, Dieudonné, Dubreuil, Leray, Mandelbrot, de Possel, and Weil began meeting before the seminar at *Capoulade*, a cafe in the Latin Quarter. Their goal was to write a treatise on analysis which would change the teaching of mathematics at the university level and also be useful to researchers, physicists, and technicians.² The first volume of *Eléments de Mathématique* was published in 1939 under the name Nicolas Bourbaki. Dieudonné was always attracted by the art of compilation; dictionaries and encyclopedias were his favorite readings. From a young age, he enjoyed



making new lists according to some new classification, so it was not surprising that he participated with enthusiasm in the writing of the treatise. In 1940, Dieudonné began writing a bulletin called *La Tribu*, which provided internal communication among the dispersed group, and he became a “key player.”³ He wrote several chapters himself, and, according to Henri Cartan, “no article was published without Jean Dieudonné reading it and including his final touch.”¹ Furthermore, he often made up all of the exercises. Adrien Douady, another member of the team, said that “fifty percent of the energy of Bourbaki came from [Dieudonné] alone.”¹ Dieudonné felt that his participation in the group broadened his mathematical knowledge considerably, forcing him to tackle new material, extending his research to topology and algebra, and exposing him to the original ideas of his teammates. The Bourbaki group still exists. It has published about 50 volumes and, like the Academy of Science, renews itself by choosing its own members.

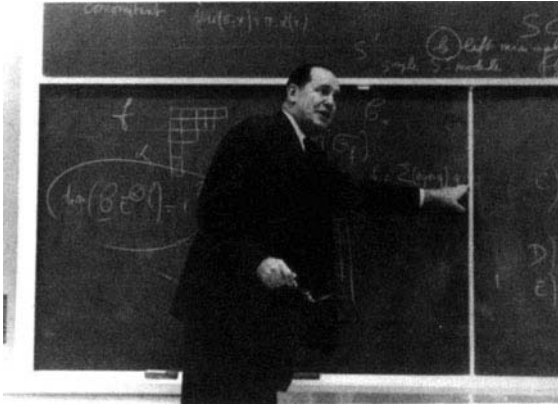
In 1937, Dieudonné left the University of Rennes to join his friend Jean Delsarte at the University of Nancy where he remained until 1952. He was not really interested in pedagogy and often admitted that he became a professor not because he was interested in teaching, but as a way of continuing his mathematical research; however, “this did not stop him from giving fascinating classes and seminars, incredibly clear, which communicated his passion.”⁴

Dieudonné spent seven years in the United

Small Grants from page 7

- in the field;
- Teaching strategies that take into account the needs, socioeconomic backgrounds, and cognitive development of adolescents;
- Multi-year involvement with students;
- Strong directors and a committed and stable staff;
- Involvement of appropriate staff members;
- Stable, long-term funding base with multiple funding sources;
- Recruitment of participants from a relevant target population in a defined area;
- Involvement with universities, colleges, industries, schools, community-based organizations;
- Parental and community support;
- Development of a peer support system;
- Evaluation, long-term follow-up, careful data collection;
- Networking through a consortium.





States, from 1952 to 1959, the first at the University of Michigan and six at Northwestern University. Alex Rosenberg, one of his colleagues at Northwestern, remembers "how much interest he took in the day-to-day affairs of the department, working at building it up and taking an active interest in the graduate students." But these were difficult years: his son and daughter were growing up and, for them, a French education was imperative. As a result, the family was often separated.

In 1959, Dieudonné returned to Paris to become Professor at the *Institut des Hautes Etudes Scientifiques*. In 1964, he was elected *Président de la Société Mathématique de France*. A year later, he became the first Dean of the Science Faculty at the University of Nice. He had no desire to get involved in administration, but felt it was his duty to accept the position. Opposed to the student unrest of 1968, he remained at the helm during difficult times and "successfully managed the University of Nice Science Faculty as an enlightened despot."¹

From 1931 until his retirement from the University of Nice in 1969, Dieudonné was very prolific. His active participation in the Bourbaki group (until 1970) was only part of his work. He was an extremely broad mathematician with an "encyclopedic knowledge."¹ The "exceptionally rich work of J. Dieudonné"⁵ consists of some 130 papers in a variety of fields: Analysis, Topological Vector Spaces, Algebra, and Algebraic Geometry.

In Analysis, which was his first research field, he used ingenious techniques to study the zeros of holomorphic functions of various classes, and he was the first to use p -adic analysis, which has since received much

attention.

In Algebra, he worked on noncommutative rings, introduced the socle of a ring, generalized Wedderburn's theorem, and developed Galois theory for simple and semi-simple rings. His work on Lie groups and Lie hyperalgebras over a field of characteristic $p > 0$ led him to "his most influential discovery, the introduction of formal groups."⁶

In Topology, Dieudonné made valuable contributions. He made a critical study of certain topological spaces, gave a new proof of the Hahn-Banach Theorem, introduced the idea of continuous partition of unity, and extended the idea of paracompact spaces. These notions proved to be very important in functional analysis and differential geometry. In collaboration with L. Schwartz, he published in 1949 an important paper on the duality between vector spaces, *La dualité dans les espaces (F) et (LF)*.

With much modesty, he was able to put his devotion to work in the service of others. "For ten years, he was literally Alexandre Grothendieck's scribe, writing and proving theorems, under the direction of this brilliant mathematician, whom he thought had something interesting to say."¹ The result was the publication of *Eléments de Géométrie Algébrique*, which has revolutionized the field.

On January 24, 1968, he was elected a member of the prestigious *Académie des Sciences*, and on November 29, 1969, he received his academician sword.

Jean Dieudonné was a fascinating person, "a giant in every sense of the word."¹ He had three passions: mathematics, music, and gourmet cooking.

An accomplished pianist, he often found time in his full schedule for an hour of piano. He loved classical chamber music, relaxed by listening to it, and when he lived in Evanston, was a devotee of the Fine Arts Quartet. He was also very knowledgeable in music; in Nice he gave a lecture on Gabriel Fauré.

His third passion, gourmet cooking, was a delight for all his friends. Wherever Dieudonné lived, he would invite three or four couples to his home and prepare for them a French meal similar to that of a fine restaurant. For the occasion, he would usually chase Odette from the kitchen. Once, he gave a select group a lesson on puff pastry. Later in life, his granddaughter became his cooking partner. Odette recalls how he often enjoyed stopping in some *gîte de France* on his way to or from Nice; in a gorgeous site with scrumptious food he could forget about the university's problems.

"Enormous energy and an incredible power of work coupled with a sharp sense of organization, such was the secret of his achievements. He would get up at five o'clock, spend an hour gardening, then write his five pages of Bourbaki before starting his day as dean at Nice."⁷ A few years ago, after his retirement, when he was crisscrossing the globe giving lectures, he stopped at my house for a couple of days. Without any appearance of weariness from his travel, he arose the next day at the crack of dawn, grabbed *Mathematics Today, Twelve Informal Essays*⁸ from the bookshelf, and by breakfast time was ready to discuss Roger Penrose's essay *The Geometry of the Universe*, convincing me that teaching Euclidean Geometry was useless.

He was always learning something new to stay abreast of recent developments. He did not accept mediocrity, but showed consideration and love for those he cared for. Frankness and honesty were two other important traits of his character, which proved to be key factors when he became dean of



From left to right: Roger Godment, Jean Dieudonné, André Weil, Saunders Mac Lane, and J. Piere Sere, in 1954.

the faculty. He had firm convictions and would not accept any compromise.

His retirement from the University of Nice in 1969 did not turn him into an idle man. Much to the contrary, free from administrative duties, he was able to devote himself entirely to mathematics. He completed *Éléments d'Analyse* (nine volumes),⁹ a monumental work, then wrote ten other works, some aimed at students, such as *Cours de Géométrie Algébrique*, others aimed at mathematicians, and others just for "readers interested in Science" such as *Pour l'honneur de l'esprit humain*.¹⁰ In this remarkable book, translated into English as *The Music of Reason*, and into Italian as *L'Arte de Numeri*, Dieudonné wanted his readers to understand the art of mathematics by understanding what mathematicians do, the problems they are trying to solve, and the tools they are inventing to solve them.

The last years of his life were devoted to history of mathematics. Under his direction, and with the collaboration of ten other mathematicians, Hermann published *Abrégé d'Histoire des Mathématiques, 1700-1900*,¹¹ which has already been translated into several languages, including Japanese. In 1981, Jean Dieudonné published *History of Functional Analysis*, and in 1989, *History of Algebraic and Differential Topology*,¹² which, according to his biographer, Pierre Dugac, is "a masterpiece that will outlast everything else he has done."

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- ⁴L. Schwartz, quote from *La Mort du Mathématicien Jean Dieudonné*. (Schwartz was Dieudonné's student before becoming his colleague at the University of Nancy.)
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- ⁶Alex Rosenberg, from a personal letter.
- ⁷M. Douady, quote from *La Mort du Mathématicien Jean Dieudonné*.

Recognition and Rewards in Mathematics Departments

The Committee on Professional Recognition and Rewards, a committee of the Joint Policy Board for Mathematics, has been working for about a year and a half and expects to put out its report in early 1994. At issue is the question of what contributions are recognized and rewarded in mathematics departments.

How does your own institution value teaching, curriculum development, mentoring, public awareness of mathematics, expository writing, and service to the community?

The Committee made site visits to twenty-three academic mathematics departments, ranging from Ph.D.-granting departments to departments in two-year colleges. They also conducted a survey of over 600 mathematics department chairs and nearly 2000 faculty members. The Committee gathered further information by way of panel discussions and presentations at national and sectional meetings of the AMS, the MAA, and SIAM.

One interesting finding from the survey was that the perceptions of department chairs and faculty often differ considerably. For example, at all kinds of institutions, the proportion of chairs who think teaching ability is important to salary increases is sig-

nificantly larger than the proportion of faculty who think so. And the overwhelming majority of those responding say that research is now and should continue to be "very important" in decisions about salary increases and about promotion and tenure.

The committee also found that, in departments where the major emphasis has traditionally been on research, teaching has become more important; while in departments where the major emphasis has traditionally been on teaching, research has become more important.

Among the questions the Committee will explore in its report are the degree to which faculty are dissatisfied with the current rewards system and what aspects of it they would like to see changed. Other issues also being examined are how well departments communicate internally and with their deans, provosts, and presidents. In addition to presentation and interpretation of the survey and site visit findings, the report will make recommendations to departments and to the community for ways to improve the rewards system.

The above was abridged from an article written by Allyn Jackson, published in the November issue of the AMS Notices.

⁸*Mathematics Today, Twelve Informal Essays*, ed. L. Steen (Springer-Verlag, 1978).

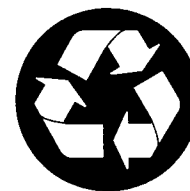
⁹Jean Dieudonné, *Éléments d'Analyse* (Gauthiers-Villars, 1982). (An English translation of the eighth volume, *Treatise on Analysis, vol. VIII*, was published June 1993 by Academic Press.)

¹⁰Jean Dieudonné, *Pour l'Honneur de l'Esprit Humain* (Hachette, 1987).

¹¹Jean Dieudonné, P. Dugac, et al., *Abrégé d'Histoire des Mathématiques, 1700-1900* (Herman, 1986).

¹²Jean Dieudonné, *A History of Algebraic and Differential Geometry, 1900-1960* (Birkhäuser, 1989).

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Geometer's Sketchpad Two Regional Minicourses

December 3-4, 1993 at Seattle Central Community College
December 11, 1993 at Towson State University

During the month of December the MAA Minicourse Committee, with the support of IBM and the Interactive Mathematics Text Project, will sponsor two courses on the innovative new software, the Geometer's Sketchpad.

The Seattle Central Community College course will be presented by Jim King of the University of Washington. In addition to the presentation on Geometer's Sketchpad, there will be a brief presentation on MathKit by Jim Swift of Burnby South 2000 Secondary School in Vancouver, British Columbia.

Doris Schattschneider of Moravian College will present the course at Towson State University. This one day course will be held in the IMTP Lab in the Cook Library.

To register or for additional information please contact:

Lisa Johnson
Mathematical Association of America
1529 Eighteenth St., NW
Washington, DC 20036
1-800-331-1622
e-mail: ljohnson@maa.org



Editorial

The proof of Fermat's Last Theorem by Andrew Wiles last summer certainly got a fair amount of media attention. And, on the basis of "any publicity is good publicity", that is all to the good of mathematics.

The second of two articles by Gina Kolata in the *New York Times*, an in-depth focus that appeared on June 29, was a particularly well-written piece that managed to capture something of the essence of the true nature of mathematical research and life within the mathematical community. When it comes to covering mathematical issues, Kolata towers way above any of her colleagues writing for other newspapers, to say nothing of television folk, most of whom seem unable to distinguish mathematics from elementary arithmetic.

The average newspaper writer clearly has trouble understanding basic English, as witnessed by the writer who stated that mathematicians had always suspected, but prior to Wiles had not known for sure, that the equation

$$x^3 + y^3 = z^3$$

has no whole number solutions, thereby completely misunderstanding the English

sentence "For every integer n greater than 2, the equation

$$x^n + y^n = z^n$$

has no whole number solutions." (The case $n = 3$ has been known for hundreds of years, of course.)

And yet, even Kolata missed what is surely the most *newsworthy* aspect of the proof, namely, the *cultural* significance of Wiles' achievement. Forget the technical details of the proof (a task that for all but a handful of mathematicians is decidedly easy, since the technical details of Wiles' argument will defeat most of us). Consider instead what has been achieved on a human cultural level.

Back in the middle of the 17th Century, a French mathematician scribbles a problem in the margin of a textbook. Over the years, a great many mathematicians work on this problem. These mathematicians live all over the globe, they speak different languages, and in many cases they never meet one another. Over time, the many contributions made by these mathematicians eventually lead to a solution—and make no mistake about it, Wiles' proof not only rests upon the work of a significant number of contempo-

rary mathematicians, he, and they, build upon the work of those that have gone before.

In how many other areas of human activity can you find such a dramatic instance of a struggle toward a common goal that unites people across time and across continents? In what other subject can a question raised over 350 years ago be as fresh and crisp and meaningful today as it was when the ink on Fermat's page was still wet? In what other walk of life can one be so sure of the absolute truth of a particular statement as happens with a mathematical proof?

An event of unusual, and perhaps unique, human cultural significance takes places, and what do we read in our newspapers? Misstatements of the problem, incorrect illustrations of the result, silly asides about balancing checkbooks, and a plethora of idiotic remarks as to how "useless" the result is in the "real world", as if the yardstick of human culture is its utility.

In grand and regrettable unison, the press missed a great "human interest" story concerning our culture and instead treated the culmination of over three centuries' work leading to the proof of Fermat's Last Theorem as little more than the solution to a particularly hard homework problem. Sad. Very sad.

—Keith Devlin

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

Letter to the Editor

Dear Editor,

Re: Article by Professor Shafroth (FOCUS, June 93)

The article supported my own experience. (I was born in Germany and went through the German school system, got a *Diplom* in Mathematics, and then came to the U.S., and obtained a Ph.D. from the University of Illinois at Chicago. Since 1984, I have taught at Eastern Michigan University.) I have some remarks:

1. It is important to realize that in the German school system EVERYBODY who wants to attend a university has to pass the abitur examination, including the mathematics portion. This is true in particular for all elementary teachers! The exam which

Chantal Shafroth quoted might have been from the science concentration exam, but the general exam has the same format and may ask a similar question for a rational function instead of a trig function.

Of the students who enroll in the first required math course for elementary teachers at Eastern Michigan University, a substantial portion places into a Beginning Algebra course or lower.

2. The oral component of the examinations in Germany is worth remarking. The abitur exam has an oral part which might be waived. (At least that's how it was twenty years ago.) Much of one's grade in each course at the precollege level is based on in-class work, class participation, and oral reports on homework assignments.

At the university, students may have to write exams or turn in homework assignments in order to pass courses, but the major exams are oral: the *Vordiplompruefung*, after 2 years, and the *Diplomhauptpruefung*, at the end of the studies. These exams provide the only grades, apart from the thesis, which appear on a grade report for an employer. The courses often don't carry grades, or the grades are only kept internally. This shows a clear emphasis on the final understanding of the material.

I enjoy reading FOCUS.

Regards,

Gisela Ahlbrandt
Eastern Michigan University

Personal Opinion

Teaching, Learning, and Publishing in the Age of the Inconceivable

Alexander Kugushev

Who in 1988 could have conceived of today's world's political map and psychological climate? In 1989-91, power relationships around the globe changed with lightning speed, leaving us gasping. In large part this happened because computers and computer-driven telecommunications accelerated the dissemination of information.

These same forces affect all aspects of modern life, higher education included. In the mathematical sciences, change in teaching and in learning is spurred by electronic media, its operational ease, and increasing affordability. While new developments are taking place, it is not yet clear what will be the ultimate consequences for education. A safe guess is that the results will be striking, that they will affect faculty and educational publishers, and that ultimately they may take forms as inconceivable today as our new-world political relationships were in 1988.

Effect on Faculty

For centuries, the lecture was the exclusive way to transmit knowledge in mathematical fields. This was natural and effective because

- there was no alternative;
- the environment was intimate and select;
- the information provided suited the needs of the times, reflecting a slowly-changing accumulation of knowledge that would suffice for a graduate for the rest of his/her professional life.

Over the last forty years, this pattern began to change, as cultural, economic, demographic, social, and technological conditions evolved. In 1950, there were two-million relatively select, homogeneous higher education students in the United States. Today there are more than fourteen million. They are an enormously diverse lot—culturally, demographically, and in terms of motiva-

tions and aspirations. The number of faculty and their diversity have equally increased in the intervening forty-some years.

Conditions for change resulting from these human and economic factors have been awaiting a catalyst. In the mathematical sciences, it came in the form of the PC and, to a lesser extent, the graphing calculator. The advent of these technologies has allowed, and also required, a series of adaptations, perhaps the most important being the alteration of the relationship between the teacher and the learner, which traditionally involved an active instructor and a relatively passive recipient of knowledge.

Now the computer and the graphing calculator are beginning to enfranchise students to gain independent insights, reducing the role of the lecture and the lecturer. Something akin to a laboratory substitutes for the classroom, and the instructor's function becomes more like a coach, mentor, or consultant.

Another effect of these developments is that the order of information acquisition changes; it becomes less disciplined, more creative and productive. Thus, we begin to see a new and unfamiliar learning culture emerge, whose ultimate outcome is not yet clear. It challenges the traditional mode, content, and sequence of instruction. Not all faculty will welcome that.

Effect on Educational Publishers

For the better part of the past five centuries, educational publishers produced textbooks by "canning" professors' lectures. This worked well because there was no better alternative, it replicated the classroom's teaching/learning process, and the information provided had lasting value. Now the rules are changing for publishers as well. Canning lectures will no longer suffice as it

does not reflect what takes place in the modern classroom.

Students gain access to information in a manner that is neither planned nor wholly expected by instructors. Students have the power to perform computations of complex, real-world problems. In doing so, they are wont to "jump over" theory, often intuiting it, sometimes challenging it. They can conduct experiments, change variables, and explore mathematical ideas or real-world data with ease, in a highly visual, graphic, and dynamic (as opposed to verbal and static) environment unable to be reflected in a textbook of canned lectures. Students' transformations are a wonder; they are empowered, active, enthusiastic, no longer bored and passive.

The New Educational Publishing

For an educational publisher, what is the appropriate response to all this? Certainly not business as usual, meaning "We publish books." The proper response must take into account new circumstances and new opportunities. Faculty need help in making the transition from past to future. They are continually busy, with ever-diminishing available time, and their instructional facilities are in transition, while the public education systems offer only limited funds to support this transition. There is also uncertainty about how and when the new environment will become fully functional. And, at the same time, there is pressure by students to use computers for instruction in a real world context.

Under these conditions, publishers' conventional offerings—a textbook plus a few afterthought ancillaries put together at the last moment—do not serve current needs. Addressing the faculty's changing circumstances is the educational publisher's primary challenge at the turn of the 21st Century, and should include a range of options that are both customer-oriented and reflective of the emerging educational environment.

Providing Educational Products of the Future

Publishers need to address the following menu of requirements:

Customization New technologies in book

Please see Teaching on page 14

Teaching from page 13

production allow easy “customization” of publishers’ offerings and respond to latent demand among faculty. “Customization” may mean different things: abbreviation of large textbooks, permutation of topic sequences, narrowing of focus, combining different resources into an “integrated package”, and other possibilities. Its aim is to meet the specific needs of a specific instructor, or course, or program. Current textbooks are the opposite of “customized”, trying as they do to reach as wide an audience as possible.

Software and the Laboratory Setting The new products will perform combine print and electronics, especially in cases where courses involve laboratory activities using computers or graphing calculators. New ways of physically integrating learning and teaching devices will be called for. The new “package” may be a box, the “textbook” one of several items within it. In fact, print may eventually come to support software.

The Instructor’s Guide In presenting a new teaching idea, a primary objective for publishers is to make it easy for the faculty to implement. So it is time for publishers to cease being squeamish about the importance of the “Instructor’s Resource Manual”. Such manuals are often presented with a semi-apologetic disclaimer, lest faculty perceive

them as demeaning their teaching abilities. The realities of introducing new ideas in the 1990s require an explicit and detailed statement of an innovative author’s objectives and the specific means to implement them. This is especially true when part-time or adjunct faculty are placed into unfamiliar teaching contexts.

The Student’s Role New learning devices will need to incorporate the student as an active rather than passive learner. The definition-theorem-proof approach to mathematical instruction is becoming less pertinent. The new environment is causing students to acquire knowledge differently, through insights stemming from activities connected to real-world problems. Thus, the new educational products must combine this mode of learning with knowledge generated by faculty in the classical mode.

The New Authorship

The new educational products will require a different approach to authorship. No longer will a single author, or even a team of co-authors, be able to embrace all the activities required. Publishers will need to put together teams of authors to support the ideas of the originating author and translate them into the ancillary elements of the package.

The New Environment

The effects of all these changes are not completely foreseeable; however, the following

are plausible:

- Student input, and not solely that of the faculty, will increasingly influence publishers’ offerings.
- A sharp trend toward customization of educational products will develop.
- Efforts to address individual learning styles will increase.
- Students will exercise more freedom in shopping for educational products priced and packaged to fit their expectations.
- Publishers will create tutoring devices, electronic and in print, to support the less experienced and the part-time instructor, the part-time student, and the off-campus learner.
- At the lower division level, publishers will provide pre-packaged *courses* rather than mere textbooks with ancillaries.
- The cleft between teaching and research faculty will become more pronounced.
- A growing partnership between educational publishers and teaching faculty may result.

The above observations reflect events that already occur episodically throughout the educational system. They suggest that the time is now to begin making the transition to the age of the inconceivable, for faculty and for educational publishers alike.

Alexander Kugushev is editor and publisher of Duxbury Press in Belmont, California.

Employment Register from page 4

- 62% of applicant high priority requests were satisfied.
- 9% of applicant normal requests were satisfied.
- Employers averaged 39 interviews.
- Applicants averaged 6 interviews.
- 15 applicants had 3 or fewer interviews.
- 26 applicants had 10 or more interviews.

To further increase satisfaction with the ER, the JCEO is attempting to make participants—especially applicants—aware of its realities. The following statements are included in announcements for the 1994 ER in Cincinnati:

- At the 1993 ER in San Antonio, the ratio

of applicants to interviewers was approximately seven to one.

- Employers who responded to the 1993 follow-up survey (78%) reported sending out 94 invitations to ER applicants for on-campus interviews.
- In San Antonio the average number of interviews for an applicant was between five and six.
- Most jobs listed require a doctorate.
- Most jobs listed are for academic positions at undergraduate institutions.
- Over half of the interviewing employers in San Antonio indicated they were restricted by their institution or company to hiring only U.S. citizens or permanent residents.

Several inferences can be drawn from these facts. The ER is not likely to help mathema-

ticians find research positions or non-academic positions. It tends to attract smaller schools, certainly not large research universities. Because of the preponderance of teaching schools using the ER, applicants should have a good command of spoken English and strong classroom experience.

The ER cannot guarantee an applicant an interview with his or her top choice, nor can it guarantee any interview at all. What it does is provide a sophisticated and invaluable service to both applicants and employers, endeavoring to help everyone move toward the next stage of the hiring process.

Networks in FOCUS

The Internet: Some Tools for Efficient Usage

Bert G. Wachsmuth

It all started with a frustrated student who told me she had to write a term paper about computer crime but was unable to locate appropriate references in our library. Although I suspected the student did not use the library services to their fullest extent, I thought the perfect place to locate such information would be the computer itself.

I have used the Internet routinely for electronic mail and occasionally to access a computer at another university, but I did not fully know what the Internet was or how to use it efficiently; however, I suspected that information on most any topic would be accessible through the Internet. I embarked on a quest to search out methods for finding and retrieving information from the Internet. After several weeks I was not only successful, but I was amazed by the wealth of information available, and the ease with which it could be retrieved. I was able to offer the student many more references than she needed. I also obtained data sets to improve instruction in our introductory statistics course, retrieved information about symbolic mathematics now being incorporated into our calculus sequence, read preprints and papers from the AMS, and had a lot of fun on the side.

Several methods for retrieving information from the Internet are available for MS-DOS, Macintosh, and Unix computers. All of the software described below is inexpensive, readily available, and easy to use. The only hardware requirement is access to the Internet. (See "Technicalities.")

1.1. What is the Internet?

Today's Internet is a global resource connecting millions of users that began as an experiment over 20 years ago by the U.S. Department of Defense. While the networks that make up the Internet are based on a standard set of protocols (a mutually agreed

Bert Wachsmuth is a Visiting Assistant Professor at Dartmouth College

upon method of communication between parties), the Internet also has gateways to networks and services that are based on other protocols. (Krol: What is the Internet? — Working Draft, FYI)

The Internet, in effect, ties together a large collection of computer networks through a common standard called TCP/IP (Transmission Control Protocol/Internet Protocol). Users of any of the networks can utilize services provided by other networks through this standard. Currently, there are about 700,000 networks tied together to form the Internet, and the number is growing rapidly.

By using 'smart' software, the user is shielded from most technical details and can concentrate on the purpose in mind. Usually a user need not be concerned with intricate details of how the Internet works or is implemented at a given site.

1.2. What's in a Name?

Addresses and IP Numbers

Members' addresses are the only detailed information one needs when using the Internet. Institutions attached to the Internet receive unique domain names, then assign addresses to individual members. For example, Dartmouth College has the domain name `dartmouth.edu`, and particular stations on the Dartmouth College network include `dartvax.dartmouth.edu`, and `carr.dartmouth.edu`. Each station on a network also has a unique four-part numerical address called the IP number. For example, the IP number of `dartvax.dartmouth.edu` is 129.170.16.4. The first two parts of that number reflect the domain name and are identical for all stations at Dartmouth. The last two parts of the number represent individual stations on its network.

When addressing a station, you can use the name of that station (`dartvax.dartmouth.edu`) or the corresponding IP number (129.170.16.4). Usually, the station name is more convenient. It is automati-

cally converted to an IP number by a name server behind the scenes. In some cases, however, you may want to refer to a station directly by its IP number.

The name of a station usually reveals something about its origin. For example, addresses ending in `.edu` refer to educational institutions in the United States, `.com` to commercial institutions in the United States, `.org` to non-profit organizations, `.de` to German Internet members, and so on.

Selected Services

The following are brief descriptions of important services. Some suggestions for their usage in mathematics can be found in Section 3, "Case Studies."

2.1. Basic Connections: Telnet and Ftp

Telnet and *Ftp* are two programs that allow connection from one computer to another through the Internet. Both programs are based on similar protocol, but offer different services.

By using *Telnet*, you can logon to a computer anywhere on the Internet and use that computer as if it were sitting in front of you.

The remote computer processes your commands. Only keystrokes and the terminal output are passed back and forth through the Internet. If you want to use *Telnet*, you usually must have a valid account on the computer to which you wish to connect. Some sites offer special services, such as current weather conditions, and do not require a personal account.

I often use *Telnet* to access my 'home' account and read electronic mail when I am away for a conference.

Ftp (File Transfer Protocol) allows you to copy files between any two computers on the Internet. Logon to a remote computer, then copy a file from there to your machine, or vice versa. If you have a valid account, you can copy any accessible file. Many sites offer the possibility of an anonymous connection; however, only selected files will be accessible in this situation.

2.2. Worldwide Bulletin Board: Usenet

Usenet is the set of machines that exchange

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articles tagged with one or more universally-recognized labels, called newsgroups (or 'groups' for short)... If the above definition of Usenet sounds vague, that's because it is. It is almost impossible to generalize over all Usenet sites in any non-trivial way. Usenet encompasses government agencies, large universities, high schools, businesses of all sizes, home computers of all descriptions, etc. (Kehoe: *Zen and the Art of the Internet: A Beginner's Guide to the Internet.*)

Usenet can be thought of as a collection of topics, called groups, ranging from the bizarre to the scientific. In each group, notes are placed by individuals, universities, companies, or governmental organizations. You can read these notes, download them, and, if you like, reply. Some notes contain questions, some, answers to previous notes, others, information of general interest to a group. Some may even contain complete computer programs or pictures. Before reading any of these notes, you have to decide which topics are of interest to you and 'subscribe' to them. Some groups have a moderator who decides which notes should be posted.

I subscribe to the groups `sci.math` (general discussions about mathematical questions for novices as well as mathematicians), `sci.math.research` (discussions about mathematical research), `comp.binaries.ibm.pc` (computer programs for MS-DOS based computers), and `comp.binaries.mac` (computer programs for the Macintosh). Now and again I read these groups' ongoing discussions, and occasionally I discover a useful computer program.

2.3. Finding Information by Keyword: Gopher

Gopher n. 1. Any of various short tailed, burrowing mammals of the family Geomyidae, of North America. 2. (Amer. colloq.) Native or inhabitant of Minnesota: the Gopher State. 3. (Amer. colloq.) One who runs errands, does odd-jobs, fetches or delivers documents for office staff. 4. (Computer tech.) software following a simple protocol for burrowing through a TCP/IP internet. (...)

The Internet Gopher protocol and the first Gopher software was developed by the Gopher Team at the University of Minne-

sota. It was originally created as a fast, simple, distributed, campus-wide information search and retrieval system. Ease of use and implementation has made Gopher increasingly popular on the Internet. Since its original release, many folks on the Internet have contributed to its growth, submitting patches, servers, clients, and linking their local servers into the worldwide network of Gopher servers. Now there are even gateways to seamlessly access a variety of non-Gopher services such as FTP, Archie, WAIS, USENET news, whois servers, etc.... This network of Gopher servers is at your disposal from a Mac, PC, or workstation connected to the Internet. (from documentation of TurboGopher)

Gopher is an appropriate name. Universities and companies worldwide decide on information potentially valuable to users. They place this information under the guidance of a computer program called a *Gopher* server. Users access that information via another computer program called a *Gopher* client. Using a *Gopher* client, you encounter a hierarchical list of topics, documents, pictures, programs, and other information. Choose from that information what you wish. The beauty of the *Gopher* system is that it shields users from most complexities of the Internet. You can, for example, connect to the University of Minnesota's *Gopher* server, read an on-line help document about Gopher Services, then display a satellite picture of last week's weather over North America. Next, read information about grants offered by the NSF, then search the Library of Congress for exact references. Finally, search the Internet for any references to symbolic math. You need not know where the information is actually located or what type of information is offered. The *Gopher* server—client model will take care of everything.

2.4. Finding More Information: WAIS

WAIS is a database system that exploits two recently popularized computer science concepts: the client—server model, and full-text databases. It gives users the ability to search existing databases of articles, books, references, abstracts and specialist information (such as genome databases, usenet group archives, Ftp-site listings, etc.), and for people with information to publish it at little expense and effort over the Internet.

The client—server model is a commonly used

method of providing services over a network. The end-user uses a client program to access information by communicating with a server program. Typically the server and client are running on different machines and communicate over the network. You need not have a server of your own to be able to use the client.

*The full-text database is a model designed explicitly to search documents on any word that appears in those documents. The old approach was to have a set of keywords which you could search on, and these words represented a small subset of all the words in the documents. (Torkington: *WAIS Introduction*)*

WAIS (Wide-Area-Information-System) is similar to Gopher in that it shields the user from the intricacies of the Internet. You can view pictures, read documents, or obtain programs with a single keystroke, without knowing where the document is located or what type of document it is. However, rather than maneuvering through a hierarchical menu, and only occasionally using keyword searches, WAIS is based on a search mechanism from the beginning. You enter the information you are looking for in an English sentence, and WAIS does its utmost to locate information relating to your sentence. You usually start with a broad topic and refine it as the search progresses. A nice feature of WAIS-based searches is that you need not enter an exact keyword. WAIS services usually give you an 'index of matching,' based on how well the found document agrees with your search specification (in WAIS's opinion). You then continue, searching only those hits with a high index of matching, or decide to follow a new tangent.

2.5. Talking Across the World: Internet Relay Chat

*A world-wide 'party line' protocol that allows one to converse with others in real time. IRC is structured as a network of servers, each of which accepts connections from client programs, one per user. (LaQuey Parker: *Internet Users' Glossary*)*

Internet Relay Chat (IRC) is another server-client model, developed in Finland in 1988. You connect to a server and are then able to 'talk' in real-time to others connected. All discussions are divided into groups, called channels (private, public, moderated, secret, or open). You must join a channel (and gain permission to speak,

in some cases) before entering into a discussion. Another possibility is starting your own channel and waiting for others to join. Members may be located on your campus, in North America, or in any of more than twenty countries around the world.

Messages typed by a channel member are displayed nearly immediately on every other channel member's screen, allowing international 'party line' conversations. Join the Chess group and be challenged by someone in China, or search out others for useful conversation. I am German, so I search out and speak my native language with people in Germany.

2.6. Miscellaneous

Briefly, here are some additional services the Internet has to offer.

Talk

Talk is one program which may not be available for any platform. *Talk*—sometimes called *Phone*—works like an ordinary telephone, except speaking and listening is replaced by typing and reading.

Address the program by telling it with whom you would like to communicate—next door or halfway around the world. Should the recipient be at a booted machine that has the *Talk* standard implemented, a message will appear on the screen, informing him or her that someone wishes to talk. Issuing his or her own command for *Talk*, communication is established, and messages appear simultaneously on each screen.

Archie

This allows you to search all sites that have public domain programs or documents available through the Internet for specific names (or substrings). You need to know the exact name, or at least an exact substring, of the name of the document you are attempting to locate.

Finger

Obtaining information about another user of the Internet with an account on a Unix machine is the expertise of *Finger*. You might locate a colleague's home phone number, determine whether someone has any unread mail waiting in their mailbox, or perhaps check how many users are currently working on a particular network on the Internet.

Library Access

Many libraries nowadays have a comput-

erized catalog of their inventory available across the Internet. That means you can search different library catalogs (even from universities in different countries) directly from your computer. Some libraries offer, in addition, special searches of selected research journals. The AMS offers on-line searches of their publications. There are services, such as CARL, that allow you to search for an article containing keywords, then have the article faxed to you (for extra, however). A few libraries accessible through *Telnet* are:

Dartmouth College (telnet lib.dartmouth.edu no user name needed)

Library of Congress (telnet dra.com no user name needed)

New York Public Library (telnet nyplgate.nypl.org username:nypl)

University of Berlin (telnet elib.zib-berlin.ed user name: elib)

The best method, however, for accessing a library is via *Gopher*. Most gopher sites offer as one of their choices *Library access*, and list many, many libraries available for searching. For mathematics, the *Gopher* client of the AMS gives numerous mathematically-oriented libraries, and automatically connects you as well.

SCV Library

There is another kind of service the Internet offers that has not yet been discussed: Listserv. Interested in regularly getting information about a particular topic? You can send e-mail requesting you be included on an automatic mailing list. Whenever there is new material about your topic, it is sent to your e-mail address. There are several documents available on the Internet describing this kind of service in detail.

For example, you could automatically receive preprints of mathematical research papers and other material in *Several Complex Variables* about once a month. Many of the preprints can be sent in their entirety (usually in TeX format) if you request it. Details of this service are currently being changed to allow *Gopher* access.

3. Case Studies

3.1. ICPSR Data, SPSS Analysis in Statistics

At Seton Hall, we use the statistical com-

puter package SPSS in our introductory statistics classes to simulate a 'real-world' data analysis process. It is difficult to obtain data sufficiently interesting and complex to design challenging exercises for our students. Using *Gopher* and a few minutes of queries across the Internet, I found the ICPSR data collection (Inter-university Consortium for Political and Social Research). It makes available data from social studies surveys and can send you the appropriate information in electronic form. Just use *Gopher* and search for the keyword ICPSR.

As a survey of our students indicated, this data has improved their interest in statistics. Some students have spent considerable time playing with SPSS and the data, thereby improving their understanding of a statistical computer package and the intricacies of a 'real-world' data analysis process.

3.2. AMS Gopher Access

The AMS offers its own *Gopher* server, available at e-math.ams.org. You will have immediate access to lots of information relating to mathematics. Search and order AMS publications, flip through the catalog of mathematically-oriented libraries, become a book reviewer for the AMS, receive the latest employment information, and much more.

3.3. Derive Manual for Calculus

We are currently in the process at Seton Hall of restructuring our calculus sequence to incorporate the computer programs *Derive* and *Maple*. We needed to develop some exercises to make use of these symbolic algebra packages, yet improve the students' understanding of mathematical theory and usage. With *Gopher*, *WAIS*, and *Usenet*, we were able to locate free information on symbolic algebra packages, from simple descriptions of the capabilities of different programs to completely worked-out computer exercises. We have modified some of this information and incorporated it in our own "Lab Notes for Calculus," thereby eliminating the need to reinvent the wheel.

In fact, we found that most information about symbolic algebra packages relates to *Maple* and *Mathematica*, while there is a lack of material on *Derive*. We will shortly make available to the Internet our computer exercises using *Derive*, hope-

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The New Job Diary

Edward Aboufadel

Our intrepid diarist continues his account of his first year as a university professor. This episode takes him from the beginning of December 1992 through to the end of January 1993.

December 9: Members of the DEC (Department Evaluation Committee) observed my classes twice last week. They came to my evening courses, which I requested, since the students in there are livelier than my afternoon course. I thought I would be more nervous than I was as they sat and took notes of my work. Afterwards, the DEC members said that they would talk about what they observed during the formal interview in February. We ended up, though, discussing the pros and cons of using a computer to help teach graphing of trigonometric functions. A few days later, one member of the DEC observed that I rarely refer to my students by name in class. This is probably because I'm not very good with names.

Yesterday I turned in my application for re-assigned time for research. The application was a bit difficult for two reasons. First, I was limited to two pages to describe what I intended to do, and second, Fall 1993 seems a long time away. I talked to the Dean about these difficulties. He was pleased with the two-page summary that I wrote, particularly with the reference to a *New York Times* article that was published last April and was related to my work. He also said that the selection committee understood that it is not possible to describe exactly what you are going to work on ten months from now. I will know by February if I have been selected.

The new issue of FOCUS arrived yesterday with the second part of my Job Search Diary inside. I have received positive comments again from my colleagues here, although one person wondered if the following comment from the diary applied to Southern: "Two of my interviews left me uninterested in working for those schools. I wish I could just cross these schools off of my list, but these are desperate times for new Ph.D.s, and I may not be able to be choosy." I explained to him that I didn't interview with Southern in Baltimore.

Another item that I have been pursuing lately is developing a proposal to establish a Computer Coordinator in the department. I wrote something right before Thanksgiving, and have been chatting with many of my colleagues about it since then. The idea has been kicking around for a while, but no one had actually written a proposal yet.

A few people asked me if I wanted to be the Computer Coordinator, and I guess that I do, as long as I don't end up stepping on anyone's feet. See, I'm starting to think about department politics, too.

Just wait until the election for department chair next spring!

December 19: Well, Finals Week has come and gone. I have administered three examinations this week. Then came a marathon grading session, and now I have figured out my final grades.

In a way, the students here are just like anywhere else—their talents vary widely. In a class of 22, I gave three A+s and six Fs, with the other thirteen in between. And, just like anywhere else, Finals Week was full of chaos. I lost count of the number of times someone knocked on my open door to ask, (1) "Are you the math department?" and, (2) "Do you know where my math final is at?"

We had a full-fledged department meeting two days ago. The first hour we listened to a police officer at Southern talk about security and theft and what is being done on campus. There has been a rash of thefts on campus. Two weeks ago, my office mate came in one morning to discover his radio and telephone stolen, but nothing else, and thankfully I was spared. It has made all of us a bit paranoid, though.

Also at the meeting, my proposal to establish a Computer Coordinator (CC) was approved by the department, as was my offer to become the first CC. Next stop is the Dean. Older members of the department commented that I was learning quickly, since I said, "Since no one is jumping at the chance to become Computer Coordinator, I guess I'll do it."

As CC, I'm looking forward to enlivening our computer room. I am not looking for-



Ed Aboufadel with his office mate Henry Gates.

ward to dealing with the bureaucracy here. I got a sense of what trouble lies ahead when I suggested that we purchase a new desk for one of our computers. There was a nice one on sale at Caldor's this week. Apparently things are not that simple. How did our Chair put it?: "The Purchasing Department still thinks it's 1960."

At the department meeting, we also heard a report on space use at Southern. Apparently the average office size nationwide for a college faculty member is 100-125 square feet. Our offices are 80 square feet. There was a reason for this—so that no one would be foolish enough to suggest putting two professors in one office.

If you notice, I mentioned my office mate a few paragraphs back.

So, looking ahead, I'm hoping to catch up on some research time over this five-week break that I have. I'm also heading to the Joint Mathematics Meetings in San Antonio. (One of the perks of this job is that there are some funds for travel.) I'm sure that for me it will be quite a contrast to last January's "party" in Baltimore, as I am not hunting for a job this time.

January 23, 1993: After traveling all around the country, I am back in Connecticut with our Spring Semester only two days away.

I spent the first few weeks of my Christmas break at my parents' house in Fort Wayne. I quickly learned that Ph.D. or no Ph.D., parents still insist that you get a haircut.

Last week I went to the Joint Meetings in San Antonio. These meetings were rewarding to me for a number of reasons.

One reason is that I was a minor celebrity there. I was greeted by many people that had read the first two parts of my "Job Search

Diary" and were wondering whether or not I ever got a job. A few people who were involved in this year's job hunt were glad to discover that they were not alone. One gentleman told me that his department had been receiving e-mail from prospective applicants asking for a detailed description of the research interests of members of his department, and he attributed this wave of questions to my articles.

The article also earned me an invitation to be a guest at the meeting of the Joint Committee on Employment Opportunities. I was pleased to learn that the people in charge of the Employment Register are very committed to reforming the Register. Apparently there were significant changes made from last year. Since I didn't even get an on-campus interview last year by using the Register, any change is welcome.

Finally, the gentleman in charge of MAA Publications expressed an interest in my future work.

I also went to a number of presentations in either Mathematics or in Mathematics Education. I noticed that a number of the Mathematics talks were being given by people my age, and it made me wonder if these were graduate students presenting their theses work. Later, I learned that in order to give a presentation at the Joint Meetings, you merely need to apply and be accepted. In other words, you don't need to be invited in order to give a talk. I did not know this.

Some other highlights for me include: Robert Osserman's address on "The Shape of the Universe," the controversial Jenny Harrison outlining a way to integrate functions over fractal sets, and an analysis of the best strategy when spinning the Showdown Wheel on "The Price is Right" TV game show.

It seems to me that in this profession, different people find different ways to advance their careers, and often these ways are acci-

dental. In graduate school, the mantra is "Research! Research! Research!" yet once you are out, you see that people move ahead by becoming department chairs, experimenting with graphing calculators, or, so far in my case, writing for FOCUS. You like to feel that you are in control of your career in the same way you control your car while driving from New York to Chicago, but sometimes you are forced to take detours or scenic routes and you never get to Chicago at all. (Besides, Chicago isn't hiring.)

My scenic route has led me to Southern Connecticut State University, and it is time for me to get back to work. Coming up for me: my Annual Evaluation; applying for a Summer Research Grant; applying to give a talk at a conference; coordinating the department computing resources; and, of course, teaching four courses.

To be continued . . .

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fully thereby saving time for other universities.

3.4. E-Mail Addresses: Netfind

Use the Internet to find e-mail addresses through a service called Netfind, available either through *Telnet* or by using *Gopher*. Again, *Gopher* is the more convenient method.

To find an address via *Telnet*, first connect to a *Netfind* server. They are available, for example, at:

```
telnet bruno.cs.colorado.edu
username: netfind
```

```
telnet netfind.oc.com
```

```
username: netfind
```

To use *Gopher*, connect to the *Gopher* server at Minnesota (*gopher.tc.umn.edu*), then choose the following menu items: Phone Books; Internet-wide e-mail address search; *Gopher* to Netfind Gateway; Search Netfind for E-mail addresses.

Remember to provide as much information as possible concerning the person's address you wish to find. For example, the keywords *wachsmuth* *dartmouth* will find my e-mail address.

3.5. Usenet on Fermat's Last Theorem

When Prof. Wiles announced that he proved the missing link for Fermat's Last Theorem, the news spread through the Internet within hours to many universities around the world. There was an outburst of questions and information across the Internet. People were discussing the implications of the proof long

before the news finally made it into printed form. I found the news first on *Usenet*, in the newsgroup *sci.math*, which I subscribe to and regularly read. It was not always, admittedly, the most serious information that I read, but many comments were absorbing. When I finally had a chance to hear much more about the proof in person during a recent conference in Montreal, I probably knew a

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Service	Address (selected)	Chart A
Usenet	usenet.coe.montana.edu news.yale.edu sol.ctr.columbia.edu quip.eecs.umich.edu (Posting OK) news.fu-berlin.de (Germany)	
Gopher	gopher.tc.umn.edu (University of Minnesota-General) e-math.ams.org (AMS Gopher-Math. Interest) gopher.math.lsa.umich.edu (University of Michigan-Math. Interest) laurel.euromath.dk (Euromath Gopher in Denmark) begbick.law.cornell.edu (Cornell Law School-Experimental)	
WAIS	usually provided with client program	
IRC	csd.bu.edu ucsu.colorado.edu irc.caltech.edu sunsystem2.informatik.tu-muenchen.de (Germany)	

lot more about this particular subject than many of my colleagues, simply from turning on my computer for a couple of minutes every other day.

4. Technicalities

4.1. Requirements for Your Machine

All the software listed below can be used on a Macintosh or a PC. Installing software for Unix machines is more difficult and should be left to a local systems administrator; however, publicly accessible Internet sites are given so that you can test the various services without going through any installation process.

Your Macintosh must have access to the Internet and must have *MacTCP* installed. For details on *MacTCP*, refer to your local

systems administrator.

IBM compatibles must have access to the Internet and must have *Novell's Lan Workplace* installed. For details on *Lan Workplace*, also refer to your local systems administrator. All IBM software is available for so-called packet-driven TCP/IP access, but installation varies according to network types. You may want to experiment with the publicly accessible Ftp sites to find the necessary software yourself, or ask your local systems administrator.

4.2. Where to Get the Software

The software listed in chart B is free or requires a small fee after using the program for a period of time. I do not claim that the software is the best available. It is simply easy to obtain, easy to use, and affordable. If

you are interested in any of these programs, upload the package via *Ftp* (see example below). If *Ftp* access is too difficult, feel free to write to me and I will send you the necessary programs for a nominal fee.

You then need to get that file to your Macintosh computer and convert it properly. Ask your systems administrator how to do that.

Similar client programs are also available for Unix-based computers; however, they usually have to be compiled before they can be used, and installation should be left to the local systems administrator.

There are specialized *Telnet* sites which allow access to the services mentioned above without requiring a client program (other than *Telnet*). Chart C lists a series of sites, the services they offer, and how to login. Other sites may offer similar services.

4.3. Where to Find the Servers

If you installed the client software, you will need the address of a server. It is usually best to use a server that is located geographically close to you. Ask your local systems administrator for more information. To start, some selected servers are listed in chart A.

4.4. How to Learn About More Services

Many other services are available through the Internet that have not been mentioned here. The best way to find out about them is by using the Internet itself. Use either *Gopher* or *WAIS* to locate documents describing your interest. Chances are it's available somewhere on the Internet. You can also use either of these services to find client software for Archie, Finger, Talk, and other programs.

As an exercise, find out how to access these fun services:

Weather Info: get an update about current weather forecasts

Sports Info: find out how the Mets are doing

NASA Info: check the time-table for the latest space shuttle missions

Supreme Court: obtain the exact wording of latest Supreme Court rulings

White House: obtain copies of President Clinton's speeches and policy statements.

Some documents that describe many

	Macintosh - MacTCP	IBM - Novell	Chart B
Telnet	Ftp: ftp.ncsa.uiuc.edu Dir: Telnet/mac/Telnet2.5 Name: Telnet2.5sit.hqx	built in	
Ftp	Ftp: dartmouth.edu Dir: pub/mac Name: Fetch-2.1.sit.hqx	built in	
Usenet	Ftp: sumex-aim.stanford.edu Dir: info-mac/comm Name: the-news-224.hqx	Ftp: ftp.utas.edu.au Dir: pc/trumpet/lwp-version Name: newslwp.zip	
Gopher	Ftp: sumex-aim.stanford.edu Dir: info-mac/comm Name: turbo-gopher-105.hqx	Ftp: boombox.micro.umn.edu Dir: pub/gopher/incoming Name: gopher.exe and gopher.doc	
WAIS	Ftp: think.com Dir: public/wais Name: wais-for-mac-1.1.sea.hqx	no working program found	
IRC	Ftp: sumex-aim.stanford.edu Dir: info-mac/comm Name: ircle-135.hqx	Ftp: ftp.utas.edu.au Dir: pc/trumpet/lwp-version Name: irclwp.zip	

To obtain the program TurboGopher for a Macintosh, you would do the following:

- Find a machine that has *Ftp* installed (most Unix systems) and login
- Type: ftp
- Type: open sumex-aim.stanford.edu
- Type: anonymous (when asked for a user name)
- Type: -guest (when asked for a password)
- Type: cd info-mac/comm (to change to the appropriate directory)
- Type: dir turbo* (to see if the file is actually there, and check the version)
- Type: binary (to change to binary mode for uploading programs)
- Type: get turbo-gopher-105.hqx (to upload the file to your computer)

more features of the Internet are:
 Hitchhiker's Guide to the Internet
 Internet Gold - Finding the Nuggets
 Internet Users' Glossary
 Introduction to Gopher
 Merit's Cruise of the Internet
 WAIS Introduction

What is the Internet - Working Draft, FYI.

Zen and the Art of the Internet: A
 Beginner's Guide to the Internet.

Search for these documents using *Gopher*
 or *WAIS* with appropriate keywords.

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dents were not required to do all of the listening. Several students who had conducted research on their own campuses or during summer research programs came prepared and gave presentations on their work. Then it was time for the professionals, including seven faculty members accompanying the students, to listen along with peers to what the students had accomplished. In so doing, the students inspired each other to reach for greater achievements.

Rounding out the three days of activities were other panels on graduate school and related issues with faculty participants from Carnegie Mellon University, Howard University, University of Maryland, Hampton University, Georgia State University, and the University of Georgia. This provided a unique opportunity to obtain information on applying to, and attending a graduate school as well as financing advanced study.

Also represented at the conference were the National Physical Science Consortium, which provides graduate support to minority students, and the National Security Agency of the Department of Defense, which provided financial support to make the conference possible. Conference coordinators, Teresa Edwards, Nagambal Shah, and Sylvia Bozeman of the Spelman College mathematics faculty, were quite pleased with the results of the second MATHfest for undergraduates. In a symbolic gesture of determination to institute an annual conference of this type, the MATHfest Torch was passed from James Turner, originator and director of the first MATHfest at Hampton University, to Teresa Edwards, current director, and on to Latricia Edwards, a student at Southern University, Baton Rouge, LA.

Service	How to reach it	Notes	Chart C
<i>Usenet</i>	rn or nn	(local Unix machine)	
<i>Gopher</i>	telnet ux1.cso.uiuc.edu	login as: gopher	
<i>WAIS</i>	telnet sunsite.unc.edu	login as: swais	
<i>IRC</i>	telnet tiger.itc.univie.ac.at 6668	no login necessary	
<i>Archie</i>	telnet archie.sura.net	login as: qarchie	

1994 Residential Summer Institutes for Mathematically Talented Undergraduates

University of California at Berkeley, June 18-July 30

The sixth annual Summer Mathematics Institute (SMI) at UC Berkeley seeks applicants from African-American, Hispanic-American, and Native-American undergraduate men and women who are considering research careers in mathematics and related fields. Approximately 30 students will receive room and board, a \$2,000 stipend, and the cost of transportation to and from Berkeley. The SMI is a cooperative project of the mathematics departments at UC Berkeley and the University of Texas at Austin. Program organizers are Professor Uri Treisman (Texas) and Professor Leon Henkin (UC Berkeley).

Mills College, June 18-July 30

The fourth annual intensive mathematics program at Mills College is seeking applications from undergraduate women of all ethnic groups who are considering research careers in mathematics and related fields. Approximately 20 students will be admitted to the 1994 program; each will receive room and board, a \$2,000 stipend, and a travel allowance. The SMI is supported by grants from NSF, the NSA, and Grenetech, Inc. Program organizers are Lenore Blum (Mathematical Sciences Research Institute); Steven Givant (Mills College); Leon Henkin (UC Berkeley); and Deborah Nolan (UC Berkeley).

Faculty members are asked to seek out candidates for the programs and to encourage them to apply. All applicants must have completed *with distinction* at least one year of college mathematics beyond freshman calculus by June 1994. In addition, applicants to the Mills Program must have completed one course that involves extensive exposure to discovering and writing proofs.

Institute description

Participants explore in depth two areas of mathematics. Part of this exploration will take place in seminars consisting of approximately 12 students each and taught by active research mathematicians. Seminar students will be encouraged to tackle challenging problems individually, in small groups, and in consultation with graduate student mentors. In addition, there will be weekly colloquia designed to provide participants with a broad view of current work in mathematics. Lastly, students will participate in informal workshops that will (1) assist them in making informed decisions about graduate school, (2) give them current information about fellowships and financial aid opportunities to support their graduate studies, and (3) make them aware of career opportunities for mathematicians.

The application deadline for both programs is February 11, 1994. Further information and application forms for the Institute at UC Berkeley can be obtained by calling Olga Alvarez at (512) 471-3285, by electronic mailing OAlvarez@utxvm.cc.utexas.edu, or by writing to the Office of Special Projects, College of Natural Sciences, University of Texas, W.C. Hogg Building #204, Austin, TX 78712. Further information and application forms for the SMI can be obtained by calling Kathy Guarnieri at (510) 430-2226 or by writing to Summer Mathematics Institute, c/o Mills College, Oakland, CA 94613.

NEW NEW NEW NEW NEW

The Search for E.T. Bell

also known as John Taine

Constance Reid



No one today writes about mathematics and mathematicians with more grace, knowledge, skill, and clarity, and no one is going to produce a more delightful, informative, accurate account of Eric Temple Bell and his work, and that of his alter-ego, the prolific pioneer of science fiction, John Taine. This is a fine book.

—Martin Gardner

Eric Temple Bell (1883–1960) was a distinguished mathematician and a best selling popularizer of mathematics. His *Men of Mathematics*, still in print after almost sixty years, inspired scores of young readers to become mathematicians. Under the name “John Taine,” he also published science fiction novels (among them *The Time Stream*, *Before the Dawn*, and *The Crystal Horde*) that served to broaden the subject matter of that genre during its early years.

In *The Search for E.T. Bell*, Constance Reid has given us a compelling account of this complicated, difficult man who never divulged to anyone, not even to his wife and son, the story of his early life and family background. Her book is thus more of a mystery than a traditional biography. It begins with the discovery of an unexpected inscription in an English churchyard and a series of cryptic notations in a boy’s schoolbook. Then comes an inadvertent revelation, by Bell himself, in a respected mathematical journal... You will have to read the book to learn the rest.

Includes a collection of over 75 photographs.

384 pp., Hardbound, 1993

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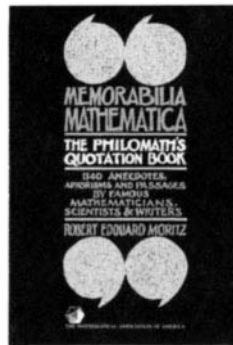
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Memorabilia Mathematica

The Philomath’s Quotation Book

Robert Edouard Moritz



When Robert Edouard Moritz compiled his book of quotations, **Memorabilia Mathematica**, which appeared in 1914, he stated that his primary objective was to seek out the exact statement of and exact references for famous passages about mathematics. He searched the writing not only of mathematicians, but poets, philosophers, historians, statesmen, and scientists as well. His sources ranged from the works of Plato to the writings of Hilbert and Whitehead. His second objective was to produce a volume that would be a source of pleasure, encouragement, and inspiration to both mathematicians and non-mathematicians alike

The more than eleven-hundred fully annotated selections in this book, gathered from the works of three hundred authors, cover a vast range of subjects pertaining to mathematics. Grouped in twenty-one chapters, they deal with such topics as the definitions and objects of mathematics; the teaching of mathematics; mathematics as a language or as a fine art; the relationship of mathematics to philosophy, to logic, or to science; the nature of mathematics, and the value of mathematics. Other sections contain passages referring to specific subjects in the field such as arithmetic, algebra, geometry, calculus, and modern mathematics. Of special interest is the extensive amount of material on great mathematicians which provides irreplaceable glimpses into the lives and personalities of mathematical giants.

440 pp., Paperbound, 1993

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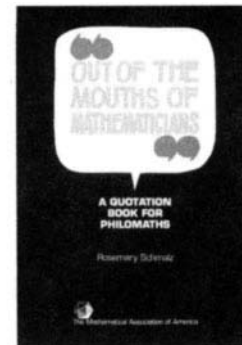
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Catalog Number: MEMO

Out of the Mouths of Mathematicians

A Quotation Book for Philomaths

Rosemary Schmalz



Published as a companion volume to Robert Edouard Moritz’s **Memorabilia Mathematica**, Rosemary Schmalz’s **Out of the Mouths of Mathematicians** picks up where Moritz left off. Her work will give you a sense of the “story” of twentieth century mathematics.

Out of the Mouths of Mathematicians: A Quotation Book for Philomaths is a compilation of 727 quotations from 292 contributors, almost all of whom are twentieth century mathematicians. The book also offers readers the opportunity to broaden their ideas about what mathematics is by offering many definitions of mathematics, making comparisons of mathematics to computing and to the fine arts, and showing similarities between many aspects of mathematics and religion. The complete reference for each quotation allows the reader to continue exploration into a favorite area. A large topic index makes the book quite user-friendly. Some of the subject categories include: The Development of Mathematics, Exhortations to Aspiring Mathematicians, Pure and Applied Mathematics, About Mathematicians (by name), Anecdotes and Miscellaneous Humor, Particular Disciplines in Mathematics, Moments of Mathematical Insight, Mathematics and the Arts,... and much more.

This book will give pleasure to any philomath. It can be used to facilitate a literature search or to give quick access to an appropriate quote for writers and speakers.

304 pp., Paperbound, 1993

ISBN 0-88385-509-7

List: \$29.00 MAA Member: \$23.00

Catalog Number OMMA

NEW NEW NEW NEW NEW

Knot Theory

Charles Livingston

I learned more about knots after an hour with the book than I thought I could, and I am glad that it is here on my desk so that I may spend more time with it and, I hope, learn more.
—Paul Halmos

Knot Theory, a lively exposition of the mathematics of knotting, will appeal to a diverse audience from the undergraduate seeking experience outside the traditional range of studies to mathematicians wanting a leisurely introduction to the subject. Graduate students beginning a program of advanced study will find a worthwhile overview, and the reader will need no training beyond linear algebra to understand the mathematics presented.

The interplay between topology and algebra, known as algebraic topology, arises early in the book, when tools from linear algebra and from basic group theory are introduced to study the properties of knots, including the unknotting number, the braid index, and the bridge number. Livingston guides you through a general survey of the topic showing how to use the techniques of linear algebra to address some sophisticated problems, including one of mathematics' most beautiful topics, symmetry. The book closes with a discussion of high dimensional knot theory and a presentation of some of the recent advances in the subject—the Conway, Jones and Kauffman polynomials. A supplementary section presents the fundamental group, which is a centerpiece of algebraic topology. An extensive collection of exercises is included.

264 pp., Hardbound, 1993

ISBN 0-88385-027-3

List: \$31.50 MAA Member: \$25.00

Catalog Number CAM-24

Proofs Without Words

Exercises in Visual Thinking

Roger B. Nelsen

Just what are “proofs without words”? First of all, most mathematicians would agree that they certainly are not “proofs” in the formal sense. Indeed, the question does not have a simple answer. Proofs without words are generally pictures or diagrams that help the reader see *why* a particular mathematical statement may be true, and *how* one could begin to go about proving it. While in some proofs without words an equation or two may appear to help guide that process, the emphasis is clearly on providing *visual* clues to stimulate mathematical thought. Proofs without words bear witness to the observation that often in the English language to *see* means to *understand*, as in “to see the point of an argument.”

Proofs without words have a long history. In this collection you will find modern renditions of proofs from ancient China, classical Greece, twelfth-century India—even one based on a published proof by a former President of the United States! However, most of the proofs are more recent creations, and many are taken from the pages of MAA journals.

The proofs in this collection are arranged by topic into six chapters: Geometry and Algebra; Trigonometry, Calculus and Analytic Geometry; Inequalities; Integer Sums; Sequences and Series; and Miscellaneous. Teachers will find that many of the proofs in this collection are well suited for classroom discussion and for helping students to think visually in mathematics.

The readers of this collection will find enjoyment in discovering or rediscovering some elegant visual demonstrations of certain mathematical ideas that teachers will want to share with their students. Readers may even be encouraged to create new “proofs without words.”

160 pp., Paperbound, 1993, ISBN 0-88385-700-6

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AAAS Meeting in San Francisco to Offer Strong Mathematics Program

Warren Page

The 1994 Annual Meeting of the AAAS, February 18-23, in San Francisco, will feature many outstanding expository talks by prominent mathematicians. These include the following symposia (three-hour sessions) and invited talks sponsored by Section A (Mathematics) of the AAAS:

- *Phase Transitions*, organized by Jennifer Tour Chayes (UCLA). Presenters will be: Jennifer Tour Chayes, Christian H. Borgs (Free University of Berlin); D.B. Abraham (Oxford University); and Steve Kivelson (UCLA).
- *Mathematics, Sculpture, and Architecture*, organized by Nathaniel Friedman, (SUNY-Albany). Presenters will be: Harriet Brisson (Rhode Island College); Stewart Dickson (Post Group Digital Center, Hollywood, CA); Nathaniel Friedman, Charles Perry (Sculptor); and Rhonda Roland Shearer (Sculptor).
- *The Unreasonable Effectiveness of Number Theory*, organized by Stefan Burr (CUNY), and Manfred R. Schroder (University of Göttingen). Presenters will be: Manfred R. Schroder, Fan R.K. Chung (Bellcore), Stefan Burr; Jeffrey C. Lagarias (AT&T Bell Labs).
- *Frontiers of Physical Sciences lecture: The Stability of Matter From Atoms to Stars*, by Elliot Lieb (Princeton University).
- *Topical Theme lecture: Fermat's Last Theorem*, by Karl Rubin (Ohio State University).

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

- *Is Visualization REALLY Necessary for Science*, organized by Nahum Gershon, (MITRE).
- *The Third International Math and Science Study*, organized by Dorothy M. Guilford (NAS), and Daniel Horvitz (National Institute of Statistical Sciences).
- *Face Recognition by Computers and People*, organized by James C. Bartlett (University of Texas) and Bert S. Moore (University of Texas).

The above symposia are only a few of the 150 or so AAAS program offerings in the physical sciences, life sciences, and the social and biological sciences that will broaden the perspectives of students and professionals alike. Indeed, AAAS Annual Meetings are showcases of American science, deserving greater participation by mathematicians. In presenting mathematics to the AAAS Program Committee, I have found the committee genuinely interested in more symposia on mathematical topics of current interest. The Section A Committee is looking for organizers and speakers who can present substantial new material in understandable ways.

The task is not easy, but outstanding success of the mathematics symposia at last year's AAAS Annual Meeting in Boston proved that effort and inspiration can accomplish wonders. That meeting's mathematics program showed that first-rate math-

ematical researchers can also effectively reach a broad scientific audience.

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

I hope that you will have the opportunity to attend some of this year's exciting symposia in San Francisco. For details see the October 8th issue of *Science*. I invite you to attend our Section A Committee Meeting, 12:00-2:00P.M., Sunday, February 20, Teakwood B Room at the San Francisco Hilton. The committee meeting is open to all who wish to stimulate interest and activities of the mathematical sciences within the AAAS. Please send to me, and encourage your colleagues to send me, symposia proposals for future AAAS meetings.

Warren Page is Secretary of Section A of the AAAS.

MAA Statement of Ownership

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Volunteer Tutoring Program at Montgomery College - Rockville

Volunteer mathematicians are urgently needed to tutor one or more hours per week.

Depending upon the number of tutors available, tutoring will be offered one-on-one or in small groups.

Please call Helen McCarron, Coordinator, Volunteer Tutoring Program, (301) 530-0490 or George Jefferson, Student Activities Office, Montgomery College, (301) 279-5092

Penn State Erie, Behrend College

Mathematics Faculty Position: A tenure-track position for fall 1994. Applicants must have strong commitment to undergraduate teaching including topology and algebra, with research interests in areas of applied mathematics, numerical analysis, probability, or partial differential equations to develop an externally funded research program involving undergraduates. PhD required; postdoctoral and teaching experience a plus. Behrend is a 4-year and graduate college offering the BS in mathematics within the Penn State system. Application deadline is January 15, 1994. Send resume, transcripts, a brief description of research interests, and arrange that three letters of reference be sent to Dr. Roger Knacke, Division of Science, Department MATH-F, The Pennsylvania State University at Erie, Erie, PA 16563-0203

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MATHEMATICS

Applications are invited for a tenure-track position in mathematics beginning August 1993. We seek a PhD mathematician who is committed to excellent teaching of undergraduates, will maintain active scholarship and is willing to contribute to divisional and university activities. The area of expertise is open, but the ability to teach in an area of modern applied mathematics is desirable.

Send letter of interest, curriculum vitae, graduate transcripts and three letters of support to:

Dr. Addison Frey
Division of Mathematics
and Computer Science
Alfred University
26 N. Main Street
Alfred, NY 14802
(E-mail: ffrey@alfredu.bitnet)

We particularly encourage women and minority applicants. Alfred University is an Equal Opportunity Employer.

Review of applications will begin January 25, 1994 and will continue until the position is filled.

Wake Forest University Department of Mathematics and Computer Science

Applications are invited for a position as Instructor or Visiting Assistant Professor in Mathematics. The term is one year, renewable for up to three years. Rank is dependent upon qualifications, and a Master's degree or PhD degree in Mathematics or Statistics is required. Duties consist only of teaching three courses per semester. A strong interest and preparation for teaching calculus and introductory statistics is desirable. The department has 22 members, offers a BS and MA in mathematics, and a BS and MS in computer science. Send a letter of applications and resume to Richard D. Carmichael, Chairman, Department of Mathematics and Computer Science, Wake Forest University, Box 7388, Winston-Salem, NC 27109. AA/EO employer.

Numerical Analysis Position Department of Mathematics Southern Illinois University at Carbondale Carbondale, Illinois 62901

Applications are invited from qualified candidates for a tenure-track position at the assistant professor level beginning on August 16, 1994. PhD in mathematics with specialization in numerical analysis required. Evidence of teaching effectiveness is required (foreign applicants must provide evidence of ability to teach in English effectively). Send letter of application, resume, and three letters of rec-

ommendation to:

Numerical Analysis
c/o Ronald B. Kirk, Chair
Department of Mathematics
Southern Illinois University at Carbondale
Carbondale, Illinois 62901

The closing date for applications is December 10, 1993 or until the position is filled. SIUC IS AN EQUAL OPPORTUNITY/ACTION AFFIRMATIVE EMPLOYER. Women and minorities are particularly encouraged to apply.

Topology Position Department of Mathematics Southern Illinois University at Carbondale Carbondale, Illinois 62901

Applications are invited from qualified candidates for a tenure-track position beginning August 16, 1994. The rank will be at the assistant or associate professor level depending on qualifications of the candidate. A PhD in mathematics with specialization in topology—preferably algebraic topology—is required. Candidates must have demonstrated excellence in research or potential for such, and must be qualified to teach graduate level courses in algebraic topology. Evidence of teaching effectiveness is required (foreign applicants must provide evidence of ability to teach in English effectively). Send letter of application, resume, and three letters of recommendation to:

Topology Position
c/o Ronald B. Kirk, Chair
Department of Mathematics
Southern Illinois University at Carbondale
Carbondale, Illinois 62901

The closing date for applications is December 10, 1993 or until the position is filled. SIUC IS AN EQUAL OPPORTUNITY/ACTION AFFIRMATIVE EMPLOYER. Women and minorities are particularly encouraged to apply.

Murray State University Department of Mathematics & Statistics

Position: Search extended for Asst. Professor. **Starting:** August 1, 1994. **Qualifications:** Doctorate in mathematics or mathematics education with at least a master's degree in mathematics; evidence of outstanding teaching, a successful record of scholarly activity or the potential for continuing scholarly activity, and a strong commitment to teacher education. **Responsibilities:** Maximum three course teaching load of a range of courses including content/methods courses for prospective K-12 teachers, continuing research/scholarly activities, and university/departmental service;

seek external funding, work in collaboration with public schools to help implement the Kentucky Education Reform Act. **Application Deadline:** December 17, 1993. **To Apply:** Send a letter of application, vita, and copies of graduate transcripts to Department of Mathematics & Statistics, Murray State University, Murray, KY 42071. Murray State University is an equal opportunity education and employment opportunity, M/F/D, AA employer.

United States Military Academy Department of Mathematical Sciences

USMA seeks mathematics faculty at the Associate and Assistant Professor level. Applicants must be U.S. citizens, hold an earned PhD in mathematics, applied mathematics, operations research, or statistics. Responsibilities include teaching various core and elective courses, coordinating curriculum development, carrying out research, participating in faculty committees, and providing educational leadership. Send curriculum vitae, letters of recommendation, academic transcripts, and if claiming veteran's preference, DD214 to U.S. Military Academy, Civilian Personnel Office, Attn: Mrs. Vicki Nunnally, West Point, NY 10996-1995. The deadline for applications is February 1, 1994.

University of Alaska Southeast

Assistant Professor of Mathematics, tenure track position starting August 1994. PhD degree in mathematics required. Teaching experience at college level required. Must be competent and willing to teach precollege through upper division mathematics courses. Teach twelve hours per semester. Advise undergraduate students. Perform appropriate University and public service. This is a nine-month teaching track position. Research is welcome but not required for tenure or promotion. Salary is competitive and commensurate with qualifications and experience. Applicants must submit completed application form, curriculum vitae, official transcripts, three letters of reference, and a one page statement of Philosophy of Mathematics Education. Applications must be received by January 17, 1994. Application forms may be obtained from:

University of Alaska Southeast
Personnel Services
11120 Glacier Highway
Juneau, AK 99801-8675
Telephone: (907) 465-6263

The University of Alaska is an AA/EO employer and educational institution. Women and minority candidates are encouraged to apply.

Marist College

Mathematics Faculty - Tenure Track Fall 1994

The Marist College Division of Computer Science and Mathematics invites applications for one (1), possibly more depending on funding, tenure track faculty positions in mathematics beginning Fall 1994. Responsibilities include teaching 12 hours per semester at the undergraduate level, continuing scholarly activity and institutional participation.

Minimum qualifications include a PhD in mathematics or a closely related field, interest and ability to teach all mathematics courses at the undergraduate level, and a commitment to research. The position is open to applicants from all research areas.

Marist College is a four year liberal arts institution. The Division of Computer Science and Mathematics administers undergraduate majors in mathematics, computer mathematics, computer science, computer information systems, and a graduate program in computer science. The Division currently employs 24 full-time faculty including 13 in mathematics. The College is equipped with state-of-the-art computer hardware and software.

Review of resumes will begin immediately and will continue until the position is filled. Please submit a letter of application discussing teaching philosophy and research interests, resume and three letters of recommendation to: Dr. Onkar P. Sharma, Chair, Division of Computer Science and Mathematics, MPO Box 905, Marist College, FOCUS, Poughkeepsie, NY 12601.

Marist College is committed to the principle of diversity, and welcomes applications from women and members of ethnic minorities.

Marist College is an Equal Opportunity/Affirmative Action Employer.

Mathematics - Eastern Illinois University, Charleston, IL 61920. Beginning 8/22/94. Subject to availability of funding. Two positions. Department grants undergraduate degrees in Mathematics (pure, applied, and teacher certification options), Mathematics and Computer Science, and Masters degrees in Mathematics and Mathematics Education. Duties include teaching wide spectrum of courses in support of these programs as well as service courses and general education courses. Excellence in teaching expected. Applications from all areas of pure and applied mathematics, statistics, and mathematics education welcome. PhD in appropriate discipline required. Applications due 1/15/94. Send application letter, transcript, three letters of recommendation to Ira Rosenboltz. Equal opportunity, equal access, affirmative action employer committed to achieving a diverse community.

Carleton College

The Department of Mathematics and Computer Science has one tenure-track and one two-year position to begin September, 1994. A PhD in math or applied math is required and evidence of teaching excellence is essential. In addition to applicants with a pure math background, we are interested in candidates with applied interdisciplinary training or modeling experience in the biological or physical sciences. Review of applicants will begin Dec. 1 and continue until positions are filled. Carleton faculty teach 2 courses per term, 3 terms per 9-month year. Preference will be given to candidates able to teach 1 or 2 introductory statistics courses per year. Carleton is an Affirmative Action / Equal Opportunity Employer; applications are specifically invited from women and members of minority groups.

Send letter of application, resume, graduate transcripts, and three letters of recommendation to David Appleyard, Chair, Department of Mathematics and Computer Science, One North College Street, Northfield, MN 55057-4025. (email: dappleya@carleton.edu). At least one letter should specifically address teaching.

Carleton is a highly selective liberal arts college 35 miles south of Minneapolis/St. Paul. The department has 12 full-time members. A commitment to teaching in a liberal arts setting is essential. Research is supported and encouraged. In the fall of '93, the department moved into a new building with excellent facilities for learning and teaching. Computing resources available to the department include four teaching laboratories equipped with Mac Quadras, NeXts, 486 PC's, DEC microvax, Raster tech 3/85 workstations, and access to a central VAX cluster. The department employs a full-time computer technician.

Mathematics Department

Tenure track position at Assistant Professor rank beginning 8/22/94 to teach undergraduate/graduate mathematics education and mathematics, and supervise secondary schools student teachers. Teaching load: 12 hours/sem. Salary range: \$32,677 to \$45,786. Qualifications: doctorate (or near completion) in mathematics or mathematics education with a strong mathematics background, evidence of quality teaching, potential for scholarly growth. Secondary school teaching experience preferred. Send letters of application, vita, transcripts (unofficial ok), three letters of reference to Dr. Robert Washburn, Chair, Search 93-269, Southern Connecticut State University, 501 Crescent St., New Haven, CT 06515. Full consideration given to applications received by 1/15/94. AA/EOE.

Western Washington University Mathematics Education

A tenure-track position in the Department of Mathematics beginning Fall 1994. Responsibilities include teaching mathematics education courses and lower division courses in mathematics, and developing inservice opportunities. Candidates should be excellent teachers, professionally active and committed to the mathematics preparation (methods and content) of preservice and inservice elementary teachers. Recent elementary teaching experience and an appropriate advanced degree preferred. Send a letter addressing qualifications and interest in position, a vita, transcripts, and three letters of recommendation by January 15, 1994 to Dr. T.J. Ypma, Department of Mathematics, Western Washington University, Bellingham, WA 98225-9063. AA/EOE

University of Tennessee at Chattanooga

Department Head

The University of Tennessee at Chattanooga invites applications for the Head of the Department of Mathematics. A PhD in a Mathematical Science, at least five years of college mathematics teaching experience, and qualifications commensurate with the rank of Associate Professor or higher are required. Applicants should provide evidence of leadership in curriculum development, teaching, public service and research/scholarly activities. In this primarily undergraduate institution, the faculty is expected to exhibit excellence in teaching while maintaining a strong commitment to research and public service. The mathematics department has 23 faculty members including a Chair of Excellence in Applied Mathematics. Located in a very scenic metropolitan area of 400,000, UTC has a student enrollment of 8300. Send applications to Dr. DeWayne S. Nymann; Chair of the Search Committee, Dept. of Mathematics, UTC, Chattanooga, TN 37403-2598. Screening of applicant's credentials will begin on January 3, 1994, and will continue until the position is filled. Women and minorities are encouraged to apply. UTC is an Equal Opportunity Employment/Affirmative Action/Title IX/Section 504/ADA Institution.

Assistant Professor

Mathematics/Physics Department

The Mathematics/Physics Department of the Philadelphia College of Pharmacy and Science is accepting applications for a tenure-track faculty position at the assistant professor level starting in the fall of 1994. Candidates should have a PhD in math or applied math with a strong computer science and statistics background. The successful

candidate will be responsible for teaching undergraduate math and computer science courses and is expected to participate in undergraduate research by either collaborating on current faculty projects or starting their own project.

Applicants should submit a resume, the names of at least three references and a statement regarding teaching and research interests to Dr. Robert P. Marande, Chair, Mathematics/Physics Department, Philadelphia College of Pharmacy and Science, 600 South 43rd Street, Philadelphia, PA 19104. Applications will be accepted until the position is filled.

The Philadelphia College of Pharmacy & Science is an Equal Opportunity/Affirmative Action employer with a strong commitment to racial, cultural and ethnic diversity. Nominations of and applications of individuals from a broad spectrum of backgrounds are encouraged.

Spalding University Department of Mathematics and Science

The Department of Mathematics and Science of Spalding University invites applications for a tenure-track position as Assistant Professor of Mathematics beginning August 1994. Teaching responsibilities will be general undergraduate courses in mathematics, including introductory statistics. Qualifications to teach computer courses would be an asset. The successful applicant will demonstrate a dedication to teaching within the context of the liberal arts. Normal load is 12 credit hours; duties also include committee work and student advising. PhD required, full-time teaching experience desirable; salary negotiable. Send letter of application, vita, three letters of reference, and a brief statement of educational philosophy to: Edwin C. Weber, Chair, Department of Mathematics and Science, Spalding University, 851 South Fourth Street, Louisville, KY 40203. Screening of applicants will begin in February, 1994 and will continue until position is filled. AA/EOE

The College of Wooster Wooster, Ohio

Two positions are available beginning August, 1994, one tenure track, both with three year initial appointments. One position will include math education courses. The College of Wooster, an independent liberal arts college with a commitment to excellence in undergraduate education, seeks persons to teach introductory and advanced undergraduate courses in Mathematics and to direct student research projects. Ph.D. in Mathematics is required. Experience in Computer Science is desirable. Send vita, transcripts, and three letters of reference to Charles R. Hampton, Chairperson, Department of Mathematical Sciences, The College of Wooster, Wooster,

OH 44691. Review of applications will begin on January 22, 1994 and continue until the position is filled. The College of Wooster is an equal opportunity, affirmative action employer.

Mathematical Olympiad Summer Program of the Mathematical Association of America

Applications are being solicited for instructors for the Mathematical Olympiad Summer Program, conducted annually by the Mathematical Association of America. This four-week summer program is held in alternate years at the US Military Academy and at the US Naval Academy, where it will be in 1994. Twenty four outstanding high school mathematics students are chosen for the program on the basis of their performance on the American Mathematics Competitions and their potential as members of the US team to the International Mathematical Olympiad (IMO). Six students are selected for the IMO team during the four-week session, and are given specialized coaching for their participation in the IMO. All participants receive in-depth enrichment in important mathematical topics to stimulate their continuing interest in mathematics and help prepare them for future study of mathematics. Instructors in the program provide accelerated instruction in Geometry, Number Theory, Combinatorics, and Advanced Analysis. Experience working with high-ability students and familiarity with olympiad-type competitions is desired. Some instructors also serve as coaches for the IMO team, and accompany the team to the international competition, to be held in 1994 in Hong Kong. Applicants should send a copy of their Curriculum Vitae and a statement of related experience to: Professor Walter Mientka, Executive Director, American Mathematics Competitions, Department of Mathematics and Statistics, University of Nebraska, Lincoln, NE 68588-0658. Applications are due January 3, 1994. It is expected that instructors will be selected by February 15, 1994. The MAA is an equal opportunity/affirmative action employer.

DEPARTMENT OF MATHEMATICS AND ACTUARIAL SCIENCE

Indiana University Northwest, Gary, Indiana

The Department of Mathematics and Actuarial Science invites applications for both a tenure-track assistant professorship and lecturer.

Assistant professor—A Ph.D. in mathematics and a strong commitment to teaching undergraduates is expected. Applicants with a knowledge of statistics, operations research or ability to teach actuarial science courses will

be given preference.

Lecturer— A Masters in mathematics and a strong commitment to teaching undergraduates is expected. Applicants showing progress toward a Ph. D. will be given preference.

Send applications with vita, three letters of recommendation and transcripts to: Dr. A. Mizrahi, Department of Mathematics and Actuarial Science, Indiana University Northwest, 3400 Broadway, Gary, Indiana 46408. Deadline for applications is March 1, 1994. Indiana University Northwest is an Affirmative Action, Equal Opportunity Employer.

SCHOOL OF MATHEMATICS, UNIVERSITY OF MINNESOTA

Temporary Assistant Professor, Mathematics and Mathematics Education, for recent Ph.D.s interested in working in mathematics education in a major mathematics department. Areas include graduate training, undergraduate curriculum reform, programs for mathematically gifted secondary school students, and networking. 9-month appointment, non-tenure track, 2-year initial period, renewable for up to 2 additional years. Work with the University's Talented Youth Mathematics Program (UMTYMP), departmental initiatives, and various networking grants. Projected academic year salary \$31,000–\$33,000. Summer appointments may be available. Responsibilities: Teaching in the UMTYMP calculus component. Work with the Director on K–12 and undergraduate curriculum development, innovative graduate programs and activities, and systemic networking projects. Conduct research with the Director and staff leading to publications. Qualifications: Ph.D. degree in mathematics by beginning of appointment. Teaching experience at the undergraduate level required. Research experience in educationally related programs, especially with undergraduate curriculum development or innovative educational programs for talented secondary school students desirable. Send curriculum vitae, 3 letters of recommendation (including at least one letter on teaching and educational experiences), and statement of interest and background to Dr. Harvey Keynes, School of Mathematics, University of Minnesota, 206 Church Street SE, 127 Vincent Hall, Minneapolis, MN 55455. THE UNIVERSITY OF MINNESOTA IS AN EQUAL OPPORTUNITY EDUCATOR AND EMPLOYER.

Western Connecticut State University

Applications are invited for a **tenure track Assistant Professor** position in mathematics for fall 1994. Preference will be given to applicants with a background in algebra and in discrete mathematics and with a research background similar to the interests of the department. Applicants should have a PhD in

mathematics or should expect to receive same by June 1994. Applicants should be committed to teaching as a primary responsibility and to directing student research. The normal full time teaching load in 12 credit hours. The university is located in a dynamic area within 60 miles of New York City, New Haven, and Hartford. Many professional and cultural opportunities exist. Screening will begin immediately and continue until a suitable candidate is selected. Applications should be received by 2/1/94 in order to be guaranteed full consideration. Send a letter of application, resume, and the names of three references to: Josef Friedman, Associate Chair, Department of Mathematics and Computer Science, Western Connecticut State University, 181 White St., Danbury, CT 06810. An Equal Opportunity/Affirmative Action Employer.

Central College Pella, Iowa

Mathematics/Computer Science: Tenure-track position beginning September 1, 1994. PhD in Mathematics required; ability to teach mathematics education and/or computer science courses desirable; demonstrated ability and commitment to provide high quality undergraduate teaching essential. Primary duties include teaching, advising, and sharing in the departmental duties. Support for the institutional mission is expected. Central College is on the 3x3 modified quarter system; faculty normally teach 7 courses/year with no more than 3 in a term. Central College is an inclusive community welcoming students, faculty, and staff from any cultural, ethnic, and religious traditions. It is a private liberal arts college, affiliated with the Reformed Church in America, with study abroad programs in 8 locations. Send resume, transcripts, and three letters of recommendation to: Dr. W.H. Bearce, Dean of the College, Central College, Pella, IA 50219. Review of applications will begin on January 20, 1994. Central College is an equal opportunity/affirmative action employer. We actively seek and encourage applications from persons of color and female candidates.

The University of North Carolina at Asheville

The Mathematics Department at UNCA has an entry level tenure track position open beginning August 1994. PhD is required. UNCA is a small public liberal arts college dedicated to undergraduate education. Typical teaching load is 3–4 courses per semester. In addition scholarly work and university service are expected. Application deadline is February 1, 1994. All interested candidates send a resume, a statement clarifying ones teaching philosophy, 3 letters of recommendation (at least one should address teaching ability), and gradu-

ate school transcripts to:

Lothar A. Dohse, Chair
Department of Mathematics
University of North Carolina at Asheville
Asheville, NC 28804-3299

UNCA is an Equal Opportunity/Affirmative Action Employer; women and minorities are encouraged to apply.

SUNY Farmingdale

Fall 1994 anticipated tenure track vacancies at the assistant professor rank. Teaching responsibilities may include remedial through all levels of undergraduate mathematics. Teaching emphasized with scholarship and service expected. Expertise in the use of technology in the teaching of mathematics desired. Minimum qualifications, doctorate in mathematics, statistics, or operations research. The department is particularly interested in candidates with expertise in Applied Mathematics, however, other areas will be considered. Consideration will also be given to candidates who expect to complete all degree requirements by August 15, 1994 (necessary for appointment). Letter of application and resume, including the names and telephone numbers of three references must be received by January 21, 1994. Address correspondence to: Dr. Robert V. Mark, Dean, School of Arts and Sciences, State University of New York, College of Technology, Farmingdale, NY 11735. The College is an Equal Opportunity/Affirmative Action Employer.

Clemson University Department of Mathematical Sciences

Applications and nominations are invited for the position of Department Head available July 1, 1994. Qualifications include a PhD degree, teaching experience, proven research ability, and leadership potential. Administrative experience is highly desirable. The department integrated the areas of algebra/combinatorics, analysis, computational mathematics, operations research, and probability/statistics into balanced undergraduate and graduate programs. With 54 faculty and 90 graduate students, it is the largest unity within the College of Sciences. A candidate is sought who is committed to the mathematical sciences philosophy and who will provide strong leadership for future development. Initial screening will begin February 1, 1994; applications will be accepted until the position is filled. Vitae (with names and telephone numbers of three references) should be sent to: Professor Douglas R. Shier, File HS, Clemson University, Box 341907, Clemson, SC 29634-1907. Clemson University is an AA/EO Employer.

Pomona College Claremont, California

Pomona College seeks applications for a tenure track position, at the assistant professor level. The strongest candidates will have post-doctoral experience and be excited about teaching our culturally and intellectually diverse student body, of which about a third of the mathematics majors are women. They should also be committed to continuing a strong research program.

Send application materials to: The Search Committee, Department of Mathematics, Pomona College, Claremont, CA 91711-6348. Include a curriculum vitae and 3 letters of recommendation (which include evaluations of teaching), graduate school transcripts, and a description, written for the non-specialist, of research accomplishments and plans. Let us know if you will be at the January AMS meeting. We especially encourage applicants from traditionally under-represented groups. Pomona College is an AA/EEO employer.

DARTMOUTH COLLEGE John Wesley Young Research Instructorship in Mathematics

The John Wesley Young Research Instructorship is a two year post-doctoral appointment for promising new or recent PhD's whose research interests overlap a department member's. Current departmental interests include areas in algebra, analysis, combinatorics, computer science, differential geometry, logic and set theory, number theory, probability and topology. Teaching duties of four ten-week courses spread over two or three quarters typically include at least one course in the instructor's speciality and include elementary, advanced and (at instructor's option) graduate courses. Nine-month salary of \$34,000 supplemented by summer (resident) research stipend of \$7,556 (two-ninths). Send letter of application, résumé, graduate transcript, thesis abstract, description of other research activities and interests if appropriate, and 3 or preferably 4 letters of recommendation (at least one should discuss teaching) to Phyllis A. Bellmore, Mathematics and Computer Science, 6188 Bradley Hall, Hanover, NH 03755-3551. Applications received by Jan. 15 receive first consideration; applications will be accepted until position is filled. Dartmouth College is committed to affirmative action and strongly encourages applications from minorities and women.

SEARCH EXTENDED University of St. Thomas

Dept. of Mathematics, St. Paul, MN Assistant Professor of Mathematics

Applications are sought for a non-tenure track position in mathematics. Applicants must have completed a Ph.D. in an area of discrete mathematics, be recognized for quality undergraduate teaching, have a well-defined research agenda, and share a commitment to liberal arts education. Candidates should also consider their role in contributing to the mission of the University. The University of St. Thomas, located in the heart of the attractive Twin Cities metropolitan area, has, for over a century, provided a strong program of liberal arts education in the Catholic tradition. The Department of Mathematics offers a comprehensive undergraduate program. Application materials, including a letter of interest, a CV, and three letters of recommendation (including comments of the applicant's experience and promise in the areas of teaching and scholarship) must be received by January 1, 1994. Applications should be sent to Suzanne Lechtman, Department of Mathematics, University of St. Thomas, St. Paul, MN 55105. The University of St. Thomas is an equal opportunity/affirmative action employer. Qualified women and persons of color are particularly encouraged to apply.

Mathematics Chair Search

Rose-Hulman Institute of Technology is a school of 1350 strong (mean SAT scores – 680 math, 540 verbal) science, engineering, and mathematics students.

The Department of Mathematics consists of 17 faculty who take teaching seriously. Faculty are active in regional and national professional organizations and are leaders in curriculum efforts to use computers in instruction and to teach innovative curriculum combining science, engineering, and mathematics.

We seek a Chair to begin in Fall 1994.

Send request for more information, inquiries, and applications to: Chair Search Committee, Department of Mathematics, Rose-Hulman Institute of Technology, Terre Haute, IN 47803, USA. E-mail: MathSearch@rose-hulman.edu. Phone (812) 877-8391.

A complete application includes a vita, a statement of mathematical, pedagogical, and administrative philosophy, and three letters of recommendation. Evaluation of applications begins December 15, 1993.

Mathematics/Physics Tenure Track Faculty Positions and Department Chair

Assistant Professor of Physics. PhD in physics, experimental preferred. Teach 12–14 semester hours in physics and mathematics (introductory). Oversee physics laboratory equipment and operation. Professor Tai-Hyung Kwon, Chair, Search Committee.

Assistant Professor of Mathematics. PhD in mathematics. Teach 12–14 semester hours. Professor Donald Alexander, Chair, Search Committee.

Department Chair. PhD in mathematics or physics. Minimum of five years university teaching experience desired. Teach 8–10 semester hours plus usual chair duties. Professor Anne Battle, Chair Search Committee.

Salaries negotiable. Positions begin August 1994. Interested candidates send resume and three letters of recommendation to appropriate search committee chair, **Department of Mathematics and Physics, University of Montevallo, Montevallo, AL 35115.** Review of applications begins January 20, 1994. *UM in an Affirmative-Equal Opportunity Institution and qualified minority candidates are encouraged to apply. Individuals with disabilities who require a reasonable accommodation in order to respond to this announcement and/or participate in the application process are encouraged to contact the Office of Personnel Service at (205) 665-6055 for assistance.*

Western Carolina University

Department of Mathematics and Computer Science: Tenure track position in Mathematics Education beginning Fall 1994. PhD or equivalent in Math Education required. Quality teaching in both mathematics and math education; continued scholarly activity and service expected. Applicants should provide a current vita, graduate transcripts, and three letters of reference to: Dr. Harold Williford, Chair, Search Committee, Department of Mathematics and Computer Science, Western Carolina University, Cullowhee, NC 28723. WCU is an EO/AA Institution. Closing date is February 1, 1994.

Mathematics

Assistant Professor, tenure-track position. Teach wide range of undergraduate mathematics courses in a multi-purpose college environment. Preference for candidates with high school teaching or computer science experience. Begins Fall 1994. Women and minorities encouraged to apply. Send application, including vita, statement of career objectives, and three letters of recommendation to: Chairperson, Mathematics Search Committee, School of Arts and Sciences,

Eastern Oregon State College, 1410 "L" Avenue, La Grande, OR 97850-2899. Closes February 1, 1994, or until filled. Inquiries: Robert Brandon, Telephone (503) 962-3631; E-mail bbrandon@eosc.osshe.edu. AA/EOE

University of Evansville Department of Mathematics

Applications are invited for a tenure-track position as assistant professor of mathematics beginning August, 1994. PhD in mathematics and a strong commitment to teaching required. Background or interest in teaching in at least one of the following areas preferred: actuarial mathematics, mathematics for elementary teachers, mathematics modeling. Responsibilities include teaching 9-12 hours per semester in a wide range of undergraduate mathematics courses, continuing scholarly activities, and University service. Send application letter, resume, transcripts, and 3 letters of reference to:

Dr. J. Robert Knott, Chairman
Mathematics Department
University of Evansville
Evansville, Indiana, 47722

The University of Evansville is an Equal Opportunity/Affirmative Action Employer.

Xavier University Cincinnati OH 45207

Applications are invited for an assistant/associate professor tenure track position in Computer Science starting fall 1994. Teaching/research experience preferred. Applicants should have PhD in Computer Science, however, those having a doctorate in a related field with appropriate computer experience are also encouraged to apply. The position requires strong commitment to teaching at the undergraduate level, to scholarly research, and to service consistent with the mission of Jesuit higher education. Research interests must be in mainstream Computer Science. Applications will be accepted until February 1, 1994. Send a letter of application, resume, copy of graduate transcripts, and three letters of recommendation to: Janice B. Walker, Chair, Department of Mathematics and Computer Science. Xavier University is an EO/AA Employer. Women and minorities are especially encouraged to apply.

Department of Mathematics College of Natural Sciences and Mathematics

Indiana University of Pennsylvania

Indiana University of Pennsylvania invites applications for a tenure-track position in elementary and/or secondary mathematics education to begin in the Fall of 1994. The appointment is anticipated at the Assistant Professor level. Associate Professor is possible in the case of exceptional qualifications. The department recognizes a greater need in elementary mathematics education, although those with a secondary mathematics education background are encouraged to apply.

Responsibilities:

1. Teach undergraduate and graduate courses in elementary and/or secondary mathematics education and advise students. The normal course load is 12 semester credit hours. Duties include teaching courses in mathematics content and mathematics pedagogy, and supervising field experiences.
2. Continue scholarly growth.
3. Participate in university, college, and department committees.

Required Qualifications:

1. PhD / EdD by September 1994 in an area related to mathematics education with graduate course work in mathematics education.
2. Evidence of effective teaching experiences in mathematics at the elementary and/or secondary level.
3. Evidence of successful research or research promise in mathematics education.
4. Academic preparation and evidence of ability to teach mathematics content courses for elementary and/or secondary education majors.

Preferred Qualifications:

1. Experience with in-service presentations and/or curriculum consultation.
2. Active participation in recognized professional organizations.

Send letter of application, resume, undergraduate and graduate transcripts, and three current letters of reference to: Dr. Jacqueline Gorman, Chair of Search Committee, Mathematics Department, Indiana University of Pennsylvania, Indiana, PA 15705. (412) 357-2608, Bitnet: JGORMAN@IUP.

IUP is an affirmative action/equal opportunity employer.

Williams College Department of Mathematics Williamstown, Massachusetts 01267

Anticipated visiting position for the 1994-95 year, probably at the rank of assistant professor; in exceptional cases, however, more advanced appointments may be considered. Excellence in teaching and research and doctorate are expected. Please have a vita and two letters of recommendation on teaching and research sent to Visitor Hiring Committee. Evaluation of applications will begin November 15, and continue until the position is filled. As an EEO/AA employer, Williams especially welcomes applications from women and minority candidates.

University of Wisconsin-Platteville Department of Mathematics

At least two tenure-track positions as assistant professor in mathematics available August 21, 1994. Qualifications: PhD in mathematics or statistics required, primary responsibility is broad undergraduate teaching in mathematics or statistics; evidence of excellent undergraduate teaching experience; excellent communication skills, capable of maintaining a continuing program of scholarly activity; and indicate eligibility for continuing employment in the United States. Salary: \$31,000-\$34,500 depending upon qualifications and experience. The Department of Mathematics has 21 faculty. The university enrolls approximately 5000 students with programs in engineering, liberal arts, business, education, industry, and agriculture. UW-Platteville is an affirmative action, equal opportunity employer. Women and minorities especially are encouraged to apply. The names of all finalists and of nominees and applicants who have not requested in writing that their identity not be revealed will be released upon request. To be considered: Send letter of application (including eligibility for employment), vita, transcript(s), and three letters of recommendation to Dr. Alan Richert, Chairperson, Department of Mathematics, UW-Platteville, Platteville, WI 53818. Deadline: January 21, 1994.

Ohio University Robert L. Morton Mathematics Education Professorship

Dr. Robert L. Morton was perhaps the most prolific author to ever have taught at Ohio University. During his 42 years on the faculty, he wrote 9 books and co-authored junior high and elementary school mathematics textbooks, which in different editions represented 180 books. Dr. Morton wrote 160 articles and 80 book reviews/monographs/miscellaneous pieces in addition to his two co-authored

mathematics textbook series by Silver Burdett Co., *Making Sure of Arithmetic and Modern Mathematics Through Discovery*, which exceeded 50 million copies. He established the Robert L. Morton Mathematics Education Professorship as "encouragement to others for similar fulfillment of purpose."

The Morton chair is funded by an endowment and affords a unique opportunity to negotiate specific responsibilities at an institution with accredited baccalaureate, masters, and doctoral programs in mathematics education. Activities may include research, publishing, directing graduate studies, teaching, academic advising, collaborating with the mathematics department, investigating unique technological applications for mathematics, forming partnerships with public schools, initiating special projects, and/or developing a mathematics, science, and technology research and professional development center.

The Morton Chair Professor will be expected to define clear goals each year and negotiate responsibilities with the Dean of the College of Education. The chair is a tenure track position for a prominent mathematics educator with a record of teaching excellence as well as experience in elementary and/or secondary school teaching. Rank and salary will be commensurate with the candidate's qualification.

The screening process will begin January 3, 1994 and will continue until the position is filled. Please send letter of application and credentials to:

The Morton Chair Search Committee
Dean's Office
133 McCracken Hall
Ohio University
Athens, Ohio 45701

Ohio University is an Affirmative Action/EEO Employer. Women and minorities are encouraged to apply. All inquiries applications, and nominations will be treated confidentially.

Jacksonville University is soliciting applications for two tenure-track Assistant Professor positions in mathematics. All fields of specialty are welcome, but preference for one position will be given to a Ph.D. in statistics. Applicants with experience or interest in computer-assisted instruction are particularly desired. Responsibilities include teaching 12 hours per semester, continued scholarly activity (broadly defined), and department/university service. Applications will be accepted until December 15, 1993. Send vita, cover letter addressing qualifications, and three letters of reference to Dr. Charles Lindsey, Chair, Department of Mathematics, Jacksonville University, Jacksonville, FL 32211

Bowdoin College Brunswick, Maine 04011

Mathematics Department: Tenure track Assistant Professorship in applied mathematics starting fall, 1994. Initial appointment for three years with renewal possible. Possibility of second, non-tenure-track position - field open. PhD required and strong research record or potential expected. Normal teaching load is two courses per semester. Candidates with record of effective undergraduate teaching preferred. Review of candidates begins 1 January, but applications will be considered until position is filled. Send resume and 3 letters of recommendation to James E. Ward, Chair, Department of Mathematics, Bowdoin College, Brunswick, ME 04011. Include e-mail address. Bowdoin College is committed to equal opportunity through affirmative action. Women and members of minority groups are encouraged to apply and invited to identify themselves as such.

Roanoke College Department of Mathematics, Computer Science, and Physics Salem, Virginia 24153

Applications are invited for an entry level tenure track position of Assistant Professor in the department beginning August 1994. Ph D. in Mathematics required. Salary commensurate with qualifications and experience. Excellent teaching emphasized, active scholarship encouraged. Commitment to liberal learning expected. Roanoke College is a private liberal arts college affiliated with the Lutheran church and is located in the Roanoke Valley of Virginia.

A completed application consists of a VITAE, graduate and undergraduate transcripts, and 3 letters of reference (at least one about teaching). Applications should be sent to Dr. W. D. Ertle, Chair, at the address above. Applications completed by January 31, 1994 will receive first consideration. Roanoke College encourages applications from qualified women and minority candidates. An affirmative action, equal opportunity employer.



Essays in Humanistic Mathematics

Alvin White, Editor

A dazzling array of essayists reveals humanistic mathematics in this volume, and in so doing goes beyond the facts, formulas, and algorithms that most students associate with mathematics to a presentation of mathematics as an intellectual discipline with a human perspective and a significant history. Humanistic mathematics challenges dogmatic teaching styles that expect students to parrot the lecturer. It demands creativity from both the teacher and student.

Teaching mathematics humanistically seeks to place the student more centrally in the position of inquirer than is generally the case, while at the same time acknowledging the emotional climate of the activity of learning mathematics. This type of teaching encourages students to learn from each other and to better understand mathematics as socially constructed knowledge, rather than as an arbitrary discipline.

Teaching humanistic mathematics brings the focus less upon the nature of the teaching and learning environment and more upon the need to reconstruct the curriculum and the discipline of mathematics itself. This reconstruction relates mathematical discoveries to personal courage, discovery to verification, mathematics to science, truth to utility, and mathematics to the culture in which it is embedded.

The humanistic mathematics movement, which began as the personal vision of a few, has now become a major part of mathematical culture. What was viewed with skepticism is now accepted and expected. Humanistic mathematics is not a new discovery. It is a recent rediscovery of ideas that go back to Plato. It has provided a vocabulary for previously unarticulated concepts and approaches.

The essays in this volume illustrate and help to define humanistic mathematics. The variety and scope indicate the richness and fruitfulness of the concept. Although each essay is independent, a sense of unity emerges. A glimpse at the table of contents will give you an idea of the excitement and range of the ideas presented.

212 pp., Paperbound, 1993, ISBN 0-88385-089-3

List: \$24.00

Catalog Number NTE-32

See order form on page 23.

Calendar

National MAA Meetings

January 12-15, 1994 Seventy-seventh Annual Meeting, Cincinnati (Board of Governors, January 11, 1994)

August 15-17, 1994 Sixty-ninth Annual Joint Summer Meeting, Minneapolis

January 4-7, 1995 Seventy-eight Annual Meeting, San Francisco (Board of Governors, January 3, 1995)

Sectional MAA Meetings

ALLEGHENYMOUNTAIN April 8-9, 1994, West Virginia University, Morgantown

EASTERN PA & DELAWARE Nov. 13, 1993, Cedar Crest College, Allentown

FLORIDA Feb 25-26, 1994, Daytona Beach Comm College, Daytona Beach

ILLINOIS April 22-23, 1994, Parkland College, Champaign

INDIANA March 19, 1994, DePauw University, Greencastle

INTERMOUNTAIN April 8-9, 1994, Westminster College, Salt Lake City

IOWA April 15-16, 1994, Grinnell College, Grinnell

KANSAS March 11-12, 1994, University of Kansas, Lawrence, KS

KENTUCKY April 8-9, 1994, Morehead State University, Morehead

LOUISIANA-MISSISSIPPI March 4-5, 1994, Nicholls State University, Thibodaux, LA

METROPOLITAN NEW YORK May 1, 1994, Merchant Marine Academy, Kings Point

MICHIGAN April 29-30, 1994, Alma College, Alma, MI

MISSOURI April 1994, Missouri Southern State College, Joplin, MO

NEBRASKA April 22-23, 1994, Nebraska Wesleyan University, Lincoln

NORTH CENTRAL April 22-23, 1994, Winona State University, Winona, MN

NORTHEASTERN June 3-4, 1994, Salve Regina University, Newport, RI

NORTHERN CALIFORNIA February 12, 1994, San Jose City College

OHIO April 8-9, 1994, Miami University, Oxford, OH

OKLAHOMA-ARKANSAS March 25-26, 1994, Harding University, Searcy, AR

PACIFIC NORTHWEST June 16-18, 1994, University of Oregon, Eugene

ROCKY MOUNTAIN April 15-16, 1994, South Dakota School of Mines & Tech., Rapid City, SD

SEAWAY April 22-23, 1994, SUNY at Albany

SOUTHEASTERN April 8-9, 1994, Carson Newman College, Jefferson City, TN

SOUTHWESTERN April 8-9, 1994, Glendale Community College, Glendale, AZ

SOUTHERN CALIFORNIA March 5, 1994, Loyola Marymount University, Los Angeles

TEXAS April 7-9, 1994, Texas A&M, College Station, TX

WISCONSIN April 22-23, 1994, University of Wisconsin-Eau Claire, Eau Claire, WI

Other Meetings

April 13-16, 1994 Seventy-second Annual National Council of Teachers of Mathematics Meeting, Indianapolis. For more information, contact: NCTM, 1906 Association Drive, Reston, VA 22091-1593.

January 28-29, 1994 The Mathematics Department of Montgomery County Community College and Texas Instruments are co-sponsoring a faculty development institute on using the graphing calculator. For more information, contact Dr. Roseanne Hoffman, Mathematics Department Montgomery County Community College, (215) 641-6405

FOCUS

DECEMBER 1993

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