NORTHEASTERN SECTION

NEWSLETTER

FALL 1992

VOLUME 14 NUMBER 2

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FUTURE SECTION MEETINGS

Trinity College
November 20-21, 1992
See this bulletin for details

University of Massachusetts - Dartmouth
June 11-12, 1993
Local Arrangements: Ronald Tannenwald
Program Co-Chairs: Richard Faulkenberry, U-Mass Dartmouth
and Cecilia Medeiros, Bristol Community College

Westfield State College
November 5-6, 1993
Local Arrangements: Dianne Haber and Maureen Bardwell

CHAIRPERSON'S MESSAGE

These are exciting and challenging times for those of us who are interested in fostering collegiate-level mathematics. As we endeavor to learn more mathematics ourselves and to spark interest in mathematics in others, we all can use encouragement as well as a way to keep abreast of new ideas and current trends. One way to bolster your own enthusiasm for the power of mathematics is by participating in some of the activities of the Northeastern Section of the MAA. Notices of upcoming events and activities are included throughout this *Newsletter*. I hope you will find several that are of interest to you. I also hope that you will bring a colleague (or several) with you, especially a new-comer, to share ideas and concerns and to meet new and old friends with common mathematical interests.

The NES has many talented members who have generously donated their time and energy to section activities. On behalf of the Section, let me express my appreciation to all who have set such a fine example and encourage some of our other members to follow this example by volunteering to assist in future projects. Volunteers are needed for on-going projects including Section meeting committees and hosts for regional dinner meetings. I'd be happy to speak to you about a new idea or to welcome your offer of assistance.

Congratulations to Frank Morgan of Williams College, the recipient of the first NES Award for Distinguished College or University Teaching of Mathematics. This award has been established to give recognition to extraordinarily successful teachers who foster curiosity and generate excitement about mathematics in their students. See Page 4 for further details and Page 5 for a copy of the certificate presented to Professor Morgan at the Spring Meeting.

Thanks are extended to all of those who were involved in the successful Section Meeting last spring at Merrimack College, including the Program Co-chairs, J.J. Tattersall of Providence College and Barry Schiller of Rhode Island College and the Local Arrangements Coordinator, John Royal of Merrimack College. The Section is grateful to Betsey Whitman of Framingham State College who served as Publisher's Liaison, to Ed Sandifer of Western Connecticut State University and Joseph Witkowski of Keene State College who served as Contributed and Student Papers Coordinators, and to Karen Schroeder of Bentley College who served as Student Chapter Program Coordinator. The NES welcomes Diannne Haber of Westfield State College (who set a new record for response time in answering a call for volunteers) as she begins service as our Section Photographer.

Several other successful programs added variety and richness to our Section activities this past spring. Once again Clayton Dodge hosted an interesting and rewarding short course at the University of Maine. The NES remains grateful for his many contributions. Dick Pelosi was most gracious in coordinating our minicourse at Western New England College. Thanks are extended to him and to Karen Schroeder who served as liaison with our minicourse presenters. Watch for an announcement of next's spring's minicourse which is planned for Boston College in April. John Smith has agreed to serve as host for William Dunham's presentation on *Great Theorems from Mathematical Analysis*. Our series of regional dinner meetings offered an interesting diversity of speakers as well as nourishment for body

and spirit. Thanks to Thomas Koshy of Framingham State College for coordinating this program and to the many volunteers who served as local hosts. Further information on upcoming NES activities can be found elsewhere in this *Newsletter*.

Elections for Section Officers will be held during our Fall Meeting at Trinity College at Hartford. The Nominating Committee has diligently prepared a fine slate of nominees for your consideration. I am grateful to the committee, chaired by Frank Battles of Massachusetts Maritime Academy, as well as to the Section members who, in agreeing to the nominations, have already shown their willingness to share their many talents. I urge all of you to consider your choices carefully and to participate in the election process. I am appreciative of the efforts of the "retiring" Section Officers and hope that this will mark merely a transition in their role so that the Section will continue to be the recipient of their many talents.

Lynne Durkin of Bentley College and her committee have prepared an outstanding program for our November meeting at Trinity College. I am eagerly anticipating the meeting and I hope to see you there.

Laura L. Kelleher
Massachusetts Maritime Academy
Chairperson NES/MAA

NOMINATING COMMITTEE

The following is the slate of nominees (in alphabetical order) for the 1992 election to be held on November 21, 1992 at Trinity College at Hartford CT as recommended by the Nominating Committee:

VICECHAIR

Donna Beers, Simmons College

Philip Mahler, Middlesex Community College

SECRETARY-TREASURER

Marilyn (Lynne) Durkin, Bentley College

Frank Ford, Providence College

TWO-YEAR COLLEGE REPRESENTATIVE

Miguel A. Garcia, Greater New Haven State Technical College

Michael Latina, Community College of Rhode Island

The Nominating Committee consists of Frank P. Battles, Massachusetts Maritime Academy (Chair), Helene S. Savicki, Dean Junior College and James J. Tattersall, Providence College.

MINUTES OF THE LAST MEETING

The Spring Meeting of the Northeastern Section was held on June 5-6, 1992 at Merrimack College in North Andover, Massachusetts. There were 107 registrants.

Invited Papers

Wavelets: A Tool for Time-Frequency Analysis by Ingrid Daubechies, Rutgers University.
Soap Bubbles, Metals and Undergraduate Research by Frank Morgan, Williams College.
Editorial Comment: The Myths and Mirth of Publishing by Martha J. Siegel, Towson State University.
Research in Mathematics Education: Can It Have a Role in the K-16 Reform? by Joan Ferrini-Mundy, University of New Hampshire.
Christine Ladd-Franklin and the Algebra of Logic by Judy Green, Marymount College.
The MULTIBAND Method for Traffic Light Synchronization by Susan F. Assmann, Regis College.
Mathematics in Agricultural Economics: The Theory of Individual Behavior Under Risk by Michael Weiss, U. S. Department of Agriculture.

Student Chapter Session

Group Theoryplay by Thomas Moore, Bridgewater State College.

Contributed Paper Session

A Modular Approach to Teaching Mathematics by Michael J. Bradley, Merrimack College.
The Writing Tool: A Closer Look by William Berlinghoff, Farmington, Maine.

Student Paper Session

Serendipity in Hamiltonian and Non-Hamiltonian Graphs by Michelle B. Tourville of Fitchburg State College.
A Study of Subharmonics for a Second Order Differential Equation and the Transition to Chaos by C. Alex Young, Plymouth State College.
Rational Number Matrix Multiplication by Sherry Bradanini and Donald Craig Manis, Eastern Connecticut State College.

At a special ceremony, The Northeastern Section of the Mathematical Association of America Award for Distinguished College or University Teaching of Mathematics was presented to Frank Morgan of Williams College.

At the Business Meeting, various items were discussed which are described elsewhere in this *Newsletter*. Certificates, book awards, and a one year membership in the MAA were given to each of the students who had presented a paper at this Meeting. The Chairperson thanked all who assisted in the success of this meeting.

AWARD FOR DISTINGUISHED COLLEGE OR UNIVERSITY TEACHING

Frank Morgan of Williams College is the recipient of the first Northeastern Section MAA Award for Distinguished College or University Teaching of Mathematics. The award for excellence in teaching undergraduate mathematics was presented to Professor Morgan by NES Chairperson Laura Kelleher at the June 1992 Section Meeting held at Merrimack College.

At the meeting Frank Morgan's dynamic and inspiring teaching style was vividly demonstrated through his presentation of "Soap Bubbles, Metals, and Undergraduate Research." Stopping now and then to blow some bubbles, he encouraged his listeners to speculate on the solutions to unsolved problems such as "What kind of double bubble encloses two adjacent fixed volumes with the least surface area?" He spoke of related problems in two dimensions on which his students have worked in successful research projects.

Frank Morgan generates enthusiasm about mathematics and his influence has been felt at many levels of the mathematical community. He is an inspiration to his colleagues as well as to his students at Williams where it is said that "He has created an environment in which students experience on a daily basis the excitement of learning and doing mathematics." His work in developing undergraduate research programs has had widespread influence.

Recipients of the MAA Section Awards are eligible for selection for the first National MAA Award for Distinguished College or University Teaching of Mathematics. Seven such awards will be presented in January 1993 at the Joint AMS/MAA Meetings in San Antonio.

As established by the Board of Governors, the awards are to be made to teachers of mathematics at the post-secondary level who have been widely recognized as extraordinarily successful. Their teaching effectiveness must be documented and must have had influence beyond their own institutions. The spring issue of this *Newsletter* included a call for nominations for the 1993 NES award and the selection committee, chaired by Karen Schroeder of Bentley College, is now in the difficult process of selecting the next awardee. The Northeastern Section contains many such outstanding teachers. Any NES/MAA member can nominate any other member teaching in the United States or Canada. Watch for the next call for nominations and plan to submit a nomination for a colleague for the next award!

HOWARD EVES ROOM

As you may know, the Northeastern Section has dedicated a room in the National MAA Headquarters to honor Howard Eves, the founding father of this Section. Of the $20,000 pledged by this Section all but about $4000 has been raised through many generous donations from our members and friends. In an effort to complete our obligation, the Executive Committee of NES/MAA voted to match, from our treasury, any donations made in conjunction with the upcoming meeting at Trinity College. On the Pre-registration form you will find a box to check should you wish to make a voluntary contribution. Please include the amount of your contribution in your pre-registration check.

THE MATHEMATICAL ASSOCIATION OF AMERICA

The Northeastern Section

confers upon

Frank Morgan

its

Award for Distinguished College or University Teaching of Mathematics

in recognition of extraordinarily successful teaching

1992

Section Chair

Section Secretary

GOVERNOR'S MESSAGE

The MAA Board of Governors Meeting this past summer was held in Quebec City prior to the ICME Conference. As usual, those in charge selected an excellent site. Quebec, regally carved into the bluffs overlooking the St. Lawrence by the forces of time and history, is a proud, complex city. It is the only walled city north of Mexico on the continent. It can almost be divided by a line into the old and the new: 20th century Quebec, extending up the hill beyond the Parliament Buildings, is shut off from the winding streets and 17th century buildings of Upper and Lower Town by aging walls. A European bastion, it is also a profoundly French city, whose narrow streets are lined with a mixture of military, religious, and residential buildings from the 17th through the 19th centuries. To pass through the gates (ports in French) of the massive walls is to enter a world unique to our continent; it has the heart of an essentially 17th century European city. The soul of French Canada - which some say resides in Quebec - finds no better expression than in its haute and nouvelle cuisine. The traditional French love of good food, service, and presentation are a part of the city's culinary fabric. Those who have visited Quebec know of what I speak; those who have not will hopefully be enticed.

MAA President Deborah Tepper Haimo initiated the meeting by announcing that we had a record length agenda before us. Indeed it proved to be an enormous task, and I left the meeting with the feeling that there were some very important issues whose discussions had to be cut short. As usual, I will not attempt to comment on all the motions and committee reports here, but I will highlight a few.

Working Draft #3 of the MAA Strategic Plan was placed before the Governors for discussion. The latest draft followed a review of the more than 2,500 responses to the MAA Member Questionnaire that appeared last spring in an issue of FOCUS. The Board of Governors really never got beyond page two of this twenty page document. One of the four goals under the heading "Mission and Goals" received intense debate. The proposed goal as stated in draft #3 is: Education. Stimulate effective teaching, learning, and assessment in the Mathematical sciences. The debate centered around whether or not assessment is a goal, and if so, should it have equal weight with teaching and learning. I welcome your opinions on this single issue, and later in this message I will speak to assessment. Further, if you desire a copy of this version of the strategic plan, contact the MAA at the Washington office, and feel free to forward any comments to me prior to the January Meetings.

Another agenda item that engendered much debate was the circulating draft *Guidelines for Programs and Departments in Undergraduate Mathematical Sciences* written by the ad hoc Committee on Guidelines. This document was sent to all department chairs this past spring with a request for comments. Very few comments were received by John Fulton (University of Missouri at Rolla), chair of the committee. The limited response is most surprising since their *Guidelines* could have a significant impact on all Mathematical Sciences Departments. I urge the chairs of all such departments in the Northeastern Section to share the *Guidelines* with their faculty and offer constructive comments to the chair of the ad hoc committee as soon as possible. To motivate you, I offer the following excerpts from the section entitled *Assignment of Duties* under the area *Program Faculty and*

Staffing: "Faculty for whom personnel decisions are based predominantly upon assessment of teaching and service responsibilities should have teaching assignments not exceeding fifteen contact hours per week." Although there are institutions, mostly two-year, that have such a required teaching load, I believe it is a mistake for the MAA to acknowledge approval of such an inappropriate load - especially, given the present state of mathematics education and the current emphasis on change and improvement. The section goes on to say, "Faculty for whom personnel decisions are based upon an assessment of teaching, scholarship, and institutional and professional service should have teaching assignments that are less than three courses per semester...," and "If a substantial scholarship program with activities at the doctoral level is expected, the teaching assignments should be no more than two courses per semester," and "At undergraduate institutions, faculty who are expected to sustain a scholarship program should have teaching responsibilities not exceeding five courses per year." Together these three quotes, all in the same paragraph, are confusing, if not contradictory. This fourteen page draft needs our attention, and I encourage you to participate.

It is difficult to believe that the mathematics education reform movement was initiated in 1983 when the report by the Department of Education titled *A Nation at Risk* stated that "the education foundations of our society are presently being eroded by the rising tide of mediocrity that threatens our very future as a nation and as a people." Of particular concern, the report held, was the very sorry state of science and mathematics education. Some 300 reports and surveys have since revealed the appalling extent of scientific and mathematical illiteracy in the United States. Fortunately, the mathematics community appears to be significantly ahead of its colleagues in the sciences in addressing these concerns. Our community first considered the questions: What exactly do we mean by math achievement? Just what is it we want our students to know? We answered these well for grades K-12 in the 1989 compilation titled *Curriculum and Evaluation Standards for School Mathematics* published by NCTM. The standards are one of our responses to the call for reform in the teaching and learning of mathematics. The document clearly states that all students need to learn more and often different mathematics and that instruction in mathematics must be significantly revised. The standards indicate what we value. In reality the standards are a set of goals that are forward looking, and that will stretch everybody. The document asserts something we have believed for a long time, namely, the need to make mathematics learning more about thinking and engaging the intellect and less about memorizing and mechanics. It also supports "mathematical power for all." Perhaps the most impressive thing about the new math standards is that they have been widely accepted by the constellation of diverse educational constituencies: teachers, supervisors, unions, parents, school boards, professional societies, politicians, and college and university faculties.

Change in the content and teaching of undergraduate mathematics has received equal attention. Recommendations for change have been outlined recently by a Joint Task Force of the MAA and the Association of American Colleges in the report, *Challenges for College Mathematics: An Agenda for the Next Decade*, by the National Academy of Sciences/National Research Council in the report, *Moving Beyond Myths: Revitalizing Undergraduate Mathematics*, and by the MAA report, *The Undergraduate Major in the Mathematical Sciences*. In my past messages, I highlighted and discussed some of the ideas that these reports set forth, so I will not repeat them here.

It should come as no surprise that whether the mathematical instruction and learning is at the elementary, high school, or college level, the goals and strategies for improvement are very similar.

Effective reform of mathematics education requires professional, political, and public consensus on three issues: curriculum, instruction, and assessment. The mathematics community has used an augmented grass-roots strategy for building consensus on the first two issues. Together, the curriculum and instruction standards for mathematics education at all levels portray the learning and teaching of mathematics that must take place in classrooms across America if the nation is to realize its goals for world-class mathematics programs.

Assessment - the process of collecting information for decision making - involves the use of a variety of data-producing instruments and techniques. Tests are just one means of assessment, but one that currently dominates educational decision making. Between 1972 and 1985, the number of mandated state testing programs grew from 1 to 34; by 1989 every state was involved in mandated testing. The mathematics community knows quite well that the existing tests are woefully inadequate, since they largely measure computational and routine procedural skills; hence, they poorly reflect the objectives of our many reports. These tests are one of the greatest obstacles to mathematics education reform. We also know full well that assessment items can become the objectives of instruction, that what we test is usually what we teach. And although we may think this only occurs at pre-college levels of instruction, one need look no further than the teaching of Calculus to note that it has affected us as well. If there is a sufficient stick or carrot, any instructional program can become obsessively test-driven. Assessment tests in mathematics fall far short of the current consensus of what our students ought to learn about mathematics, and how to use it. That, unfortunately, is the state of affairs now, but we hope to change this. An assessment is of no use at all if it does not measure the things that we value, the goals and objectives that we agreed upon. Since our standards have been updated, it is imperative to do the same for assessment. The complex mathematics skills we expect of our students cannot be adequately assessed with short-answer or multiple-choice tests. We need to assess students' actual performance in doing mathematics - individually and in groups - solving problems, reasoning, communicating, and connecting mathematical ideas to each other and to real situations. In this way assessment will, in my opinion, achieve its only real objective, that is, to improve the teaching and learning of mathematics.

Assessment to educators is hardly novel; after all, we continually assess the learning of our students. Far too often though, we only seek information about how well our students perform in relation to others. We must move beyond assessments that merely sort, classify, rank, or select. Assessment should seek information about how well our students perform in relation to our newly valued knowledge, skills, and processes. Our expectations now are for students to be able to reason logically and to integrate, synthesize, and apply mathematical concepts and skills to solve complex problems. Consequently, assessment methods must be numerous and diverse, such as: open-ended questions, projects, writings, demonstrations, presentations, investigations, modeling, and simulation. Assessment will be the convergence of information about student performance from multiple sources. In doing this we will identify diverse pools of ability

that have not been revealed by past testing procedures nor nurtured by our instruction. Mathematical talent manifests itself in ways that many of us have not yet experienced.

Assessment serves far more than the information needs of teachers, students, and parents. Assessment is also needed to guide a wide variety of external constituencies - assessment serves the accountability information needs of administrators, policy makers, and the public. For the mathematical community to ignore this side of assessment would be foolish for it would greatly compromise our reform movement. For those that may not know, assessment is big business; it has fostered an industry of its own. The so-called professionals in this area have their own association complete with conferences and journals. I don't know how you may feel, but I am very skeptical about individuals outside of our discipline leading the way for our community in the area of assessment. And if you think this will only affect pre-college mathematics education, think again. Regional accrediting associations for colleges and universities, such as the New England Association of Schools and Colleges, have encouraged program assessment for over ten years and I expect will soon mandate it. Further, there has already been ample discussion at the national level concerning assessment of undergraduate mathematical sciences programs. The MAA has recently formed a committee on assessment. Each mathematical sciences department should develop a statement of goals, including how progress in achieving these goals will be evaluated. The evaluation process should be used to improve the teaching and learning of mathematics.

In April of 1991 at the National Academy of Sciences in Washington, D.C., the National Summit on Mathematics Assessment was held. The report of this summit was recently published by the Mathematical Science Education Board and was entitled *For Good Measure*. It presents agreement reached on principles and goals for mathematics assessment. The principles and goals evolved from deliberations of 800 citizens representing various constituencies - mathematics educators, the education and public policy sector, the assessment industry, business and industry, and parent and community groups. The goals in the report are based on commonly held beliefs about assessment that the report states as principles for mathematics assessment. As stated in the report the principles are:

- The primary purpose of assessment is to improve learning and teaching.
- The primary use of assessment is to promote the development of the talents of all people.
- The content of assessment is derived from the consensus of the discipline.

As stated in the report, the goals to be reached by year 2000 are:

- Assessments will be aligned with the mathematical knowledge, skills, and processes that the nation needs all of its students to know and be able to do.
- Assessment practices will promote the development of mathematical power for all students.
- A variety of effective assessment methods will be used to evaluate outcomes of mathematics education.
- Adequate accountability systems will be used to assess mathematics.

- Guidelines will be developed for judging the quality of all forms of mathematics assessments.
- Mathematics teachers and school administrators will be proficient in using a wide variety of assessment methods for improving the learning and teaching of mathematics.
- The public will become better informed about assessments and assessment practices.

As a brief summary, assessment in mathematics education will take on many different forms, each governed by what we in the mathematics community value and each having the common goal of developing and improving mathematical talents in all the students we teach. We shall be involved in using assessment methods, judging their quality, and informing the public of their proper use.

We look forward to the day that mathematics will no longer be used to filter students out of educational and career opportunities. Mathematics assessment must build bridges, not barriers, for student learning and, in doing so, it will improve instruction in the mathematics that is valued. We, the instructors of mathematics, must teach students, not just mathematics.

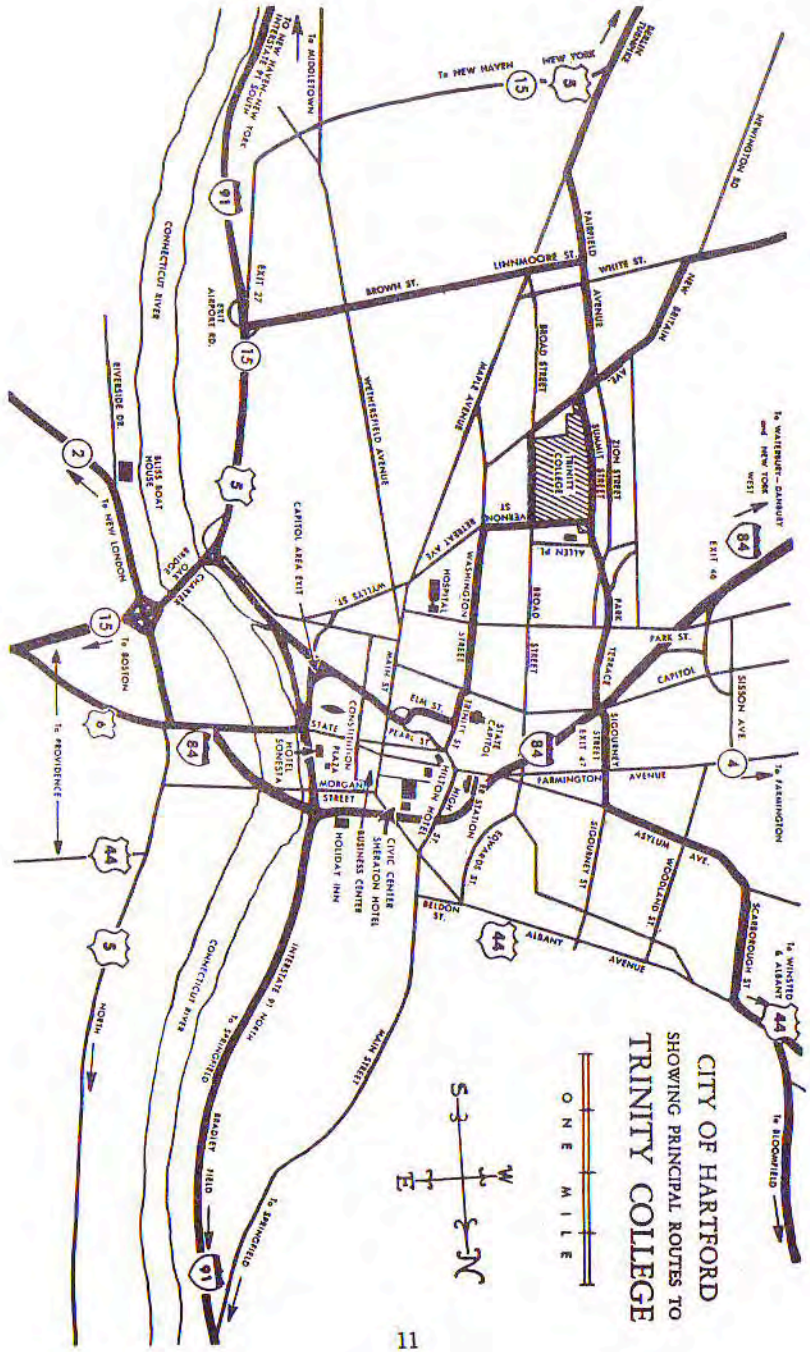
Dennis Luciano
Western New England College
Governor NES/MAA

DINNER MEETINGS

This past spring the first round of NES/MAA Regional Dinner Meetings was held. Each of the seven dinner meetings which were held at various parts of the Northeastern region had its own unique flavor and all were quite enjoyable. These offered an opportunity to hear a speaker as well as to partake of a fine meal and pleasant conversations with our colleagues. We are planning now for another series of such meetings for the Spring of 1993. If you are interested in serving as a coordinator (especially if your region was not represented for Spring 1992) or in assisting a coordinator please contact Thomas Koshy, Framingham State College, Coordinator of Regional Dinner Meetings at (508)-626-4727.

COMAP

For twelve years COMAP, a non-profit consortium of mathematics educators, has been developing educational materials that are interesting to teach and challenging to learn. These materials put mathematical ideas into every imaginable context, from the algebraic implications of hiring staff to the geometry of artwork. The idea is to show mathematics as it relates to the everyday life and interests of students and teachers. In addition to publishing the *Consortium* newsletter, COMAP offers hundreds of classroom-ready modules, book, videos and software packages. COMAP is committed to assisting teachers who are implementing the NCTM *Standards* and enlivening the mathematics curriculum. Call 1-800-77-COMAP (800-772-6627) to receive further information and a catalog.



NORTHEASTERN SECTION OF THE MAA
FALL MEETING: NOVEMBER 20-21, 1992
TRINITY COLLEGE, HARTFORD CT

Friday, November 21

2:00-6:00 Registration (Lobby of the Mathematics, Computing and Engineering Center: #24 on the Campus Map)

2:00-3:00 Executive Committee Meeting

Integrating the TI-81 Graphing Calculator into the Mathematics Curriculum: The Power of Visualization
3:00-4:30 **Pre-Calculus**
4:35-6:00 **Calculus**
Donna M. Christy, Rhode Island College

3:00-3:40 **Chaos in the Classroom: Discrete and Continuous Population Models**
Bob Decker, University of Hartford

3:45-4:30 **Newton's Method from a Calculus I Perspective**
John Williams, University of Hartford

4:35-6:00 **Calculus Explorations and Modeling with Calculus T/L**
Donald B. Small, USMA, West Point
Miguel A. Garcia, Greater New Haven State Technical College

4:35-6:00 **Making a Difference in Undergraduate Mathematics: Suggestions for Preparing Proposals for External Funding** (Enrollment limited to 30)
James Leitzel, MAA Visiting Mathematician

6:00-6:45 Reception

6:45-8:00 Dinner (limited to the first 100 pre-registrants)

8:10-8:15 **Welcoming Remarks**
J. Ronald Spencer, Associate Academic Dean, Trinity College

8:15-9:10 **Environmental Mathematics via Energy Diagrams**
B. A. Fusaro, Salisbury State University

9:15 Social

Saturday, November 21

7:30-10:30 Registration

7:45-8:55 **Student Paper Session**

8:30-3:30 **Book Exhibits**

9:00-9:55 **Newton's Method: Complex Numbers and Complex Dynamics**
Paul Blanchard, Boston University

9:00-9:55 **Student Chapter Presentation: Mathematics and the Environment**
Charles Hadlock, Bentley College

10:00-10:30 Coffee Break and Tour of Book Exhibits

10:35-11:30 **Christie Lecture: A Further Look at Fibonacci and Lucas Numbers**
Peter Hilton, State University of New York at Binghamton

11:30-11:55 Business Meeting and Election of Officers

12:00-1:00 Lunch

1:00-1:55 **Synchronous Fireflies**
Steven Strogatz, Massachusetts Institute of Technology

1:00-2:55 **MAA Northeastern Section Student Workshop: Environmental Mathematics** (students only)
B. A. Fusaro, Salisbury State College

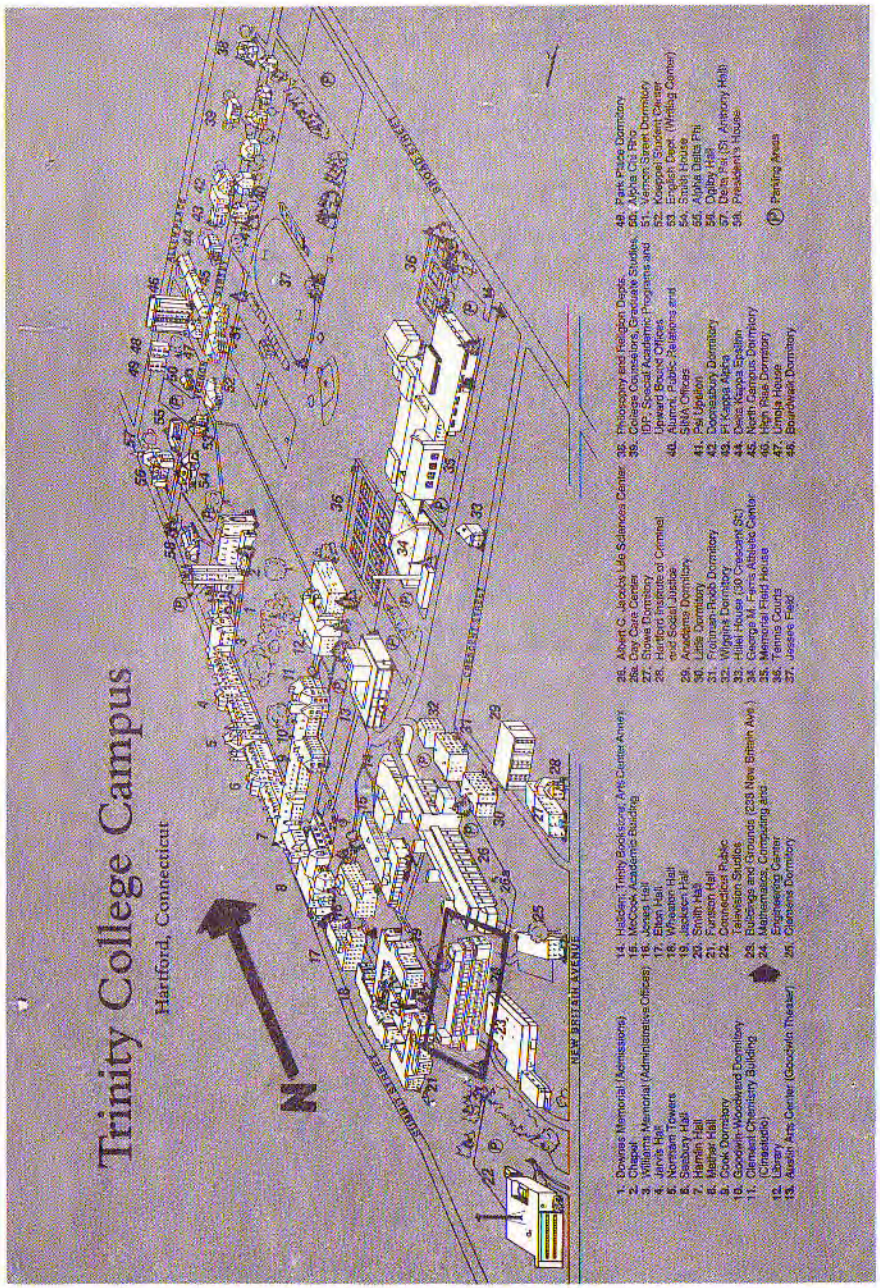
2:00-2:55 **The Role of Mathematicians in Addressing Environmental Problems**
Charles Hadlock, Bentley College

3:00-3:55 **Modeling Natural Resource Depletion**
Michael Olinick, Middlebury College

3:00-3:55 Contributed Paper Session

PROGRAM COMMITTEE:
Marilyn Durkin, Bentley College, Chairperson
Miguel Garcia, Greater New Haven State Technical College
David Robbins, Trinity College
Helen Salzburg, Rhode Island College

LOCAL ARRANGEMENTS COORDINATOR:
David Robbins, Trinity College



DIRECTIONS TO TRINITY COLLEGE

From the North (Springfield, etc.)
Take I-91 South to intersection with I-84. Take I-84 West to Sigourney St. Exit (Exit 47). Turn left at the bottom of the exit ramp, and, keeping to the right side of the roadway, proceed straight ahead. After a short distance, merge with Park Terrace (yield sign). Continue on Park Terrace through traffic light (at Park St.) and take third (diagonal) left past the light, onto Summit St. Go up hill one block to stop sign (at Zion St.). Cross Zion St. diagonally, proceeding up the hill (on Summit St.) to stop sign (at Vernon St.). You are now at the Northwest corner of the Trinity campus.

From the South (New Haven, New York, etc.)
Take I-91 North to junction with I-81 West. Take I-84 West to Sigourney St. Exit (Exit 47). Turn left at the bottom of the exit ramp, and, keeping to the right side of the roadway, proceed straight ahead. After a short distance, merge with Park Terrace (yield sign). Continue on Park Terrace through traffic light (at Park St.) and take third (diagonal) left past the light, onto Summit St. Go up hill one block to stop sign (at Zion St.). Cross Zion St. diagonally, proceeding up the hill (on Summit St.) to stop sign (at Vernon St.). You are now at the Northwest corner of the Trinity campus.

From the East (Boston, etc.)
Take I-84 West to Sigourney St. Exit (Exit 47). Turn left at the bottom of the exit ramp, and, keeping to the right side of the roadway, proceed straight ahead. After a short distance, merge with Park Terrace (yield sign). Continue on Park Terrace through traffic light (at Park St.) and take third (diagonal) left past the light, onto Summit St. Go up hill one block to stop sign (at Zion St.). Cross Zion St. diagonally, proceeding up the hill (on Summit St.) to stop sign (at Vernon St.). You are now at the Northwest corner of the Trinity campus.

From the West (NYC via I-84, Dandury, etc.)
Take I-84 East to Capitol Ave. Exit (Exit 48). At the foot of the exit ramp bear right onto Capitol Ave. At the fourth traffic light, turn left onto Park Terrace. Proceed on Park Terrace through traffic lights at Russ St. and Park St. and take third (diagonal) left after Park St. onto Summit St. Go up hill one block to stop sign (at Zion St.). Cross Zion St. diagonally, proceeding up the hill (on Summit St.) to stop sign (at Vernon St.). You are now at the Northwest corner of the Trinity campus.

See maps on pages 11 and 14 for additional detail.

ACCOMMODATIONS

A block of rooms has been set aside beginning Friday night, November 20, at the Holiday Inn in downtown Hartford (50 Morgan St., Hartford CT 06120). The price for a room, single or double, is $59.00 per night, plus 12% tax. Parking is $5.00 per night per car. The Holiday Inn should be contacted directly at (203)-549-2400 by October 30, in order to make reservations. Please specify "Mathematical Association of America" when doing so.

Reservation # 64061720

TRINITY COLLEGE

Founded in 1823, Trinity College is a highly selective independent liberal arts college of approximately 1900 full-time equivalent undergraduates (1750 full-time) and approximately 190 faculty FTE (150 full-time). Its library is one of the best small college libraries in the country, with over 830,000 volumes and almost 2100 journals. The Department of Mathematics currently has seven full-time members, and averages eight to ten graduating seniors per year. Current fields of active research include several complex variables, dynamical systems, geometry, statistics, graph theory, number theory, real analysis, and functional analysis. Recent graduates of the Department are enrolled in graduate programs at Brown, Penn, and UConn and earlier graduates have held a Young Instructorship at Dartmouth and a Moore Instructorship at MIT.

CALL FOR CONTRIBUTED PAPERS

Participants are invited to submit contributed papers for either the Fall or Spring Meeting. We are particularly interested in papers pertaining to teaching, new courses, new techniques and in research you or your students have done relating to classroom material. We encourage you to share your experiences with our colleagues. Your presentation should be approximately 15 minutes in length. Please send a typed abstract, together with a list of any special equipment you may need to: Ed Sandifer, Department of Mathematics and Computer Science, Western Connecticut State University, Danbury CT 06810. Telephone (203)-797-4310 or BitNet at SANDIFER@WCSU.CTSTATEU.EDU. The deadline for the Fall Meeting is October 28 and for the Spring Meeting is May 15.

CALL FOR STUDENT PAPERS

Students (and recent graduates) from the Northeastern Section are invited to present papers at the Fall Meeting on topics in mathematics, statistics, or computer science. The presentations will be 15 to 20 minutes in length, on either expository work, research projects, employment experiences, or problems from math periodicals. Prizes will be awarded and the registration fee and the cost of meals will be waived for one student presenter per paper at the Fall Meeting.

Almost every college/university has students working on projects, problems, and mathematical research. The success of a student paper session depends primarily on faculty members identifying prospective papers, encouraging their students and arranging departmental financial support when possible. If there are no potential student papers on your campus for the Fall Meeting, we urge you to initiate student projects now for presentation at the Spring Meeting.

Interested students should send an abstract and current address, with phone number, by Friday, November 6 to: Joseph C. Witkowski, Department of Mathematics and Computer Science, Keene State College, Keene NH 03431. Telephone (603)-358-2555. All proposals will be reviewed by department faculty members.

STUDENT CHAPTERS

An exciting Student Chapters Program, focusing on mathematics and the environment, is planned for the Fall Meeting at Trinity College. Highlights of the program include: student papers; a talk by Professor Charles Hadlock on using mathematical models to solve real-world environmental problems; lunch with designated tables to promote student conversation; and a two-hour environmental computer workshop presented by Professor Ben Fusaro. (Details of this program may be found elsewhere in this *Newsletter*.) Complimentary registration and lunch for two members of each Student Chapter will be provided. Details will be mailed to all Chapter advisors shortly. Students who are not members of any Student Chapter are also encouraged to attend this meeting.

At the Fall meeting, I hope to set aside a table at lunch on Saturday so that Chapter advisors can discuss ideas for student activities at both the local and Section level.

The Section is tentatively planning to hold a Career Fair in October, 1993. Suggestions for presenters, especially those from companies that you may know of who historically employ mathematics majors, would be appreciated from all Section members.

For the first time, there will be a special papers session devoted exclusively to Student Chapter Activities at the National meeting in San Antonio in January. For further information please contact me.

If anyone wants to start a Student Chapter, please contact me at the address inside the front cover of this *Newsletter*.

Karen J. Schroeder
Bentley College
Student Chapters Coordinator

ABSTRACTS/SPEAKERS

Integrating the TI-81 Graphing Calculator into the Mathematics Curriculum : The Power of Visualization
Session I: Pre-Calculus
Session II: Calculus
Donna M. Christie, Rhode Island College

The focus of these sessions will be on the use of the TI-81 as a tool to enhance concept development and to solve application problems in pre-calculus or in first semester calculus. The activities in these hands-on workshops will be conducted both in "group" and "whole class" format. Calculators will be provided for use during each session.; no previous TI-81 experience is necessary.

Dr. Donna Christy holds a joint appointment as an Assistant Professor of Mathematics and Secondary Education at Rhode Island College. She received her doctorate in 1989 from Boston University. With a grant from the RI Workforce 2000 Council, Dr. Christy is experimenting with integrating the TI-81 into college algebra, pre-calculus, and calculus courses.

Chaos in the Calculus Classroom:
Discrete and Continuous Population Models
Bob Decker, University of Hartford

By comparing discrete and continuous models of the same or similar phenomena, students gain a better understanding of the modeling process. In the case of logistic population models, there are many possible types of behavior. In particular, cyclic as well as chaotic behavior can occur in the discrete case. This activity ties together many of the disparate topics in calculus from differentiation and integration to sequences and the Mean Value Theorem.

Bob Decker is an associate professor of mathematics at the University of Hartford. He has an engineering degree from the University of Cincinnati and a Ph.D. in mathematics from Indiana University. His interests include calculus reform, mathematical modeling, chaos and fractals, and the use of technology in mathematics. The calculus lab manual *Bringing Calculus to Life*, written with John Williams, was published by Prentice-Hall in 1992.

Newton's Method from a Calculus I Perspective
John Williams, University of Hartford

Starting from a lab on Newton's method which the author uses in Calculus I, some of the possible behavior of Newton's method which our beginning students could and should understand is presented. This will include rate of convergence, periodic non-solutions and a pedagogical route to chaos.

John Williams received his Ph.D. from Indiana University in 1983 and has been teaching at the University of Hartford for eight years. His pedagogical interests include uses of technology in the classroom, discrete mathematics, and calculus; his mathematical interests include complex dynamical systems and geometry; his other interests include juggling and brewing.

Calculus Explorations and Modeling Using Calculus T/L
Donald B. Small, USMA, West Point
Miguel A. Garcia, Greater New Haven Technical State College

This talk will use Calculus T/L to explore questions in calculus beyond the reach of students in standard courses. There will also be an analysis of some "real life" applications.

Donald B. Small is a nationally recognized authority on calculus reform and is the author of many books and papers on the subject, as well as on many other research and pedagogical topics. The recipient of many professional honors, Professor Small has been past Chairperson and Governor of the Northeastern Section of the Mathematical Association of America. He is currently on leave from Colby College as Visiting Professor at the United States Military Academy.

Miguel A. Garcia is Chairman of the Mathematics/Science Department of Greater New Haven State Technical College where, for the past two years, he has experimented with technology using Calculus T/L and calculus reform through the Connecticut Calculus Consortium.

Making a Difference in Undergraduate Mathematics: Suggestions for Preparing Proposals for External Funding
James Leitzel, MAA Visiting Mathematician

A brief overview of the structure and programs within the National Science Foundation's Directorate for Education and Human Services will begin this hour and one-half session. Following the overview presentation, there will be more interactive discussion on the specific program solicitations and the preparation of proposals. Enrollment will be limited to 30.

James R. S. Leitzel served as Director of Special Projects at the Mathematical Association of America in Washington D. C. During his term of service he was actively involved in the preparation and implementation of about eight externally funded projects. He was on the Faculty of The Ohio State University for 26 years before moving to the position in Washington. In January, he will assume a position in the Department of Mathematics and Statistics at the University of Nebraska Lincoln.

Leitzel has served as Chair of the MAA's College Committee on the Mathematical Education of Teachers (COMET) and editor of the MAA publication *A Call for Change: Recommendations for the Preparation of Teachers of Mathematics*. He is now serving as chair of the MAA's Committee on the Undergraduate Program in Mathematics and the Committee on the Teaching of Undergraduate Mathematics.

Environmental Mathematics via Energy Diagrams
B. A. Fusaro, Salisbury State University, Maryland

Environmental Mathematics (EM) is a subject in the process of being defined. Environmentally-oriented subjects such as Mathematical Ecology have been studied for about 65 years, going back to the Lotka-Volterra predator-prey equations. These subjects tend to be in research or in the upper end of the curriculum. EM aims for entry level courses. Also, it is more tied in to Environmental Science or Engineering than to Ecology. A more important difference is that EM is powered by an environmental concern. It is more of an "immersion" subject than a white-coat science.

A simple, friendly entree to EM is given by the energy diagrams of Systems Ecologist H. T. Odum. Energy diagrams are the first step in a five-stage modeling process that requires nothing beyond Algebra II. The emphasis throughout is on the visual, the computational, and the quantitative.

Ben Fusaro is a professor of Mathematics and Computer Science. He has organized five-day applied mathematics workshops for the MD-DC-VA Section since 1976. He created the Mathematical Contest in Modeling and directed it for seven years. The first call to engage faculty and students in Environmental Mathematics was written by him (and Marcia Sward) for *FOCUS*. He has presented two student workshops on environmental mathematics. The first was sponsored by the MAA Student Chapters Committee and was given at the AMS-MAA January 1992 Baltimore meeting. The second was given at the MAA-PME meeting in August 1992 at Miami University of Ohio. He chairs the MAA Mathematics and the Environment Committee and organized (with Marcia Sward) the environmental theme for the Baltimore AMS-MAA 1992 meeting.

Newton's Method: Complex Numbers and Complex Dynamics
Paul Blanchard, Boston University

Newton's Method is often an effective method for approximating the roots of a polynomial. Unfortunately, a random initial guess does not always produce a root. In this talk we use the theory of complex dynamics (along with some computer graphics) to explain the difficulties that arise, and we suggest ways to avoid these pitfalls.

Paul Blanchard received his Ph. D. in Mathematics from Yale University in 1978. He has held faculty positions at Northwestern University and the University of Southern California, and he is currently a faculty member at Boston University. He has also held visiting positions at the Institute for Mathematics and at the Institute for Advanced Study.

His research interests center around the qualitative theory of dynamical systems with an emphasis on complex-analytical systems. He is also involved in the use of computer graphics as a research tool in mathematics. For the last three years, his efforts have focused on the teaching of calculus, and most recently he has coauthored a calculus text with Dennis Berkey. For the past 35 years, he has considered every spring as the beginning of "the" season when the Red Sox will finally prevail.

Student Chapter Presentation: Mathematics and the Environment
Charles Hadlock, Bentley College

Environmental problems are all around us - polluted air in the cities and acid rain even in the wilderness, contaminated rivers and harbors, large quantities of wastes with no place to go, abnormal cancer rates in certain areas, and others. Mathematical models are used every day by engineers, scientists, economists, and others to try and solve these problems, and progress is being made slowly but surely. This talk will explore some of these models and how they are used in the real world.

Charlie Hadlock is the Chairman of Mathematical Sciences at Bentley College. He received his Ph. D. in applied mathematics in 1970 from the University of Illinois. Prior to his joining Bentley in 1990, he was Manager of Safety and Environmental Risk at Arthur D. Little, Inc., in Cambridge, Massachusetts, where he was responsible for an international consulting practice involving risk analysis, safety and environmental protection. As part of his work, he has been involved in the development of mathematical models for the estimation of various risks, including the behavior of spills of chemicals on bodies of water, the transport of pollutants in groundwater systems, releases from buried radioactive wastes, and acute exposures from catastrophic accidents. In addition to the analytical aspect of his work, he has spent considerable time in the field assessing safety and environmental problems at operating plants.

Christie Lecture:
A Further Look at Fibonnacci and Lucas Numbers
Peter Hilton, State University of New York at Binghamton

Fibonnacci (and Lucas) numbers not only occur in nature; they also present excellent opportunities to stimulate undergraduate students to notice patterns, make conjectures, and even try to prove them.

It turns out that there are some remarkable arithmetic properties of these numbers which have only recently been observed. Some of these properties will be discussed - and even proved by far simpler methods than those traditionally used.

Peter Hilton received the D. Phil. degree from Oxford University and the Ph. D. degree from Cambridge University. He currently holds the position of Distinguished Professor of Mathematics at the State University of New York at Binghamton. He has held lectureships at Cambridge and Manchester, professorships at Cornell and the University of Washington, the Mason Professorship of Pure Mathematics at Birmingham and the Louis D. Beaumont University Professorship at Case Western Reserve. He has presented his research in algebraic topology, categorical algebra, homological algebra, group theory and mathematical education in numerous publications as well as in lectures in many countries and on several continents. His publications include *An Introduction to Homotopy Theory* (Cambridge University Press, 1953) and *Classical Mathematics* (coauthored with H.B. Griffiths, Van Nostrand Reinhold, 1970, reissued by Springer, 1980) as well as several books and articles with Jean Pedersen concerned with the revival of geometry at the pre-college and college levels and the development of an integrated mathematics curriculum. He served as First Vice-President of the Mathematical Association of America 1978-1979 and has further demonstrated his commitment to mathematics education by chairing a number of national committees, including the National Research Council Committee on Applied Mathematics Training and the United States Commission on Mathematical Instruction. At Hunter College on May 9, 1990 he spoke on "The Joy of Mathematics" as one of the presenters of the first Dolciani Lectures. The text of this lecture appears in the September 1992 issue of *The College Mathematics Journal.*

MAA Northeastern Section Student Workshop:
Environmental Mathematics
B. A. Fusaro, Salisbury State University

The application of mathematics to the environment is an emerging field, just now being developed. The main tool in this workshop is a five-stage modeling process. We begin with a verbal description or direct observation of an environmental situation. The first stage constructs a diagrammatic energy model. Then a qualitative graph is made of an energy variable versus time. The third stage develops a *flow equation.* An approximate solution of this equation is then found via an Execution Trace (via calculators) or simple BASIC code. The fifth stage uses the numbers obtained to plot a graph of energy versus time.

Four key concepts will be introduced, none of which requires anything beyond high school mathematics: 1) H. T. Odum Energy Diagrams; 2) Autocatalytic Systems; 3) Embodied Energy ("All BTU's are not equal"); and 4) A Money-Time-Energy Equivalence. Notes will be provided.

This workshop is limited to 50 students and (by request of the presenter) no non-students may attend.

Synchronous Fireflies
Steven Strogatz, Massachusetts Institute of Technology

In some parts of Southeast Asia, thousands of fireflies gather in trees at night and flash on and off in unison. We discuss a simple model for this remarkable example of spontaneous synchronization. The model consists of coupled relaxation oscillators that communicate by sudden impulses, rather than by continuous feedback. We prove that, for almost all initial conditions, the system evolves to a state where all the oscillators are firing synchronously. A videotape of synchronous Malaysian fireflies will be shown.

Steven Strogatz received his B. A. from Princeton University, was a Marshall Scholar at Cambridge University, UK and received his Ph. D. in applied mathematics from Harvard University. In 1990 he was awarded an NSF Young Investigator grant. He is currently an assistant professor of applied mathematics at MIT where he is writing an undergraduate text on dynamical systems. The text, entitled *Nonlinear Dynamics and Chaos: An Applied Introduction*, is expected to be published by Addison-Wesley sometime in 1994.

The Role of Mathematicians in Addressing Environmental Problems
Charles Hadlock, Bentley College

Mathematicians have not generally been as involved as other technical groups in contributing to the solution of highly interdisciplinary problems, such as those encountered in environmental management. This talk will review a number of recent cases in which the speaker has been involved and will highlight both mathematical and nonmathematical aspects that may be of interest. Topics will include hazardous materials transportation, contaminated site clean-up, nuclear waste disposal, and others. The talk will conclude with a discussion of how interested individuals can get involved in this kind of work, and how to bring these ideas to the classroom.

Modeling Natural Resources Depletion
Michael Olinick, Middlebury College

By definition, a *nonrenewable* natural resource is one whose supply over time must decrease. Once we use up a ton of available tin or a barrel of petroleum, it is gone forever: we have diminished the earth's supply. Since the total reserve of any mineral or fuel is finite, we will eventually run out of a nonrenewable resource unless we can cut consumption to zero or completely recycle the product.

We often compare the reserve of two nonrenewable resources by comparing the *time* it will take to exhaust the total supply of each. We will examine several simple deterministic models of resource depletion assuming first a constant demand and then considering the case where demand rises with population. We will explore how such models might be modified to incorporate recycling, the discovery of new reservoirs of a resource, and the rising costs on resource usage.

We also briefly consider deterministic models of the depletion of renewable resources. Results from analytic solutions and computer simulation approaches will also be presented.

Michael Olinick received his Ph. D. in mathematics (topology) in 1970 under the direction of R. H. Bing at the University of Wisconsin. He has been at Middlebury College since 1970 and has taught at the University of Wisconsin and the University of East Africa as well as holding several other visiting positions. He has published numerous articles and given many talks on mathematical modeling, game theory, and a variety of diverse mathematical topics. He is currently involved in writing a chapter on probability for a COMAP project, revising the second edition of his book *An Introduction to Mathematical Models in the Social Life Sciences*, and working on several additional texts.

SHORT COURSE MAKES "AVERAGE" RETURN

The United States Military Academy at West Point again provided the speaker for another delightful week of lectures this past June. Professor Rickey A. Kolb investigated Exploratory Data Analysis in our thirteenth annual NES-MAA short course. His clear morning lectures were supplemented with afternoon lab sessions using Minitab. Twenty-nine participants, many of whom had had little prior exposure to statistics, enjoyed the lectures and the pleasant early-summer Maine weather.

We have been most fortunate to have obtained excellent lecturers and interesting and informative topics for our courses, and 1992 carried on that tradition. As usual, in addition to our academic endeavors, the short course featured a midweek break: a trip to Mt. Desert Island and pizza party which was followed by a lively curriculum discussion. The Thursday evening lobster banquet provided the climax for our social calendar.

Next summer our short course will be on newer ideas on teaching the calculus. Don Small has just announced that he has received a grant, part of which will be used to help support our June 1993 University of Maine short course. Further details will be forthcoming in your next *Newsletter*, in *Focus*, and in the usual fliers we mail each spring.

Clayton Dodge
University of Maine (Orono)
Short Course Coordinator

PUBLISHERS

It is expected that a number of textbook and software exhibitors will be present at the Fall Meeting at Trinity College. Their exhibits will be displayed at a central location from 8:30 am to 3:30 pm. Be sure to take time to visit them. They are an integral part of our program. A special thanks to **Jones and Bartlett Publishers** and Mr. Klaus Peters (617-482-3900) for exhibiting at our June Meeting at Merrimack College. We were especially pleased in that we do not usually have exhibits at the Spring Meeting.

If you know any publishers who would wish to exhibit at Trinity College please have them contact: Betsey Whitman, Publisher's Liaison, Framingham State College (508-626-4729).

SPRING 1993 MEETING

This spring's meeting will be held at the University of Massachusetts-Dartmouth (formerly Southeastern Massachusetts University) on June 11-12, 1993. Ronald Tannenwald is the Local Arrangements Coordinator and the Program Committee Co-Chairs are Richard Faulkenberry of U-Mass Dartmouth and Cecilia Medeiros of Bristol Community College. Other Program Committee members are Dwayne Cameron of Old Rochester Regional High School and Thomas Moore of Bridgewater State College.

The theme for this meeting is *Geometry*. Tentatively scheduled to speak are H. S. M. Coxeter (University of Toronto), John Ewing (University of Indiana and Editor of the *American Mathematical Monthly*), Thomas Banchoff (Brown University), Jeff Weeks (Middlebury College), and Lynne Durkin (Bentley College). Workshops on **PMATH** and **MATLAB** are planned for Friday afternoon.

NEWS FROM NEMATYC

The annual meeting of the New England Mathematics Association of Two-Year Colleges will be held at Middlesex Community College in Middletown CT on Saturday March 13, 1993. The Program Chair for the meeting is Steve Krevisky. Proposals for relevant papers and workshops are invited. If interested, please submit your proposal, prior to December 18, 1992 to:

Steve Krevisky
Middlesex Community College
100 Training Hill Road
Middletown CT 06457.

If you are not a member of AMATYC nor NEMATYC but would like to receive an announcement of this meeting, please send your name and address with the words "NEMATYC Mailing List" to Steve at the above address.

EDITOR'S MESSAGE

Friday, March 12, 1993 is the date when all information for the *Spring Newsletter* must be received by the editor (address on inside front cover). **Wednesday, September 1, 1993** is the deadline date for the *Fall Newsletter*. This later date reflects the fact that our Fall 1993 Meeting, is to be held on November 5-6, 1993 which is two weeks earlier than usual. Thanks to all for their timely and well written input for this issue. If your material could come to me on an IBM compatible floppy disk as an ASCII file, along with a hard copy, that would be much appreciated.

Laura L. Kelleher, our Section Chairperson, is to be congratulated. At graduation exercises held at Massachusetts Maritime Academy this past June, she was named *Outstanding Faculty Member of the Year*. I would also like to gratefully acknowledge her assistance in the preparation and mailing of this issue of the *Newsletter*.

PRE-REGISTRATION FORM

FALL MEETING OF THE NORTHEASTERN SECTION-MAA

NOVEMBER 20-21, 1992 **TRINITY COLLEGE**

Mail Registration Form to: David Robbins
Department of Mathematics
Trinity College
Hartford CT 06106

Checks should be made out to: NES/MAA

You may register at the meeting if you wish; however, it would facilitate the organization of the meeting if you pre-register by mail **and** it will save you money in that on site registration fees are five dollars more than pre-registration fees. Also, seating is limited for the Friday banquet and will be allocated on a rolling basis as pre-registration forms are received. In any case, no meals can be guaranteed unless reservations are received by Friday, November 6, 1992. Spouses and guests are welcome at all meals.

REGISTRATION:

Name_____

Institution _____

Address _____

City, State, Zip_____

Telephone (____) _____

PRE-REGISTRATION FEE:

MAA Member ($10.00)
Non-member ($15.00)
Student or unemployed ($5.00) } $_____

MEALS:

Banquet 6:45 p.m. Friday
Chicken: Number ( ) x $16.00
Vegetarian: Number ( ) x $16.00 } $_____

Luncheon 12:00 Noon Saturday
Number ( ) x $8.00 $_____

VOLUNTARY CONTRIBUTION FOR THE HOWARD EVES ROOM (see page 4): $_____

TOTAL $_____

Northeastern Section MAA
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Massachusetts Maritime Academy
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