NORTHEASTERN SECTION

NEWSLETTER

FALL 1989

VOLUME 11 NUMBER 2

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FUTURE SECTION MEETINGS

College of the Holy Cross
November 17-18, 1989
See this bulletin for details

Roger Williams College
June 8-9, 1990
Local Arrangements Chair : John O'Connell
Program Chair : Donna Beers, Simmons College

Framingham State College
November 16-17, 1990
Local Arrangements Chair : Thomas Koshy
Program Co-Chairs : Thomas Moore, Bridgewater State College
and Kenneth Preskenis, Framingham State College

A MESSAGE FROM THE CHAIR

"Mathematics is the key to opportunity. No longer just the language of science, mathematics now contributes in direct and fundamental ways to business, finance, health and defense. For students, it opens doors to careers. For citizens, it enables informed decisions. For nations, it provides knowledge to compete in a technological economy. More than ever before, Americans need to think for a living; more than ever before, they need to think mathematically" - taken from *Everybody Counts, A Report to the Nation on the Future of Mathematics Education.*

Mathematics has traditionally filtered students out of programs leading to scientific and professional careers, and sometimes out of the educational system itself. From ninth grade through graduate school, the half-life of students in the mathematics pipeline is about one year. Research on learning shows most students cannot learn mathematics effectively by the typical way it is taught; that is by listening and imitating. Do you remember the first course that you taught? I do! I instructed as I thought all my mathematics professors whom I hold in high esteem would have. To learn mathematics, students must be engaged in exploring, conjecturing, and thinking, rather than rote learning of rules and procedures. We know that learning mathematics is not a spectator sport. Much of the failure in school mathematics is due to a tradition that is inappropriate to the way most students learn.

Only in the United States do people believe that learning mathematics depends on special ability. In other countries, students, parents and teachers expect that through hard work most students can master mathematics. Public acceptance of low expectations contributes significantly to poor performance in mathematics. Public attitudes about mathematics are shaped by their own school experiences. Consequently, mathematics is seen not as something that people actually use, but as a painful requirement of school. Only in mathematics is poor school performance socially acceptable! Only in America do adults proclaim their ignorance of mathematics - "I never could do math." We must shift public attitudes about mathematics from indifference and hostility to recognition of the important role that mathematics plays in our lives and in society. The public perception of mathematics must shift from that of a fixed body of arbitrary rules to an exciting, active science of patterns. The public must realize that mathematics is thinking and not computing. Mathematicians must write for popular audiences. The work of John Paulos, *Innumeracy: Mathematical Illiteracy and its Consequences,* has been on the New York Times best-seller list for 16-and-counting weeks. Other mathematicians should follow his lead.

To remedy our problems it is obvious that mathematics teachers need to change the way they teach so that students are actively involved in discovering the beauty and utility of mathematics. Not only will we teach differently, but our audience will necessarily change. Whereas formerly 90% of the work force was white, between now and the year 2000 one in three new workers will be minority. The successes of Jamie Escalante and Uri Treisman must be replicated throughout the nation at every level of participation from minorities and from women. Gender differences in mathematics performance are predominantly due to the accumulated effects of sex-role stereotypes in family, school, and society. We must reduce all factors that compromise a student's potential to learn mathematics. In view of the projected shortfall of mathematically trained personnel, women and minorities must be pumped into the pipeline instead of out.

Over the next fifteen years the number of students will increase, the demand for mathematics will increase, and the requirements of mathematics teachers will increase, and the retirements of mathematics teachers will increase. Consequently, there will be a very strong demand for mathematics graduates well into the next century. However, the number of students receiving mathematics degrees declined roughly 50% from its peak in the early 1970's. The low percentage of American students in graduate programs calls attention to the obvious - that American mathematics education, especially undergraduate education, is not healthy. Of most concern to the public, mathematics departments in universities - more than any other departments rely on graduate students to

teach undergraduates. International graduate students rarely make ideal teachers for American freshmen, and for that matter neither do native born graduate students. Colleges must also share the blame. When demand for mathematics increases (almost always at the freshman level), most colleges respond by hiring underqualified temporary instructors with little continuing sense of professional commitment. It is precisely at the freshman level that college/universities must place their most effective, accomplished teachers. Rarely is this done, since the traditional rank and tenure system rewards research not excellent teaching. Secondary schools, too, have been filling mathematics classroom positions with teachers whose qualifications are inappropriate. Of the nation's 200,000 secondary mathematics teachers, more than 50% do not meet current professional teaching standards. It is estimated less than 10% of the nation's elementary school teachers meet contemporary standards for their mathematics teaching responsibilities.

To replace normal retirements and resignations of high school mathematics teachers requires in excess of 7000 new teachers a year. This is approximately half of the expected number of mathematics graduates each year. Elementary school teachers are drawn predominantely from the 75% of the population who dropped mathematics after two or three courses in high school. Many of those teachers do not have fond memories of their mathematical experiences, and feelings are often communicated to the children they teach. Undergraduate mathematics is the key for the revitalization of mathematics education. All students who prepare to teach mathematics acquire attitudes about mathematics, styles of teaching, knowledge of content, and an understanding of mathematics from their undergraduate experience. With approximately 50% of school teachers leaving every seven years, it is feasible to make significant changes in the way school mathematics is taught, and consequently in the way the public perceives mathematics, simply by transforming undergraduate mathematics to reflect our new experiences. None of our problems will be remedied until we revitalize undergraduate mathematics through the reform in both curriculum and teaching style.

The Spring Meeting of our Section was held at Keene State College and was a success on all fronts. It drew 137 participants, exceeding the previous record for a Northeastern Section Spring Meeting by almost 30. The lectures over the two days were excellent. For example, Frank Morgan's post banquet lecture on "Soap Bubbles and Teaching Mathematics" was delightfully entertaining and also quite informative. A special thanks to Joan Ferrini-Mundy (University of New Hampshire), Chair of the Program Committee, Phillip Mahler (Middlesex Community College), and Richard Pelosi (Western New England College). The local arrangements played a major role in the success of the meeting. The dining arrangements, social hour, and residence accomodations were excellent, and offered an environment for a true community spirit to flourish - thanks to Joseph Witkowski, Local Coordinator, Keene State College.

It is difficult for me to believe that my two year tenure as Chair comes to a conclusion this Fall at the Holy Cross Meeting. At my age, one hates to see two years slip by so quickly. I found my responsibilities as Chair challenging, exciting and time consuming. It was always personally gratifying to oversee successful Fall and Spring Meetings whose success (in my eyes) were solely dependent on the Local Arrangement Coordinators, the Program Chairs, the Program Committees, the Student Papers Coordinator, the Contributed Papers Coordinator and the Publishers Liason. Thanks again to all those individuals who have made my job so much easier, and always made me look so good! I must also confess that during the past two years Frank Battles and Laura Kelleher, both from Massachusetts Maritime Academy, were offering me excellent ideas and sage advice behind the scenes. A special thanks to them. I hope my contributions to the well-being of the Northeastern Section will continue into the future, and I look forward to serving the section in other important roles soon.

Melvin Tews and Thomas Cecil, Program Co-Chairs for the approaching Fall Meeting, have worked hard to formulate an interesting, diverse, and most attractive program at the College of the Holy Cross, November 17-18. I hope to see you there.

Dennis M. Luciano, Chair
Northeastern Section of the MAA

GOVERNOR'S MESSAGE

September, the month when most schools begin, is always a special month. This year it is even more special, especially for the MAA. Al Willcox, the Executive Director of the Association for the past 27 years, offically turned over the Directorship to Marcia Sward. Marcia is a past Associate Director of the MAA and for the past four years has served as Executive Director of the Mathematics Science Education Board of the National Academy of Science. Marcia is a wonderful person as well as being a very intelligent and capable executive. We are fortunate indeed to have Marcia as our Director.

The second derivative of the Association membership remains strongly positive. As of July 1, 1989, the Association had 26,693 members compared to 24,252 and 23,943 for the previous two years. Our Section's membership is 2,307. This places us second behind the Southeast Section which has 2,382 members. How about a slight push on everybody's part to get us back into first place? (See page 15.)

The programmatic activities of the MAA continue to expand as new ideas and new needs are identified. It is exciting (although exhausting) to witness the variety and volume of activities supported by our Association. There were forty-eight "reports" (committee, staff, editors, etc.) presented at the Governor's meeting in August.

Last year's restructuring of the financial accounting procedure to have program activities supported by membership dues and building maintainance (Washington Office) supported by building rent, has placed the Association on a sound financial footing. Although the payment of financial dividends to members is not yet in the plans, the long term financial picture is bright. To further enhance this positive outlook, the Board of Governors voted to conduct a $300,000 fund drive to halve the mortgage debt placed on the Washington Office Building to cover the cost of renovations. The plan is to invite MAA leaders to pledge $75,000, obtain a foundation challenge grant of $150,000, and then conduct a brief open campaign for the general membership to raise the remaining $75,000. Thus a $1 general membership donation realizes a $4 donation to the total campaign. That's a good deal!

Don Small
Governor

ATTENTION TWO-YEAR COLLEGE MEMBERS

NES/MAA has had some great meetings which have been of particular interest to two-year institutions. For example, at the NE Section Meeting at Keene, NH in June, the session on Calculus and the one on Statistics had singular interest for two-year college members, and the "Soap Bubble" session was as much fun as it was helpful. Since we're all involved, to some degree, with the NCTM Standards, it was also discussed at an introductory level.

If we wish this sort of helpful program to be continued by MAA, it would behoove us to increase our membership. I'd like to suggest that everyone who gets a copy of this Newsletter make a copy for each member of his/her department, and deliver it to them with the membership application to MAA which appears on page 15.

Further, try to talk some of your colleagues into attending our Fall Meeting in November at the College of the Holy Cross, and the Spring Meeting in June, 1990 at Roger Williams College. If enough interest is shown, we'll try to have something special for the two-year college members at the Spring Meeting.

Joseph Menard
Two-Year College Representative

EXECUTIVE COMMITTEE

The Executive Committee met at the Spring Meeting and came to a conclusion on two issues: (i) to initiate split registration fees (pre and on site) to encourage attendees to pre-register for the meetings since large on site registrations typically cause major problems for the Local Coordinator, and (ii) to hold the 1991 Fall Meeting at Providence College with Frank Ford as Local Coordinator.

MINUTES OF THE LAST MEETING

The Spring Meeting of the Northeastern Section was held on June 2-3, 1989 at Keene State College in Keene, New Hampshire. There were 137 registrants.

Invited Addresses

Calculus and the Curriculum by John Kenelly, Clemson University.

Soap Bubbles and Teaching Mathematics by Frank Morgan, Williams College.

The NCTM *Curriculum and Evaluation Standards and Their Implications/Obligations for Collegiate Mathematics* by John Dossey, Illinois State University.

Karmarkar's Linear Programming Algorithm and Its Extensions by Michael Todd, Cornell University.

Enhancing the Learning of Linear Algebra and Differential Equations Using Computers by Lee Zia and Homer Bechtell, University of New Hampshire.

Panel Discussion

Who Should Take Statistics - Who Should Teach Statistics - What Statistics Should Be Taught? Panelists : John D. McKenzie Jr., Babson College, Rosemary A. Roberts, Bowdoin College and Thomas J. Marx, Marx Social Science Research Inc.

Contributed Papers

Thought-Provoking Calculus by Alice B. Miller, Babson College.

A Hierarchical, Multiple Key Coding Scheme by Edward Sandifer, Western Connecticut State University.

The Michelson-Gale Experiment and the Postulates on the Velocity of Light by P. Moon, D. E. Spencer and E. E. Moon, University of Connecticut.

The Sagnac Effect and the Postulates on the Velocity of Light by P.E. Moon, D.E. Spencer and S.Y. Uma, University of Connecticut.

A New Postulate on the Velocity of Light by P.J. Mann, University of Connecticut.

Student Papers

The Poisson and Normal Approximations to the Binomial : A Closer Look by Donna Fitzgibbon, University of Hartford.

From Around the World to Across the Map in Fifteen Pages by Bill Ross, University of Maine.

Social Choice Reversal Paradoxes by Peter K. Harrel, Worcester Polytechnic Institute.

Mersenne Primes by Jonathan Dearing, University of Maine.

At the business meeting, the Chair recognized Don Small, Governor of the NES, who spoke briefly on the MAA at the national level. The treasurer's report was presented. Joseph Witkowski, Student Papers Coordinator, recognized each student presenter and indicated that they will receive a one year membership in the MAA, with a journal of their choice, and receive a book award. The Chair congratulated Joan Ferrini-Mundy for putting together such an excellent program. He also thanked the other members of the Program Committee, Phil Mahler and Richard Pelosi. Due to their efforts we set a record attendance for a Spring Meeting - 137. The Chair thanked Keene State for hosting the meeting and congratulated Joe Witkowski, Local Arrangements Coordinator, for all his efforts.

Laura L. Kelleher
Secretary/Treasurer

MAA STUDENT CHAPTERS

We are continuing with the establishment of Student MAA Chapters in our Section. As of September 15, we have only 3 student chapters officially registered from the Northeastern Section. All Math Clubs are urged to register as soon as possible with the national MAA office in order to be designated as a "Charter Chapter" at the national MAA meeting in August, 1990.

When you send in your national registration materials, I would appreciate your sending me the following information:

a) Faculty advisor(s) - name, address, phone number
b) List of student officers
c) Suggestions for inter-chapter activities within our section.

We hope to use this information to prepare a Student Chapter's Directory to help promote activities between chapters.

If you need help in getting your chapter registered, or if you need more information about student chapters, please contact me at the address below. Also, information will be available at the Fall Section Meeting at the College of the Holy Cross.

Thurmon Whitley
Department of Mathematics
University of New Haven
300 Orange Avenue
West Haven, CT 06516
Telephone : (203)-932-7296.

SPECIAL STUDENT CHAPTERS SESSION

At the Fall, 1989, Section Meeting, there will be a session especially for students on Satuday at 1:30 pm in Swords 309. The first part of this ninety minute program will be a talk especially for students, and will be given by James Tattersall, a participant in the MAA Visiting Lecturers Program. The title of Professor Tattersall's talk will be *An Episode in the History of Mathematics.* The last 30-45 minutes of this special session will be a "brainstorming" session. We invite student chapter representatives to share news of their chapter activities, suggestions for future activities, and ideas for working together. We hope that each school in the Northeastern Section of the MAA will send at least one student representative to this session. All students and Faculty Advisors are invited to this session, whether or not your school has an official Student MAA Chapter yet.

HOWARD W. EVES

"His talks will hold an audience spellbound whether he addresses high school students, undergraduates, or mathematics faculty." So states a recent University of Central Florida flier advertising a lecture series by Howard Eves. Some years ago my wife, who professed great mathematical anxiety, my daughter, who was then in grammar school, and I attended his lecture *Mathematically Motivated Designs* at Colby College in Maine. All three of us were completely fascinated by the talk, showing the opening quotation to be an understatement. Indeed as one of his colleagues described him, Howard Eves is "one of the most fascinating lecturers in mathematics that one can hope to find anywhere."

Howard Eves obtained his B.S. from the University of Virginia in 1934 and his M.A. from Harvard the next year, both in mathematics. He did further study at Princeton University during the next two years, and received his Ph.D. in mathematics from Oregon State University in 1948.

While at Princeton, he met many renowned mathematicians, including Albert Einstein, with whom he became well acquainted. Since they lived near one another, they would walk home together many afternoons. Along the route there was a drugstore with a huge ice cream cone out front. One day Einstein remarked that it looked inviting, so Eves offered to buy him one. From then on, it became a ritual for Howard to buy cones for the two of them as they walked home. One day, as they approached the drugstore, Einstein's eyes lit up and he exclaimed, "Look! I've got my own nickel today!" When he placed it on the counter to pay for his cone, Eves was prepared and snatched it up, replacing it with one of his own. That nickel became one of the first acquisitions in Howard Eves' famous Mathematical Museum: a nickel once owned by Albert Einstein.

Shortly after Oswald Veblen died at his retirement home on the Maine coast, Howard Eves visited the grounds for a quiet stroll in memory of this famous mathematician. As he walked beside the house he spotted a new broken yellow pencil on the ground, picked it up, and added it to his museum. Surely this was Veblen's pencil, for who else but a nearly blind person would drop a bright yellow pencil, step on it and break it, and still not see it to pick it up? Although no longer intact, Eves' Mathematical Museum would have filled a station wagon at one time.

After his stint at Princeton, Howard worked as surveyor for a year and as a mathematician for the Tennessee Valley Authority for another year. Then he went into teaching at Syracuse University 1940-1943, at the University of Puget Sound 1943-44, where he was head of the department, Oregon State University 1944-51, SUNY at Plattsburgh 1951-53, again as department head, SUNY at Binghamton 1953-54, and the University of Maine 1954 to his retirement in 1976.

Since retirement he has taught at the University of Maine at Machias and currently he teaches each spring at the University of Central Florida and summers at home in Lubec, Maine, literally a stone throw from the easternmost tip of the United States.

On November 26, 1955 the first meeting of the Northeastern Section of the Mathematical Association of America was held at the University of New Hampshire due in a large part to the efforts of Eves. He presided over the morning session and was elected the first Chair in the history of the Section. From July 1964 to July 1967 he served the Section as Governor.

Howard Eves has published well over 30 books and 200 papers and articles, many in geometry. His book on the history of mathematics has been the best seller in its field ever since its initial appearance in 1953. Ten years later he published his authoratative *A Survey of Geometry* in two volumes. His *Mathematical Circles* books, published by Prindle, Weber & Schmidt in six volumes from 1969 to 1987, form an outstanding collection of anecdotes and stories about mathematics and mathematicians. Of a more serious nature are his two *Great Moments in Mathematics* books, a collection of 43

lectures describing important developments in mathematics from the proof of the Pythagorean theorem to the resolution of the four color problem. They are volumes 5 and 7 in the Dolciani Mathematical Expositions, published in 1980 and 1981 by the Mathematical Association of America. These two series, the *Circles* and *Great Moments* books should be on the shelves of every teacher of mathematics, along with his *History* text.

For a quarter century he edited the Elementary Problems Department of the American Mathematical Monthly, publishing ten problems each month. It was my privilege to assist him during the last two years of his term. After an interim editor suddenly gave up this back-breaking task, Eves organized the Problems Group at the University of Maine, a collection of nine or ten faculty members who collectively edited the Elementary Problems Department for several years. He is an active problemist, still publishing problems and solutions in the journals.

He has served on the editorial boards of Mathematics Magazine, the Mathematics Teacher, the Two Year College Mathematics Magazine, and the Fibabacci Quaterly. Pi Mu Epsilon, Sigma Xi, Phi Beta Kappa, Sigma Delta Zeta, and the Mark Twain Society have all honored him with memberships. He has been active in the Mathematical Association of America, the American Mathematical Society, and the French Mathematical Society.

We first became acquainted in 1956 when I started teaching at the University of Maine. I took several courses from him and sat in on several others to learn what I could from him. For the next twenty years we worked together on various projects.

There are many stories that illustrate just how much Howard Eves cares for people. He has often stated that his skills and knowledge have been given to him by others and it is his responsibility to pass them on. Therefore he could not keep the royalties that his books have earned; he has given them all to a black college. Over the years he has befriended many people who needed help and has aided them with money, lodging, and encouragement.

All these things he has done with a delightful sense of humor. He once confided that it terrified him that after he drove home, he could remember leaving the office and then his next recollection would be of driving into the garage. For all he knew he could have caused several accidents and run over all sorts of people on the way home. He said he would turn to the Police Beat of the local newspaper each morning to see if anyone was the victim of a hit-and-run accident in his area the preceding day and he would carefully check his car for dented fenders. Of course, there never was such an accident. I once told him that I had attended a lecture on continued fractions. He immediately replied that, of course, the speaker never completed the lecture.

They say that all good teachers are frustrated actors at heart. Certainly Howard Eves is a seasoned performer. Upon occasion he will tell of the ways that mathematicians have met their ends: Archimedes was stabbed by a Roman soldier; Pythagoras was burned to death because he would not escape through a sacred field of grain; Hypatia was stoned to death by her Christian students, and so forth. The humor with which he would tell of the way Rene Descartes died because of the request of the young Queen Christina of Sweden had his students in stitches. When they would be laughing so hard that tears came to their eyes, he would stop and look at them with mock shock and say, "I can't understand why you are all laughing so. This is tragic."

I owe much to Howard Eves. He inspired and encouraged me to start writing books. He led me into problems work. He showed me his love for teaching and for mathematics and taught me that a teacher must be scrupulously honest with his or her students. If I am a good teacher, it is mainly his example that has made me so.

Clayton Dodge
University of Maine

NORTHEASTERN SECTION OF THE MAA
FALL MEETING
COLLEGE OF THE HOLY CROSS
WORCESTER, MASSACHUSETTS
NOVEMBER 17-18, 1989

Friday, November 17

2:30-6:00	Registration	Swords Atrium
2:45-4:00	Executive Committee Meeting	Swords 359
4:15-5:30	*Computer Graphics in Calculus* James Callahan, Smith College	Haberlin 408
4:15-5:30	*Math Surf-Software for the Sophomore Calculus Course* Melvin Tews, College of the Holy Cross	Haberlin 412
4:15-5:30	*Groebner Basis Techniques in Abstract Algebra Using* REDUCE 3.3 John Little, College of the Holy Cross	Swords 359
5:45-7:00	Social Hour	Hogan Ballroom
7:00-8:15	Banquet	Hogan Ballroom
8:30-8:45	Welcoming Address Professor Frank Vellaccio Dean and Vice President Academic Affairs College of the Holy Cross	Haberlin 103
8:45-9:45	*Exploding Julia Sets* Robert L. Devaney, Boston University	Haberlin 103

Saturday, November 18

7:00-11:00	Registration	Swords Atrium
8:00-4:00	Textbook/Software Exhibit	Swords Atrium
8:00-9:20	Student Papers	Swords 302
8:00-9:20	Contributed Papers	Swords 359
9:30-10:30	*Maximal Subgroups of Finite Classical Groups : A Survey of Methods* Harriet Pollatsek, Mount Holyoke College	Haberlin 103
10:30-10:55	Coffee Break	Swords Atrium
11:00-12:00	*THE CHRISTIE LECTURE* *Elementary Knot Theory and Computation* Paul A. Schweitzer, S.J., Boston College	Haberlin 103
12:10-1:15	Lunch	Hogan Ballroom

1:30-2:30	*From Essence to Existence : The Design of New Minimal Surfaces* David Hoffman, University of Massachusetts, Amherst	*Haberlin 103*
1:30-2:50	Student Chapters of the MAA See page 5 for details	Swords 359
2:35-2:50	Business Meeting	Haberlin 103
3:00-4:00	*Average Values of Arithmetic Functions* Michael Rosen, Brown University	Haberlin 103
3:00-4:00	Contributed Papers	Swords 359
3:00-4:00	Student Papers	Swords 302

Program Committee :
Thomas E. Cecil and Melvin C. Tews, Co-Chairs,
College of the Holy Cross

Local Arrangements :
Leonard C. Sulski, College of the Holy Cross

CALL FOR CONTRIBUTED PAPERS

There will be contributed paper sessions at the both spring and fall meetings. We are specifically interested in papers pertaining to new courses which you have developed, successful techniques you have found useful in teaching, or research you have done related to your classroom material. We urge you to make a presentation and to let others know what you are doing. This is also a good time to start planning a presentation for the Spring Meeting. Your presentation should be approximately 15 minutes in length. Send a typed abstract, together with a list of any special equipment you may need, by October 31 to : Ed Sandifer, Department of Mathematics and Computer Science, Western Connecticut State University, Danbury CT 06810. Telephone (203)-797-4310 or via BitNet at SANDIFER@CTSTATEU.

CALL FOR STUDENT PAPERS

Students (and recent graduates) 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 is waived for student presenters at all section meetings.

Almost every college/university has students working on projects, problems, and minor 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 November 7 to : Joseph C. Witkowski, Department of Mathematics and Computer Science, Keene State College, Keene NH 03431. Telephone (603)-352-1909. All proposals will be reviewed by department faculty members.

Computer Graphics in Calculus
James Callahan, Smith College

Students in the Five College Calculus Project use interactive computer graphics programs to plot multivariable functions, and to solve systems of differential equations. The plotting programs allow zooming to demonstrate local linearity; they are also used to find extrema and to display Taylor approximations. Other programs graph the solutions of up to ten coupled first-order ordinary differential equations over an arbitrarily large domain, by using a scrolling monitor. Phase plane projections of a pair of autonomous equations are also plotted. The programs will be demonstrated, and participants will have the opportunity to experiment with them in the Haberlin Mathematics PC laboratory.

James Callahan received his B.A. in 1962 from Marist College, and his Ph.D. in 1967 from the Courant Institue, New York University. Before joining the Mathematics Department at Smith, he was a Benjamin Pierce Lecturer at Harvard University. He has taught at Smith since 1970, and has served as a visiting faculty member at Warwick University on three occasions in that time.

Math Surf-Software for the Sophomore Calculus Course
Melvin Tews, College of the Holy Cross

Holy Cross College has developed software for the sophomore calculus course which runs on the College's VAX 8600 system and uses Tektronix color graphics terminals for relatively high resolution displays. In particular, students can investigate cross sections, level curves, tangent lines and tangent planes of graphs $z = f(x, y)$. Students can also investigate how two surfaces sit in space relative to one another and how they intersect. A demonstration of this program will be presented and an opportunity for hands-on use of the program will be provided using five graphics terminals available throughout the meeting.

Melvin Tews is Associate Professor of Mathematics at Holy Cross College where he has taught since 1967, He received his B.S. from Trinity College, his M.A. from the University of Maryland, and his Ph.D. from the University of Washington. His mathematical interests are in harmonic analysis, and modern functional analysis. He is also interested in using computers to help students develop geometric insight and a clearer understanding of mathematical concepts.

Groebner Basis Technique in Abstract Algebra Using REDUCE 3.3
John Little, College of the Holy Cross

Recent developments (especially the discovery and exploitation of Groebner basis techniques) have made it possible and attractive to introduce new topics in commutative algebra and affine algebraic geometry in the undergraduate abstract algebra course. In this presentation, we will briefly discuss the algebraic background of these techniques--a division algorithm for mulivariable polynomials, and an algorithm, due to B. Buchberger, that produces a special basis (called a Groebner basis) for a polynomial ideal. In essence, Buchberger's algorithm is a simultaneous generalization of Euclid's algorithm in k[x], and Gaussian elimination for linear polynomials.

We will discuss how Groebner bases give algorithmic techniques for testing ideal membership, for solving polynomial systems exactly, and for treating various geometric questions about affine algebraic varieties. We will also discuss the implementation of these ideas in the REDUCE computer algebra system, and indicate how REDUCE could be used in conjunction with an abstract algebra course.

John Little is an Associate Professor of mathematics at Holy Cross College, where he has taught since 1980. He earned a B.A. from Haverford College in 1976, and a Ph.D. from Yale University in 1980. His major research interest is the geometry of algebraic curves.

Exploding Julia Sets
Robert L. Delaney, Boston University

It is known that the Julia sets of some simple transcendental families like λe^x, $\lambda \sin x$ and $\lambda \cos x$ may explode as the parameter λ is varied. This means that the Julia set may suddenly change from occupying a relatively small, nowhere dense subset of the plane to occupying the whole plane. In this lecture we will investigate the mechanism that produces these explosions, as well as related stability questions. The role of computer experimentation in discovering these explosions will be discussed, and several short computer-generated films which exibit explosions will be shown.

Professor Robert L. Delaney received his A. B. from Holy Cross College and his Ph. D. from the University of California at Berkeley in 1973. He has taught at Northwestern University, Tufts University, and the University of Maryland before coming to Boston University in 1980. He served as Chairman of the Department of Mathematics from 1983 to 1986. His main area of research is dynamical systems, including Hamiltonian systems and complex analytical dynamics. He is the author of *An Introduction to Chaotic Dynamical Systems* published by Addison-Wesley and *Chaos, Fractals, and Dynamics*, a text written for advanced high school students and their teachers.

Maximal Subgroups of Finite Classical Groups : A Survey of Methods
Harriet Pollatsek, Mount Holyoke College

There are numerous papers on the determination of finite classical groups, going back to the turn of the century, when groups in low dimensions were studied by Burnside and Dickson, among others. From the late 1960's to the present, many special cases of groups in higher dimensions have been considered using geometric methods. The problem of determining these maximal subgroups has now been structured by Aschbacher's fundamental 1984 result. He introduced a family of "natural" subgroups of a finite, almost simple, classical group G and, using representation theory over a finite field, showed that a maximal subgroup of G is either a member of this family or is the normalizer of a quasisimple subgroup X which is absolutely irreducible on the vector space V on which G acts and is not realizable over a proper subfield of the defining field of G. The latter case leads to the study of configurations $X < Y < G$ with Y quasisimple. Seitz has studied the case when X is of Lie type over a field of characteristic p and Y is classical, showing how to lift the problem to one about algebraic groups and thereby determing all such embeddings.

This talk will begin the survey of methods with some examples of geometric arguments in special cases. Then Aschbacher's result will be described and illustrated.

Harriet Pollatsek is Professor of Mathematics at Mount Holyoke College, where she has taught since 1970. She received her B. A. (1963) and Ph. D. (1967) from the University of Michigan. Her main mathematical interests are in classical groups and their associated geometries and in algebraic groups, as well as in teaching with the use of computer laboratories.

THE CHRISTIE LECTURE

Elementary Knot Theory and Computation
Paul A. Schweitzer, S. J., Boston College

Knot theory offers an attractive way of presenting certain intuitive aspects of 3-dimensional topology with minimal technical requirements. Combinatorial algorithms for studying knots and links along with such invariants as the HOMFLY and Kauffman polynomials can be implemented on personal computers using Pascal and LISP.

Rev. Paul A. Schweitzer, S. J., who received his B. S. from Holy Cross College and his Ph. D. from Princeton University, is the Gasson Professor at Boston College for 1989-90. He is currently Professor of Mathematics at the Pontificia Universidade Catolica in Rio de Janerio, where he has taught since 1971. His research interests are in differential and algebraic topology, especially foliation theory, characteristic classes, and

low dimensional topology. He recently directed a group of science and engineering undergraduates in the study of knot theory using computers.

From Essence to Existence : the Design of New Minimal Surfaces
David Hoffman, University of Massachusetts, Amherst

In recent years many new minimal surfaces have been discovered by mathematicians using computer graphics as an exploratory tool, and by physicists interested in the structural properties of materials. This has inspired the development of new mathematical theory about classes of minimal surfaces relevant to physical situations. From the theory, mathematical construction principles have been developed that predict the existence of examples with specified characteristics and indicate how to create them. The lecture will be illustrated by computer-generated graphics.

David Hoffman is Professor of Mathematics at the University of Massachusetts, Amherst. He attended the University of Rochester and pursued a dual degree in history and mathematics. After a brief tour as a graduate student in the history of science at Princeton, he studied mathematics at Stanford, where he wrote his doctoral dissertationn under the direction of Robert Osserman. Hoffman has taught and/or pursued research at the Universities of Durham and Warwick (UK), Michigan and Stanford, as well as IMPA (Brazil), and the University of Paris VII. Recently, he was a principal producer of a didatic exhibition of computer graphics photographs, illustrating the mathematics of extremal surfaces, that will open this fall at the Palais de la Decouverte in Paris. He is co-director of the Geometry Analysis Numerics and Graphics Center at the University of Massachusetts.

Average Values of Arithmetic Functions
Michael Rosen, Brown University

Some of the most powerful results in number theory are proven by analytic means, e. g., Dirichlet's theorem on primes in arithmetic progressions, and the prime number theorem. Unfortunately, these results are often considered too advanced for the undergraduate curriculum. We will discuss the problem of determining the average value of some familiar arithmetic functions, and show how analytic methods can lead to a solution. This material has its own interest and is useful as an introduction to more advanced material.

Michael Rosen received his B. A. from Brandeis and his Ph. D. from Princeton. He has taught at Brown since 1962, and has visited at Brandeis, the University of Wisconsin at Madison, and the University of California at Berkeley. He has many mathematical interests, but his research has concentrated in the theory of algebraic numbers and algebraic functions. Together with Kenneth Ireland he has written a text, *A Classical Introduction to Modern Number Theory.* At present he is on the NSF Review Panel on NSF/BMS Regional Research Conferences, and is finishing a term as Chairman of the Brown Mathematics Department.

LOCAL INFORMATION

ACCOMMODATIONS :

There are no accommodations available for housing on the campus during the meeting. Thirty rooms have been blocked at the Howard Johnson's Motor Lodge adjacent to the campus. Participants should make their own reservations directly with the motel and identify themselves as attending the meeting of the Mathematical Association of America at the College of the Holy Cross and use the reservation number P2179600. The deadline for reservations is October 25, 1989. The rates on the page 13 are subject to change and do not include applicable taxes.

Howard Johnson's Motor Lodge
800 Southbridge Street
Worcester MA 01610
Telephone: (508) 791-5501
Single $49 Double $53 (Reservation # P2179600)

The following motels are located between two and five miles from campus. Although rooms have not been blocked at any of these locations, they are included here for information purposes.

Best Western Centrum Inn
110 Summer Street
Worcester MA 01610
Telephone: (508) 757-0400
Single $52 Double $58

Days Lodge of Worcester
50 Oriol Drive
Worcester MA 01610
Telephone: (508) 852-2800
Single $56.88 Double $61.88

Howard Johnson's Motor Lodge
West Boylston Street
West Bolyston MA 01583
Telephone: (508) 835-4456
Single $59.50 Double $71.50

Sheraton-Lincoln Inn
500 Lincoln Street
Worcester MA 01610
Telephone: (508) 852-4000
Single $85 or $95 poolside
Double $95 or $105 poolside

Worcester Marriott
10 Lincoln Street
Worcester MA 01610
Telephone: (508) 791-1600
Single $115 Double $127

Yankee Budget Motor Lodge
531 Lincoln Street
Worcester MA 01610
Telephone: (508) 852-5800
Single $33.73 Double $38.29

Yankee Drummer Inn
624 Southbridge Street
Auburn MA 01501
Telephone: (508) 832-3221
Single $74.90 Double $79.90

TRAVEL :

The Worcester Airport is located about 5 miles from the campus. Airline service to Worcester is provided by Northwest Airlines, Piedmont, Continental Express, and United Express, with direct flights from Baltimore, Washington, Pittsburgh, Newark and New York City. There is an extensive array of connecting airlines directly into the Worcester Airport. Since travel time from Logan International Airport in Boston can involve more than two hours, flying directly into Worcester is recommended if possible.

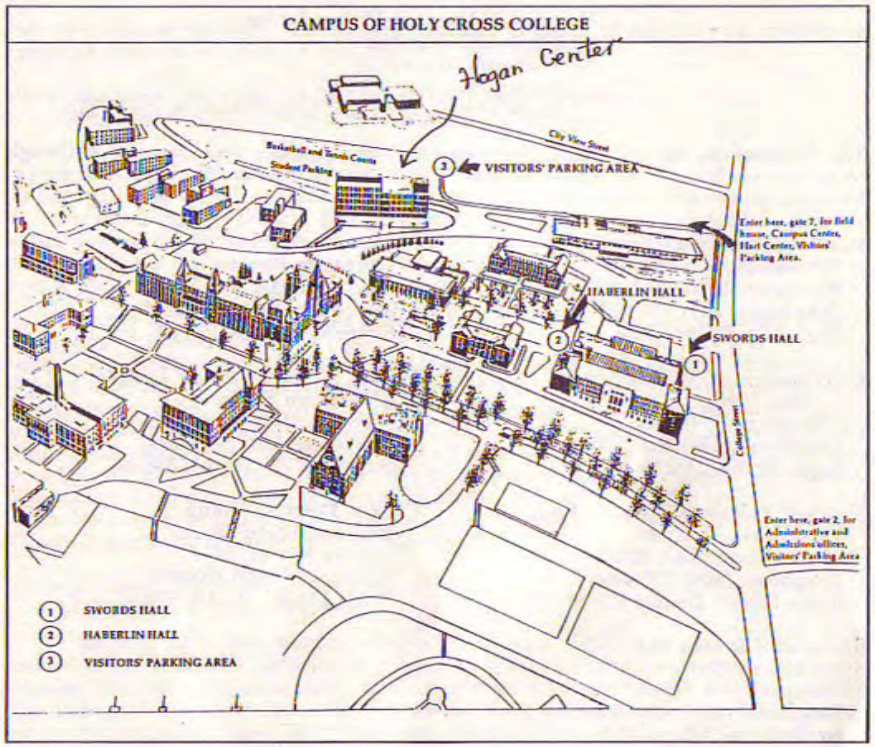
Those participants electing Logan International should make use of the Worcester Limousine Service, which will transport passengers directly to the campus or elsewhere in Worcester. **Reservations are necessary** and may be obtained by calling (508) 756-4834; at the same time information will be provided concerning passenger pickup at Logan.

Worcester is also served by Peter Pan Bus Lines and AMTRAK rail service. The bus station is about one mile from the campus. Taxi service is available from the bus station to the campus for approximately $5.00.

Participants driving to the meeting on the Massachusetts Turnpike should use Auburn Exit No. 10, then take Route 290 East to Worcester. Participants driving from the north-east of Worcester should pick up Route 290 West. The College Square exit from Route 290 is a block from the campus.

Parking :

Free parking is available at several lots located on the College of the Holy Cross Campus. Hogan Lot is the best option.



1989 UM SHORT COURSE BY ROBERT L. DEVANEY

In spite of a slow start because of wrong equipment and a crowded room, the 1989 short course was another smashing success. Robert L. Devaney of Boston University lectured on dynamical systems and chaos, profusely illustrated with slides and computer programs. He presented the main ideas of chaos, iteration, Julia sets, the Mandelbrot set, fractals, attractors, and elementary bifurcation theory. His delightful, well illustrated lectures held the attention of the varied audience, elementary enough for those without prior training in the subject matter, yet deep enough to interest those with significant experience in the area. Computer programs that he distributed allowed participants to view the highly intricate figures obtained from the simple equations and ideas of dynamical systems. Photocopies of all the overhead transparencies were distributed, saving the 80 participants from having to take extensive notes.

The weather cooperated fully for this year's mid-week trip to Mount Desert Island including the usual picnic and a delightful afternoon away from a hot classroom. The Wednesday evening pizza party featuring the unequaled Pat's Pizza, concluded with an informative lively discussion of classroom problems lead by Don Small and Alan Tucker. The social activities concluded Thursday evening with a lobster-steak banquet, enjoyed by all 80 participants, the largest number we have ever had for a UMNES/MAA short course and included high school teachers, graduate students, faculty and professional mathematicians. The cost of about $250 for 5 days of lectures including 5 nights lodging and 14 meals was a real bargain.

WANTED : NEW MAA MEMBERS

As part of a national membership drive, the MAA has instituted a section Membership Incentive Program (MIP). Under this program, an MAA section can earn $10 for each new member. The Executive Committee of the Northeastern Section believes that MAA membership is valuable to a wide variety of mathematics professionals and that the MIP offers an opportunity to raise some additional funds for the Section. We need your help. Please give the membership form which appears below (or a photocopy thereof) to any of your friends or colleagues who are not now MAA members, but who might like to join.

Frank P. Battles
Massachusetts Maritime Academy
MIP Coordinator

JOIN MAA TODAY!

Send this application to : MAA Membership Department
1529 18th Street. N.W.
Washington D.C. 20036

Nominated by the
Northeastern Section
FRANK P. BATTLES
MIP Coordinator

Name _____
Mailing Address _____ Zip _____
Employer/School _____
Position(rank) _____
Employer's City/State _____
Highest Degree Earned _____ Year Degree Earned _____
Institution Awarding Degree _____
Month/Year of Birth
Have you been a member of MAA before? ☐ Yes ☐ No

Your membership may begin on July 1 or January 1. You may elect to receive any of the listed combinations of the three MAA journals. All members receive *Focus*, the MAA newsletter.

Please circle the appropriate box corresponding to your initial membership period and the selection of journals you wish to receive. (Rates are guaranteed for the indicated periods only.) Subscription prices are included with your dues (see**).

THE AMERICAN MATHEMATICAL MONTHLY	(M)
MATHEMATICS MAGAZINE	(G)
THE COLLEGE MATHEMATICS JOURNAL	(J)

	M	G	J	M+J	G+J	G+J	M+G+J
Student Membership*							
1 year(Jan.-Dec. 1990)	$30.00	$25.00	$27.00	$35.00	$37.00	$32.00	$42.00
1½ year(July 1989-Dec. 1990)	$44.50	$36.50	$39.50	$53.00	$56.00	$47.50	$64.00
Regular Membership							
1 year (Jan.-Dec. 1989)	$60.00	$49.00	$52.00	$73.00	$76.00	$65.00	$89.00
1½ year (July 1988-Dec. 1989)	$84.00	$66.50	$71.50	$103.50	$108.50	$91.00	$128.00

* Student membership available to high school and undergraduate students and to students regularly enrolled at least half-time. Enclose letter from high school or department offical confirming status. Student rates apply to unemployed persons who are seeking employment.

** Annual dues include subscription prices as follows. Regular Member $30(M), $20(J), $16(G), $5 (*Focus*). Student Member $14(M), $9(J), $7(G), $2(*Focus*).

Payment Enclosed $ _____ U.S. Funds Only (see below)
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Card Number _____ Expiration Date (month/year)
Interbank Number [ ][ ][ ][ ] (Master Card Only - located above name on card)

Signature _____

SPRING MEETING 1990

Arrangements for the program for the Spring Meeting, June 8-9, 1990 at Roger Williams College, Bristol, Rhode Island are in progress. Local Arrangements is being headed up by John O'Connell. The Program Committee is being chaired by Donna Beers of Simmons College and includes, beside herself, Joel Silverman of Roger Williams College, Richard Pelosi of Western New England College and Barry Schiller of Rhode Island College. The theme of this meeting will be *1990: Year of National Dialogue.* This is a **great** location for a meeting, in that the scenic port of Newport is only minutes away.

NEWS FROM NEMATYC

The annual meeting of the New England Mathematics Association of Two-Year Colleges will be held at Mass Bay Community College on Saturday, March 3, 1990. The theme of the meeting will be "Math for the Fun of It." For further information contact John Jacobs, Mass Bay Community College, 50 Oakland Street, Wellseley, MA 02180; telephone (617) 237-1100 x547.

MESSAGE FROM THE EDITOR

Friday, March 2, 1990 is the date by which all materials for inclusion in the Spring 1990 issue of the Newsletter must be in the hands of the editor:

Frank P. Battles
Department of Basic Sciences
Massachusetts Maritime Academy
P.O. Box D
Buzzards Bay, MA 02532-1803
(508)-759-5761(school) (508)-224-8388(home)

Several section officers, past and present, are to be congratulated. Steve Ingram, past Chair, has left Norwich University to accept the position of Academic Vice-President at Vermont Technical College in Randolph. Laura Kelleher, secretary and treasurer of the NES/MAA, has been promoted to the rank of Professor at Massachusetts Maritime Academy. Karen Schroeder, Vice-Chair of NES/MAA, has been named Acting Department head for the Mathematical Sciences Department at Bentley College, effective January 1, 1990. James Ward of Bowdoin College, our past governor, has received a Fulbright Fellowship and will be spending this academic year in Africa (Lesotho.) In Jim's absence, I will be serving as MIP coordinator. See page 15 for a description of this program. If you have any ideas on how to make this succeed, please let me know.

We, the members of NES/MAA, owe a large debt of gratitude to our outgoing Chair, Dennis Luciano of Western New England College, for a job very well done. During his tenure both our membership and treasury have grown. The number of registrants for section meetings have set section attendance records. We have been well represented at national Section Officers meetings by him. If you see Dennis at the Holy Cross meeting be sure to thank him.

Many thanks to Clayton Dodge of the University of Maine for his most interesting article on Howard Eves, the founding father of our Section. Don Small, our Governor, is preparing a history of the short course which has been held at the University of Maine for the past eleven years. This will appear in a future newsletter. Jim Tattersall of Providence College is writing an article relating to the history of the Section's founding for the next newsletter. Similar articles are encouraged. Thank you to the other contributors to this issue as well as to Drs. Laura Kelleher and David Kan, both of Massachusetts Maritime Academy, for their invaluable assistance in the preparation of this Newsletter.

REGISTRATION FORM

FALL MEETING OF THE NORTHEASTERN SECTION-MAA

NOVEMBER 17-18, 1989 **COLLEGE OF THE HOLY CROSS**

Mail Registration Form to: Leonard C. Sulski
Attention NES/MAA
Department of Mathematics
College of the Holy Cross
Worcester MA 01610

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 and it will save you five dollars. In any case, meals cannot be guaranteed unless reservations are received by Friday, November 3, 1989. Spouses and guests are welcome at the banquet and buffet lunch.

REGISTRATION:

Name _____

Institution _____

Address _____

City, State, Zip _____

Telephone (O) ( ) _____ (H) ( ) _____

PRE-REGISTRATION FEE:

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

MEALS:

Banquet (7:00 p.m., Friday)
Number ( ) x $12.95 $ _____

Buffet Lunch (12:10 p.m., Saturday)
Number ( ) x $10.50 $ _____

REGISTRATION ON SITE:

MAA Member ($15.00)
Non-member ($20.00)
Student or unemployed ($5.00) } $ _____

TOTAL $ _____

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