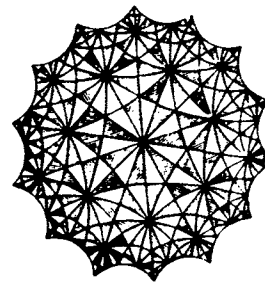


# MUDD MATH

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This newsletter, which is a collaborative effort of the HMC math faculty, alumni, students and staff is our way of sharing news about mathematical activities at HMC or by HMC alumni wherever they may be. Mudd Math invites letters and news items from and about our alumni. You do not have to restrict yourself to a few words. If you are so inclined, share a thoughtful essay about life after HMC, or after your first job, or after your first book or first child, or any other topic that you want to share. If you write it, we'll print it. Address your letters to Mudd Math.

## DEPARTMENTAL NEWS

### Sloan Foundation Grants

The Alfred P. Sloan Foundation awarded the HMC Mathematics Department \$300,000 to support visiting mathematicians from a select group of strong Liberal Arts colleges who wanted to learn more about the teaching and use of modern applied mathematics in an industrial settings. The program extended over three years ending in June 1987 and made it possible for the visitors to participate as consultants on one or more mathematics clinic projects. The program was directed by **Robert Borrelli** and **Stavros Busenberg**. The visitors and their home colleges were:

James Denton	'84-85	Guilford Spencer	'84-85
Amherst College		Williams College	
Roland di Franco	'84-85	Kenneth Lane	'84-85
University of the Pacific		Colby College	
Larry Knop	Spr '85-Fall '85	Mario Martelli	Spr '85
Hamilton College		Bryn Mawr College	
Don Small	'85-86	Robert Kozelka	'85-86
Colby College		Williams College	
Jerry Roberts	'85-86	Thomas Hill	'86-87
Davidson College		Lafayette College	
Anita Solow	'86-87		
Grinnell College			

The Sloan Foundation has also granted the HMC Mathematics Department \$25,000 to fund a study project on introducing computer algebra systems to classroom work. The project will involve the design and implementation of an interface between the MAPLE software (created at the University of Waterloo) and MATHLIB (developed here at HMC) to create an enhanced package that will be used in a laboratory environment for our Calculus, Linear Algebra and Differential Equations courses. Working on the project, which runs from January 1987 through July 1988, will be **Robert Borrelli**, (the Principal Investigator), **Stavros Busenberg**, **Courtney Coleman**, **Robin Ives**, as well as **Ned Freed** and **Dan Newman** (principal authors of MATHLIB).

### A New Genetics Course

Professor **John Greever** and Professor **William Purves** (Biology) have received a "Fresh Combinations Grant" from the Academics Deans Committee to develop a new interdisciplinary course in genetics. The course will be offered for the first time in the fall of 1987, and will be aimed primarily at students in the Claremont Colleges majoring in mathematics, engineering, or the physical sciences. By requiring mathematics through calculus, and linear algebra as prerequisites, the course will be able to do justice to a number of important topics, especially in population

genetics, which lie at the core of evolutionary biology. Although primarily a topologist, Professor Greever has been associated with biology groups while on sabbatical leaves at U.C. Riverside and the University of British Columbia, and has written papers which involve mathematical modeling of animal populations.

### **NSF Grants**

Both **Stavros Busenberg** and **David Fisher** have received two-year research grants from NSF, the first from the Applied Mathematics Division and the second from the Computer Science Division. Both of these grants include support for HMC undergraduate student research assistants.

### **Honors Workshop in Mathematics**

Harvey Mudd conducted an Honors Workshop in Mathematics from June 22 through July 17 for high school teachers of mathematics. The workshop was funded jointly by the ARCO Foundation and the Northrop Corporation, and was directed by Professor **John Greever**. Participants received room and board on campus, in addition to stipends, and were selected from teachers of mathematics in Los Angeles and surrounding communities. Topics were selected with two goals in mind: to provide deeper understanding for secondary teachers of mathematics, and to furnish a selection of enrichment topics for presentation to secondary students. Material covered included mathematical modeling, with a variety of applications, and also selections from logic, algebra, and geometry. A master secondary teacher was in residence to assist participants in the adaptation of material for use in their own classes.

### **Research Experience for Undergraduates**

Harvey Mudd College was named a Research Experiences for Undergraduates (REU) site by the National Science Foundation, and for summer 1987 and each summer of the next two years will involve 8 undergraduate students in research in applied mathematics. At least 4 of the participants will be selected from institutions other than HMC. There are only 8 sites for mathematics in the entire country, and Harvey Mudd is the only site at an institution without a Ph.D. program in mathematics. Research supervisors for the first summer were Professor **Stavros Busenberg**, whose students were **Richard Edwards**, Pomona; **Louis Rossi**, HMC; **James Woodson**, UC Davis; and **Ed Zaron**, HMC; and Professor **David Fisher**, whose students were **Dan Burnett**, HMC; **Elizabeth Knowles**, UC Riverside; **Barbara Leasher**, Bryn Mawr College; and **Carol Parker**, Hendrix College. The Program Director is Professor **John Greever**.

Each student participant received a stipend of \$2400 for the ten-week program. The essence of the program is for the participants to be guided through an apprenticeship in applied mathematics by a professor who actively publishes research in the area. The faculty supervisors presented a number of unsolved problems, together with pertinent background material, early in the program. Students selected problems of interest and read for the next few weeks in texts and journal articles related to their problems, and reported to a seminar. By the end of the program students were expected to be selecting their own reading materials, and devoting a substantial amount of their time to original research. Funding for this program amounts to \$96,000 over the three-year period.

### **New Freshman Mathematics Course**

The Department has received approval for a new two-semester freshman mathematics course that would be deeper, broader and richer than the current calculus sequence, and would assume that all entering freshman have completed the equivalent of a year-long calculus course at the high school level. (This has been HMC's de facto admission policy anyway for the last few years).

There is a national trend, endorsed by the Mathematical Association of America and the National Council of Teachers of Mathematics, for calculus to become the standard highest level course

at the secondary level, and Harvey Mudd must adapt its program to that fact. The new Freshman Math Course will essentially consist of a deeper, but less hectic version of multi-variable calculus together with other topics to broaden and enrich the students' understanding of mathematical concepts.

### New Systems Manager

**Ben Staat** had been managing the math department's computer systems since July 1985. In that time the department has acquired powerful new hardware and software, while enjoying the productive use of their existing facilities. Ben left in June of this year to join an expedition which intends to hike across the frozen Bering Straits in the winter of '87-88. He will be a grad student in Applied Math at the University of Waterloo this fall. **Chris Yoder**, a renegade from the El Segundo division of Hughes Aircraft, is now working for the Mathematics Department as Systems Manager for YMIR and HELA. The former "Mad Pitzoid" now fills the position vacated by Ben Staat and has greatly improved the functionality of the math computers.

## FACULTY NEWS

Professor **Robert Borrelli** gave a talk at the University of Kaiserslautern (West Germany) last summer at the invitation of Prof. Dr. Helmut Neunzert. The talk covered recent work supported through the Mathematics Clinic program as well as a description of the program itself. Prof. Dr. Neunzert is an organizer of the European Consortium for Mathematics in Industry (ECMI) which is actively promoting the industrial project concept in 14 research centers and mathematics departments in Austria, the Federal Republic of Germany, Finland, France, Great Britain, Ireland, Italy, the Netherlands and Norway. Bob Borrelli presently serves on the Executive Committee of SASIAM (School for Advanced Studies in Industrial and Applied Mathematics), one of the ECMI centers located in Bari, Italy.

Professors **Borrelli** and **Coleman's** book, **Differential Equations: A Modeling Approach** published earlier this year by Prentice-Hall. The text intertwined detailed models from physics, engineering, and biology with classical and contemporary themes of ordinary and partial differential equations. The differential equations solver in our local computer software package MATHLIB was used to produce much of the graphics of orbits and solution curves. **Steve Boettcher** ('84), **Bill Consoli** ('86), **Greg Slaughter** ('84), **Andrew Spellman** ('85), **Karl Steinhoff** ('81), **Rata Ngo** ('89), **Jim Pilliod** ('89), **Mike Ross** ('86), and **David Ho** ('86), and **Ben Staat** were among the Mudders who contributed their talents in the development of the text.

**Stavros Busenberg** continues to pursue his research in ordinary and partial differential equations and in biomathematics. He has had papers published in the *Journal of Differential Equations* 67 (1987), the *Journal für Reine und Angewandte Mathematik* 371 (1986), the *Proceedings of the AMS* 98 (1986), and in the book "Modelling of Biomedical Systems" North Holland (1986). He has given talks at the applied mathematics colloquia at UCLA, and at the University of Arizona as well as at meetings on ordinary differential equations and on biomathematics held at Oberwolfach, Germany last March. He also gave invited talks at a conference on Mathematical Population Dynamics held at a conference on Mathematical Population Dynamics held at the University of Mississippi and at the EQUADIFF87 conference which took place at the University of Thrace, Greece in August.

Professor **Courtney Coleman** returned from a sabbatical year at Oxford, England and Italy where he lectured and researched.

Professor **David Fisher** (HMC '80) has written several papers which have been published or were accepted for publication for the next year. These are:

*Better Bounds for Periodic Solution of Differential Equations in Banach Spaces*, Proceedings of the American Mathematics Society, **98**, 376-378, 1986 (with Stavros Busenberg and Mario Martelli).

*Your Favorite Parallel Algorithm Might Not Be as Fast as You Think*, to appear in IEEE Transactions on Computers.

*Strict Bounds for the Period of Periodic Orbits of Difference Equations*, to appear in Mathematical Analysis and its Applications.

*Minimal Periods in Discrete and Smooth Orbits*, To appear in American Mathematics Monthly (with Stavros Busenberg and Mario Martelli).

*The Number of Words of Length  $n$  in a Free Semi-Abelian Monoid*, to appear in the American Mathematics Monthly.

Professor Fisher has received a two-year grant of \$40,073 from the National Science Foundation for a research project entitled *Systolic Algorithms with Sublinear Time Complexity*.

A research paper by **John Greever** (with coauthors at the University of Guelph and the University of British Columbia) will appear next summer in the American Naturalist. The title is "Why are migratory ungulates so abundant?", and the purpose of the paper is to use mathematical modeling to determine why migratory herds of animals such as wildebeest or kob tend to be much larger than stationary ones.

In 1986-87, Professor **Melvin Henriksen** was a John H. Van Vleck Visiting Professor of Mathematics at Wesleyan University. During the year, he also gave invited talks or did his research and visited the following places:

- (1) The Free University of Amsterdam, The University of Leiden, and the Technical University at Delft in the Netherlands in September 1986.
- (2) The City College of New York in September 1986 and May 1987.
- (3) York University in Toronto, Canada in October, 1986.
- (4) The University of Manitoba in Winnipeg, Canada for three weeks from mid October through early November 1986.
- (5) Colby College in Waterville, Maine in November 1986.
- (6) The University of Toledo and Kent State University in February 1987.
- (7) The College of Charleston in South Carolina in April 1987.
- (8) New Mexico State University in Las Cruces, New Mexico in July 1987.

He also gave talks at the following professional meetings:

- (1) The Symposium on Topology and Its Applications in Prague, Czechoslovakia in August 1986.
- (2) The Meetings of the American Mathematical Society in San Antonio, Texas in January 1987.
- (3) The Spring Topology Conference in Birmingham, Alabama in March 1987.
- (4) The Conference on Limits at the City College of New York in June 1987.

He taught a graduate course on The Theory of Rings in the spring semester. Three papers that he co-authored and a book review should appear this fall in various mathematical journals.

Last summer, **Alden Pixley** and his wife drove from Germany through Scandinavia to the Soviet Union. He visited his co-author Professor Kalle Kaarli of Tartu State University for a week and were "Guests of the University" for three days during that time. On the way back he attended a meeting on Universal Algebra and Lattice Theory at the National Institute of Health in Bethesda, Maryland, and gave a talk on his joint work which will be published soon. Also attending the meeting was **George McNulty '67**, now a Professor of Mathematics at the University of South California. Professor Pixley's auto trip to the Soviet Union is a separate adventure story!

Professor **Alvin White** organized a three day conference at HMC in March 1986 on Examining Mathematics as a Humanistic Discipline. The thirty-six mathematicians participating included Phil Davis (Brown U.), Reuben Hersh (U. of New Mexico), Sherman Stein (UC Davis), Robert

Osserman (Stanford), Paul Yale (Pomona). The conference was supported by a grant from the Exxon Education Foundation. Exxon made an additional grant to support a Humanistic Mathematics Network Newsletter with an initial international mailing of 300. Copies of the Newsletter are still available.

Professor White lectured on New Trends in Calculus at Cal Poly SLO and at Cal State Northridge. He was also the external examiner of the Cal Poly Pomona Mathematics Department.

A new program at HMC is a requirement for math majors to complete a senior research project. The Math Club and Department are co-sponsoring a monthly Undergraduate Math Forum. The Forum will be a monthly lunch time occasion for students and faculty to hear notable personalities discuss exciting mathematical topics at an elementary level. It will complement, not compete with the weekly mathematics colloquium.

## MATHEMATICAL MODELING COMPETITION

HMC has scored big in the recent Mathematical Modeling Competition. On page 541, volume 7, 1986 of the journal *Mathematical Modelling*, B.A. Fusaro concludes his review of the competition as follows:

“Harvey Mudd especially stands out, with one winner last year and two this year.”

This competition has teams of three students tackling an open-ended problem over a week-end by the end of which they have to produce a paper describing their model, their analysis and their results. In 1985 HMC entered two teams; the first consisting of **Dana Hobson**, **Scott Bailey** and **David Ho**, which won the Outstanding award and the second consisting of **Jeff Cronk**, **Duff Howell** and **Lee Short** which received an Honorable Mention. In 1986 HMC improved its record by having two Outstanding awards with teams composed of **David Ho**, **Kurt Overley** and **Lee Short** and of **Jeff Cronk**, **Duff Howell**, and **Keith Saints**. The faculty advisors were **Stavros Busenberg** in 1985 and **Hank Krieger** in 1986.

## '87 GRADS

**Sherman Fung** graduated with distinction.

**Scott Gorsuch** graduated with distinction and is now employed by O'Connor and Associates.

**Rob Gould** is employed by COMARCO, contracted out to Lockheed, as a documentation specialist.

**David Graser** received \$4,000 in addition to tuition at the University of Arizona where he is studying applied mathematics.

**Janice Kim** received \$8,245 plus tuition at Rutgers University.

**Keith Saints** received the Giovanni Award, and graduated with high distinction, and will spend a year in Cambridge with an NSF Fellowship and will then study at Cornell.

**Kenneth Sell** is studying Computer Science at Cal State San Jose.

**Lee Short** is working on a Ph.D. in Computer Science at UC Irvine. He received \$10,600 in addition to tuition.

**Dave Somers** has received a Watson Fellowship to study vegetarianism and animal rights in Nepal and England.

## HMC MATHEMATICS TECHNICAL REPORTS

For several years, members of our department have been writing technical reports on their research which have been circulated internally. A list of those written since August 1985 is given below. Any of you wishing a copy of any of them can obtain one by paying a \$2.00 handling fee for each one desired; please make your check payable to Harvey Mudd College.

- 9/85 *Identifiability of Time Dependent Linear Systems* by Stavros N. Busenberg, Suzanne M. Lenhart, Curtis C. Travis.
- 9/85 *A System of Nonlinear Degenerate Parabolic Equations* by Stavros Busenberg, Mimmo Iannelli.
- 9/85 *Nearly Pseudocompact Extensions* by Melvin Henriksen, Marlon C. Rayburn.
- 11/85 *Your Favorite Parallel Algorithms Might Not Be As Fast As You Think* by David C. Fisher.
- 1/86 *Bounds for the Period of Periodic Orbits of Dynamical Systems* by Stavros Busenberg, Mario Martelli.
- 2/86 *Positioning of Emergency Facilities in an Obstructed Traffic Grid* by Jeff Cronk, Keith Saints, Duff Howell. [Winner of Mathematical Modeling Competition.]
- 2/86 *Interpolating a Topographical Map on the Ocean Floor* by David Ho, Kurt Overley, Lee Short. [Winner of Mathematical Modeling Competition.]
- 3/86 *Better Bounds for Periodic Solutions of Differential Equations in Banach Spaces* by Stavros Busenberg, David Fisher, Mario Martelli.
- 3/86 *Affine Complete Varieties* by Kalle Kaarli, Alden Pixley.
- 3/86 *The Number of Words of Length  $n$  in a Free "Semi-Abelian" Monoid* by David C. Fisher.
- 1/87 *Parallel Triangular Matrix Inversion* by David Fisher, Linda Sattler.
- 1/87 *Solving Triangular Systems Using  $N$  Inverse Matrices* by Linda Sattler, David Fisher.
- 1/87 *Matrix Multiplication on a Cubic Systolic Array* by David Fisher.
- 1/87 *The Population Dynamics of Two Vertically Transmitted Diseases* by Stavros Busenberg, Kenneth L. Cooke.
- 1/87 *The Effects of Dimension and Size for a Compartmental Model of Repression* by Stavros Busenberg, Joseph Mahaffy.
- 1/87 *Minimal Periods of Discrete and Smooth Orbits* by Stavros Busenberg, David Fisher, Mario Martelli.
- 1/87 *Discrete Separation of Variables and Matrix-Vector Multiplication on a Rectangular Grid* by David Fisher.
- 2/87 *Clique Polynomials* by David Fisher, Anita Solow.
- 4/87 *Algebraic Optimization in the Positive Orthant* by Morris Weisfeld, Steve Boettcher, Greg Cleveland, Greg Slaughter.
- 4/87 *Endemic Thresholds and Stability in a Class of Age-Structured Epidemics* by Stavros Busenberg, Kenneth Cooke, Mimmo Iannelli.
- 7/87 *Strict Bounds for the Period of Periodic Orbits of Difference Equations* by David Fisher.
- 8/87 *A Compartmental Reaction-Diffusion Cell Cycle Model* by Stavros Busenberg, Joseph Mahaffy.
- 8/87 *The Number of Triangles in a  $K_4$ -Free Graph* by David Fisher.
- 9/87  *$f$ -rings, Subdirect Products of Totally Ordered Rings, and the Prime Ideal Theorem* by David Feldman, Melvin Henriksen.
- 9/87 *The Countable Annihilator Condition and Weakly Lindelöf Subspaces of Minimal Prime Ideals* by A. Dow, M. Henriksen, R. Kopperman, J. Vermeer.
- 9/87 *Rings with a Unique Regular Element* by Melvin Henriksen.

## PROBLEM PRIZE CONTEST 1987

This problem is taken from the August-September 1987 issue of the *American Mathematical Monthly* (see page 681). It is rephrased slightly in the interest of clarity.

*Describe all integers  $p$  for which there exists an integer  $q$  such that the polynomial  $P(x) = x^3 + px + q$  and its derivative  $P'(x)$  have distinct integral zeros.*

Solutions of this problem may be submitted to Professor M. Henriksen at any time until 5 p.m. on December 12, 1987. The "best" solution received by this date will be awarded a prize of \$50 on the basis of the rules given below. Independently of these rules, solutions may also be

submitted to the *American Mathematical Monthly* prior to January 31, 1988. (This publication is in the Sprague Library – as well as other books and journals that may help in solving this problem).

1. The prize will be awarded to the HMC undergraduate who submits the most elegant, best written solution by the announced deadline.
2. If no HMC undergraduate submits a satisfactory solution by the announced deadline, then the prize will be awarded on the same basis to an HMC alumnus.
3. If no HMC undergraduate or alumnus submits a satisfactory solution by the announced deadline, the prize will be awarded to any HMC faculty member or staff member not employed by the Mathematics Department.
4. The best satisfactory solution or solutions will be published in the next issue of the Mathematics Newsletter if one is submitted by the announced deadline. Otherwise, the problem will be recycled.

### HMC in the News

The Los Angeles Times of September 18, 1987 featured HMC in a full page story on page 3 of the first section. The story included a  $5 \times 7$  photo of Professor **David Fisher** explaining combinatorics and parallel processing to his students in his office. The story was reprinted in the Washington Post a few days later.

### Math Alumni Notes

by the Old Coot\*

**Lori Ives, Bill O'Brien, John Murray, and Doug Hunter** rightly claim the honor of belonging to the first full graduating class at HMC, the Class of '61. But did you know that the two math majors, **Janet Cook** and **Tom Peters**, were the entire “zeroth” graduating class, the Class of '60, while the “minus first” graduating class, the Class of '59, consisted of the mathematicians **Stewart Black** and **Peter Loeb**? Cook, Peters, Black, and Loeb came to HMC as transfer students in the fall of '58 so that the college could claim students in all four undergraduate years and be accredited. I hope these four alumni don't mind the labels of class #0 and class #-1. These two numbers are on the list of the seven most important numbers in mathematics. For the other five pick your favorites from 1,  $e$ ,  $\pi$ ,  $\sqrt{2}$ ,  $i$ ,  $\aleph_0$ ,  $c$  and  $\gamma$ . Incidentally, a few years ago **Hank Krieger** brought a bumper sticker from Australia that reads “Maths pros are  $\#-e^{-i\pi}$ ”, a neat expression explicitly involving four of the basic numbers and alluding to the fifth. The final letter in “Maths” is a giveaway that the sticker came from England or one of its former domains. According to the English academic lexicon one studies maths, not math. After two sabbaticals at Oxford I still can't get my tongue around “maths” without sounding as if I had a mouthful of mush. But I wander – what I want to comment on is a notable recent accomplishment of **Peter Loeb** from HMC class #-1. He and A.E. Hurd have written *An Introduction to Nonstandard Real Analysis*, [Academic Press, 1985], a book on infinitesimals, those elusive little objects which Leibniz and Newton used to define limits and the calculus. Infinitesimals are non-zero quantities whose magnitudes are smaller than any positive real number. Their existence seemed so tenuous that around the middle of the eighteenth century Bishop Berkeley cast doubts upon the reality of the calculus itself in these words: “And what are these evanescent increments? They are neither finite quantities, nor quantities infinitely small, nor yet nothing. May we not call them the ghosts of departed quantities?” Cauchy and other nineteenth century mathematicians were sensitive to Berkeley's criticism and re-established the limit notion by using the (in)famous  $\epsilon$ - $\delta$  definition

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\* Otherwise known as Courtney Coleman. The nickname was applied by one of the alumni mentioned in these notes when he was still an HMC student. I let him graduate anyway.

familiar and fearsome to generations of undergraduates. However, infinitesimals refused to vanish. They were given a new intellectual respectability in 1960 by A. Robinson, who built a framework in which reals, infinitesimals, and infinities (the reciprocals of infinitesimals) coexist without logical contradiction. Loeb's book introduces the mathematically inclined reader to analysis and measure theory in the world of hyperreal quantities. The first chapter, in particular, gives an excellent presentation of the infinitesimal calculus in the new logical setting of ultrafilters. Though the book is not exactly bedtime reading, I highly recommend it to any thoughtful mathematics graduate.

Well – on to brief notes about other HMC math alumni. Since I have been in Europe for the last year and somewhat out of touch with what you have been doing, I won't vouch for the current accuracy of these items.

**Dana Hobson** '85 hopes to expand his work on a mathematical model of nonlinear waves in tokamak-type plasmas into a Ph.D. thesis at Cal Tech. He reports that **David Ho** '86 switched from the NYU graduate applied math program to a new program at Stanford bridging math, computer science, and applied areas. Apparently Dave's colleagues at the Lawrence Livermore Labs where he has worked for the last two summers persuaded him to make the switch. Added in press: Now I hear from the grapevine that Dave returned to NYU after all. Well, Dave, which is it? **Nikan Firoozye** '86 is also at NYU where the report is that he has done some impressive graphics software. **Greg Robel** '77 is the latest to leave academia for industry. He is now at the Guidance and Control Center of the commercial aircraft division of Boeing Corporation in Seattle. According to Greg, the problems he works on are difficult, fascinating, and involve a mix of mathematics, physics, and engineering. **John Murray** '61 is a Second Vice President for Pacific Mutual Life Insurance Co. and a member of the search committee for the next president of HMC (the Old Coot is another committee member). **Rick Simon** '76 is Assistant Professor of Mathematics at the University of La Verne and attends the Claremont Mathematics Colloquium lectures quite frequently. **Dave Fisher** '80 is in his third year as Assistant Professor at Mudd and is developing our new course in discrete mathematics. He is also working on the theory of parallel processors and (with **Stavros Busenberg**) has found estimates for the minimal period of a periodic solution of the vector system  $dx/dt = f(x)$ , estimates which involve the Lipschitz constant for  $f$ . **Alec Norton** '80 switched from logic, which he studied at Oxford, to dynamical systems at Berkeley (named for the same bishop who hated infinitesimals), where he recently finished his doctorate. Now he is an Assistant Professor at Boston University and working with the dynamical systems group there. **Alex Feldman** '78 got his Ph.D. in logic from Wisconsin and headed east to Ithaca, where he is a logician for Odyssey Research Associates. **Robert Berkowitz** '81 earned an MA in mathematics from UC Santa Cruz, and at last reports was finishing his medical degree at Davis. A year or so ago he was considering using of Zeeman's "catastrophe models" in his work. **Steve Boettcher** '84 finished his graduate work at UCLA and is now teaching in Arizona. My wife and I have pleasant memories of the summer he worked on the latest version of one part of the B/C Monster and lived in our home. **Rick Biedenweg** '75, is an Assistant Provost for planning at Stanford – incidentally, thanks, Rick, for sending in two names to the Presidential Search Committee. **Joe Coquillard** '75 is programming and beekeeping in Colorado. **Mark Hane** '86 reports that **Colin Keenan** '86 is finishing up a masters degree thesis on quantum field dynamics at Northern Illinois but would like to go elsewhere for a doctorate. **Jerry Tunnell** '72 and **John Sawka** '72 attended the International Congress of Mathematicians in Berkeley last year. John didn't have far to travel since he is on the faculty of the University of Santa Clara. Jerry came from his position in the math department at Rutgers University and spent last fall at the Mathematical Institute in Berkeley. **Dave Bakin** '77 is a software specialist for the Alsys Co. in Waltham, Massachusetts. **John Velling** '80 finished his Ph.D. work at Stanford and is now on the faculty at the University of Michigan.



Two years ago **Dave Abrahamson '76** sent a delightful letter which I wish I could quote in its totality, but here is part of it: "... *two years postdoc at Brown, teaching differential equations (and loving it) and working on parameter-ID problems and chaotic-behavior equations (and hating it). After a lot of soul-searching, I decided to pursue teaching at another level, and after scouring the small-college and prep-school markets, ended up teaching all levels of high school mathematics (dummy algebra through calculus) at a local prep school in Providence, The Lincoln School. I am now in my third year there; I dearly love the teaching and the interaction with other faculty and students, and I deeply loathe paperwork and the occasional interfering parent. I am at present giving serious consideration to the question of whether this is a possible long-term career. To shed a clearer light on that question, I am searching for a wealthy woman to marry.*

*I have recently take on a second job as well, one which is currently a real joy. I entered a local talent search of sorts and ended up with a job as a co-host of a sports talk show on a major local radio station. From 6:00 to 8:00 each night my partner and I take calls, interview guests, crack wise, and generally shoot the bull about baseball, football, basketball, hockey, tiddlywinks, and other major sports. Although our focus is usually local, we did have the honor recently of interviewing two members of the Los Angeles T-Birds Womens' Roller Derby team; you should all be so lucky. Anyway, the job is a gas, and should any of you pass through the area, tune in 920 on your AM dial to catch your humble alumnus slinging more bull than he ever managed to get away with in your math classes."*

Thanks, Dave, for the letter.

How many HMC math grads have appeared on National television? **Joe Costello '74** was on the CBS Evening News two days after the stock market's Black Monday. Joe is at National Semiconductor in Silicon Valley and spoke with considerable feeling about the possible effects of the crash on high-tech industry. Now if we could just model the stock market as a controllable nonlinear dynamical system, get **Greg Robel** to design the suitable controls, and steer it to an asymptotically stable equilibrium state! Unfortunately, a chaotic equation of the type **Dave Abrahamson** dislikes probably gives a better model of what is going on.

Math Alums – give me a call at 714-621-8023, write a note, or, best of all, stop by and let me know what you are up to.