MATH

NEWSLETTER

Number 3, Winter 1981
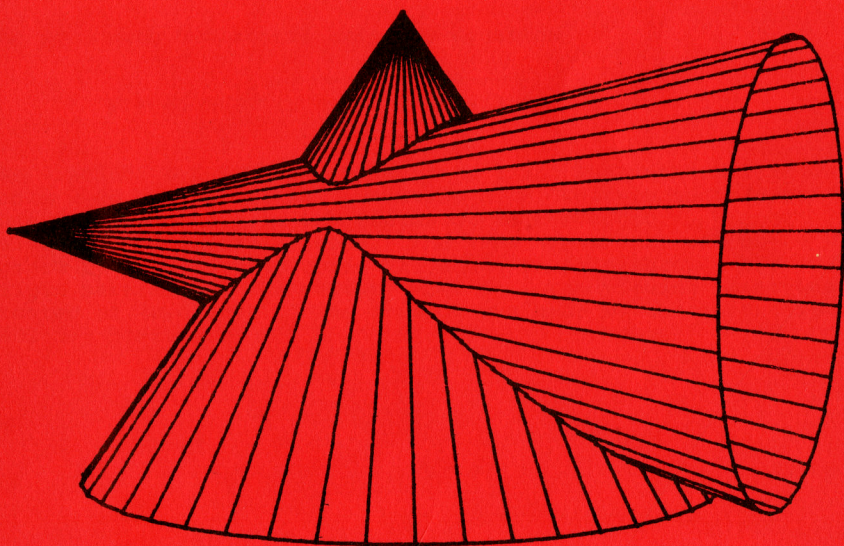
COMMENT ABOUT THE COVER DESIGN

The cover illustrates the intersection of two cones whose axes are mutually perpendicular and non-intersecting. The cone with vertical axis has equation

$$z = 6 - \frac{3}{2}\sqrt{x^2 + y^2} \ , \ 0 \leq z \leq 6;$$

the cone with horizontal axis has equation

$$y = -5 + \frac{10}{3}\sqrt{(x + \tfrac{1}{3})^2 + (z - 3)^2} \ , \ -5 \leq y \leq 5.$$

The distance between the two axes is 1/3. The mathematical tools used by mathematics professor G. M. Epstein to prepare this drawing came from the fields of vector algebra, vector calculus, and matrix algebra. The view shown here was obtained by rotating the cones 75° about an axis through the origin parallel to the vector $-i + 5j$. The viewing point was located at (0,0,1000). The drawing was made by the Tektronix 4051 x-y plotter.

LETTER FROM THE EDITOR

Once again, the time has come for us to bring you up to date on what's happening around the Math Department and to share with you some news we have received from our alumni. Of foremost significance is the addition of Dr. Stephen Weinstein to our department's impressive list of recipients of the Distinguished Teaching Award. Also, one of our majors, Donald Gibson, was honored as the 1980 Outstanding Graduating Senior from the School of Science and Mathematics. Our warmest congratulations are extended to these two fine individuals.

University-wide, there have been some noteworthy happenings. Computer-assisted registration has now been fully implemented. The new five-story Robert E. Kennedy Library opened at the beginning of Winter Quarter, 1981. The Cal Poly football players are the NCAA Division II champions, closing their 1980 season with a 21-13 win over Eastern Illinois University in Albuquerque. Fall 1980 enrollment at Cal Poly reached 16,048, including 250 undergraduate math majors.

We hope you will receive this publication prior to the 1981 Poly Royal and that you will take time out to join us in "Experiencing New Frontiers" (this year's theme) on April 24 and 25. Meanwhile, read on! As in the past, Dr. Boyd Judd has done a commendable job in compiling this third issue of our newsletter. Let's hear three cheers for this fantastic fellow! And let's hear from all you alumni out there this coming year!

Sincerely,

Charles Pasquini

Charles Pasquini
Mathematics Department

LETTER FROM THE DEPARTMENT HEAD

Dear Alumni:

I am pleased to have the opportunity again to write a few words for our Math Department Newsletter for 1981. It seems only yesterday that the decision was made to send out a Newsletter to our alumni each year, and here it is time already for Newsletter Number III!

As a result of more students enrolling in mathematics classes, our faculty has increased in size, and this together with retirements has resulted in a number of new faces. Our new faculty members have done much to stimulate and strengthen the department. In addition the entire faculty has made great strides in professional growth and development. When I joined the Mathematics Department in 1954, one-fourth of the faculty had an earned doctorate. When I became Department Head in 1972, three-fourths of the faculty had an earned doctorate. This past year all full-time members of our faculty had a terminal degree. Many of them are actively engaged in writing papers, publishing articles, giving seminars and colloquia, as well as attending professional meetings.

In addition the department maintains its reputation for good teaching. Last year Dr. Stephen Weinstein received the Distinguished Teaching Award. Since the inception of this award, six Mathematics Department faculty have been recipients--a record unsurpassed by any other department at the university.

We are pleased by the outstanding work you, our graduates, are doing as reported by the Placement Center and your employers. As noted elsewhere in this publication, each year KME sponsors a Career Conference on our campus in which business firms send representatives to discuss job opportunities in their fields. It is interesting to note that some of the representatives being sent this year by various companies are our own graduates.

I am sure that many of you have been contacted by representatives of this university to contribute to our Annual Giving Program. It is quite evident that Cal Poly will need financial support from you, its alumni and friends, in addition to monies from the taxpayers of this state if we are to maintain a quality program.

Sincerely yours,

Charles J. Hanks, Head
Mathematics Department

ALUMNI NEWS

Alumni News Briefs

Eric Burdick ('73) is now Sports Editor of the Telegram-Tribune, San Luis Obispo.

Lynn Renee Campbell ('76) has received a professional degree from the University of Texas at San Antonio. She completed her residency in pediatrics at the Children's Medical Center in Dallas, TX.

Ken Choy ('79) is working toward a master's degree at U.C. Berkeley.

Doreen Dalfol ('79) teaches high school in Livingston, CA.

Ron Jenkins ('65) is employed as a computer scientist at Computer Sciences Corporation, Vandenberg Air Force Base. His home is at 4490 Sirius, Lompoc, CA 93436.

Cynthia Jones ('79) is employed by Bell Labs in Denver, Colorado.

Jeffrey Jones ('79) is a programmer for IBM at its Santa Teresa Laboratory in San Jose, CA. Jeff's wife, Kim, played in the Cal Poly band, as did Jeff. She majored in English while at Cal Poly and is now teaching at Campbell High School in Campbell, CA, near San Jose. Jeff and Kim live at 5519 Walnut Blossom Drive, #4, San Jose, CA 95123.

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BRAINTEASER #1 One hundred lockers, numbered 1 through 100, were initially locked. A janitor performed the following tasks:

Step 1: He unlocked all of the lockers.
Step 2: He locked all of those divisible by 2.
Step 3: He changed all of those divisible by 3, i.e. if a locker was locked he unlocked it, and if it was unlocked, he locked it.
Step 4: He changed all of those divisible by 4.

If he continued this process, in step n changing all of those divisible by n, which lockers were locked and which were unlocked after the 100th step?

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* Answers to the brainteasers are given near the back page of the newsletter.

Charles K. Knickerbocker ('58) is President of Vista Development Corporation, a real estate developing and contracting firm in Balboa, CA. His residence is 226 Ruby St., Balboa Island, CA 92661.

Sharon Kuge ('76) teaches high school in Tracey, CA.

Navy Lieutenant Ernest D. Lanini ('74) recently received a Master of Science degree from the Naval Postgraduate School in Monterey, CA.

Richard Lindquist ('67) is chairman of the department of mathematics at Salinas High School, Salinas, CA. He and his wife and three children live at 55 Beverly Drive, Salinas, CA 93905.

Patrick C. Murray III ('78) is a mathematician in the Weapons Control and Software Systems Division of the Pacific Missile Test Center at Point Mugu, CA.

Bill Pandiani ('70) is a basketball coach at Wenatchee Valley College, a community college in Washington. His team won the state championship last year, the first time for Wenatchee in 44 years of competition.

Gary Pierce ('76) is working for GTE Sylvania in San Jose, CA.

Matt Tedone ('79) is employed at Digital Equipment Corporation in Colorado Springs, CO.

Maria Urquidi ('80) is employed as a programmer-analyst by Standard Oil Company of California in San Francisco. Her home address is 2340 Pacific Ave. #302, San Francisco, CA 94115.

Robert W. Watanabe ('78) is a systems representative for Burroughs Corporation in Sacramento, CA. His home address is 2100 W. Highway 12, Lodi, CA 95240.

Keep on going and the chances are you will stumble on something, perhaps when you are least expecting it. I have never heard of anyone stumbling on something sitting down. (Chalres F. Kettering)

Use what talents you possess; the woods would be very silent if no birds sang there except those that sang best. (Henry Van Dyke)

Letters from Alumni

Dear Dr. Judd:

After graduation, I spent three years doing applications programming at the Lawrence Livermore Laboratory. I then moved to Boston (just outside the city) to work as a micro-programmer for Digital Equipment Corporation. I have been working on a new VAX processor. In September I will continue my studies at U.C.S.D., where I have received a fellowship to work on a Ph.D. in computer science.

Charlie McDowell ('74)

Dear Dr. Judd:

Just recently I became a missionary with Wycliffe Bible Translators. I will work for them in the technical area of computer systems development. In June 1979 I got an M.A. in Linguistics at Cal State Fullerton. I will use that linguistics knowledge along with my math background to develop linguistic applications on the computer. The computer is going to help us with a multitude of linguistic chores. One major developing project is "Computer Assisted Dialect Adaptation" (adaptation, not translation).

David Huffman ('66)
8821 Rathburn
Westminster, CA 92683

Dear Dr. Judd:

How's everyone at Cal Poly? I do miss San Luis Obispo. I guess things are changing quite a bit with the new library going in, or is it finished? [Editor's note: Yes, the library is finished and began full operation Winter Quarter, 1981.]

This past year has been exciting for me. Last July I was married to another Poly graduate, Patrick Kawaguchi. I am now living in Nampa, Idaho. Last school year I was teaching at Nampa High School in the math department. It has been an enjoyable experience. I plan to teach there again next year.

If there is any interest, we will be looking for a new math teacher for next year. Idaho isn't a bad state, just a long way from California. I guess some people like that. Not a lot to do on weekends unless you like the outdoors. There are some nice backpacking spots and a lot of beautiful country.

My first year of teaching has been eye-opening. I've learned

alot about myself and my teaching. I've also experienced alot
more about people and students in general.

Well, better go for now.   I hope to be able to get to Cal Poly
on my visit this summer.   Take care and give my best wishes to
all.

P.S.   Thanks for keeping in touch!!

Pat (Ikeda) Kawaguchi ('77)
1432 Russell
Nampa, ID 83651

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Dear Dr. Judd:

I promised I would write - so here is my first installment.

My work is going well. The emphasis right now is on learning
to sell computers to first-time users with no knowledge of the
field. My first year I will attend four five-week long classes
in Atlanta. They are supposed to be quite tough - you have to
get good grades to keep your job!

More as the story develops!!!

Amanda Scott Lawhern ('80)
2407 Manhattan Beach Blvd.
Gardena, CA 90249

[Editor's note: Amanda is a systems engineering trainee with
 IBM, General Systems Division, in Los Angeles.]

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Dear Dr. Judd:

After getting all tangled up in my first Fortran programming
class in my junior year ('67), I swore I never again wanted to
even get close to a computer. As fate would have it, I have
been a systems engineer with IBM for 12 years now. We have
lived in upstate New York, New Jersey, North Dakota, and are
currently located in Denver. I enjoy the newsletters and find
it interesting that the majority of people who write still live
in California. Some statistics on the whereabouts of the class
of '68 might be an interesting topic for one of your future
publications.

S. W. Smith (Stephen Wells Smith, '68)
11244 N. Thrush Dr.
Parker, CO 80134

[Editor's note: Any alumni interested in the whereabouts of the
 fellow alumni should write to Ruth Weinrich, University Master

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List Office, Administration Building, Room 210C, Cal Poly State
University, San Luis Obispo, CA 93407.]

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Dear Dr. Judd:

I was very pleased to receive the latest edition of the "Math
Newsletter." It is good to be kept up to date on Cal Poly and
revived many happy memories.

To keep you up to date on what I've been doing since graduation
in 1965, I am now Deputy District Attorney for the County of
Orange. For the first eleven years that I was out of Cal Poly
I worked as a computer programmer for Systems Development Cor-
poration, Information Systems Company (now out of business),
Varian Data Machines, and Hughes Aircraft Company. It was
interesting work and took me all over the United States.

The last four years that I worked as a programmer I attended
law school at night. In 1975 I took and passed the California
Bar Exam. In October of 1976 I was hired by the Orange County
D.A.'s office and have been with them ever since.

Though I don't use the math that I studied in obtaining a B.S.
in applied math, the training I received at Cal Poly was in-
valuable in becoming an attorney. Cal Poly taught me, and many
others, how to approach problems, determine what the problem is
and how to solve it. Those are the exact things required in
being a successful attorney.

In 1976 I married Carol LaCognata, a math major from Cal State
Fullerton, who was also working as a programmer. We now have
a seven-month-old son and Carol is a full-time mother.

I find it interesting that "Charlie" Hanks is the head of the
Math Department. Did he give up golf? Fifteen years ago my
prediction would have been that he would have formed a golf
department and would have been the head of that. He was an
excellent instructor. Tell him "hi" for me.

Dr. Mach was my advisor while I was at Cal Poly. He was also
an excellent instructor. Give him my regards also. Does he
still have his Model A Ford? I finally found and bought a 1929
Model A touring car in Canada.

I see no mention of Dr. Arthur Wirshup in the newsletter. I
imagine that he retired some time ago. It seems as though I
took more math classes from him than any other instructor.
[Editor's note: Dr. Wirshup retired from full-time teaching in
1977, but we still depend on his expertise in some part-time
and substitute teaching.]

I'll stop by one of these days to chat and be brought up to date
on what is happening at Cal Poly. Please don't bother writing.
I'm sure that with your busy schedule you have other more im-

portant things to do.

Burl Estes ('65)
24011 Prague
Mission Viejo, CA 92691

Dear Dr. Judd:

I was pleased to receive the newsletter via my parents and read
it cover to cover upon opening it. I loved seeing pictures of
old faces and "success" stories of alumni. I have been neglectful
in responding to requests for present career information. It
was so much fun reading about others I would like to share "my
story." I have worked as an officer for NOAA since July 1976
and have loved almost every minute of it. I learned to navigate
and drive a 230-foot hydrographic vessel as far north as Adak,
Alaska, and as far south as San Diego, California. I learned
about photogrammetry, surveying, charting, and became an active
working diver. After my three year tour on the NOAA ship
Rainier, I am now assigned to Pacific Tide Party in Seattle, WA.

We have a network of Tide and Tsunami gauges we install, main-
tain and remove in some interesting locations. We visit each
station at least once a year and perform survey work, scuba
diving and maintenance on the stations. This job has taken me
to such glamorous locations as Adak, Dutch Harbor (Aleutian
Chain), Kodiak and many S.E. Alaska cities, coastal Oregon,
Washington and California cities, the Hawaiian Islands, Midway,
Wake, Kwajalein, Johnston, Truk, Yap, Palau and Okinawa. I
have made operational scuba dives in all the above-mentioned
locations and have worked in anything from a bikini to a dry
suit and long underwear. I originally received my diving
training from the P.E. Department and Dr. Otto Gasses at Cal
Poly Pomona.

I have used my mathematical degree very little; however, it was
very instrumental in being hired for this job in 1976. (The
fact that it was mathematics rather than another science was
important.)

While on the ship I met a commander in the U.S. Coast Guard who
was a good friend of Dr. Hanks. We were doing a calibration
check on the then "new" Loranc system to check its accuracy.

I have kept in contact with Dr. Warten since I graduated in
December 1975. He gave me a "mock" interview prior to applying
to NOAA.

I enjoy a yearly visit to SLO since my sister has moved to the
area after I left.

Please continue to send the Newsletter either to my parents'
address in San Jose or to

Lt. J.G. Marianne Molchan (PTP)
1801 Fairview Ave. East
Seattle, WA 98102   6

Annual Giving Program, An Acknowledgment

We are pleased to announce that, in response to Cal Poly President Baker's plea for private annual donations to the University, Joseph M. Crosslin ('64) sent a $100 check designated for the Mathematics Department. Mr. Crosslin resides at 1819 Tanglewood Way, Pleasanton, CA 94566.

Special Invitations to Math Alumni

1) Don't forget! You are all invited to come and share cookies and coffee with us Friday, April 24, 1981 (first day of Poly Royal) in our Hospitality Room, Math Building, room 152. We will be delighted to have you as our honored guests.

2) In addition, if you are a member of Kappa Mu Epsilon, you are cordially invited (for a fee, of course) to attend the annual KME banquet on May 16, 1981. KME members are also invited to the alumni breakfast to follow the banquet, on Sunday, May 17. And it's free! Details should be coming your way soon from Scott Ready, KME's current alumni representative.

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BRAINTEASER #2 Quadrilateral ABCD is inscribed in a circle with side $\overline{AD}$, a diameter of length 6. If sides $\overline{AB}$ and $\overline{BC}$ each have length 1, then what is the length of side $\overline{CD}$?
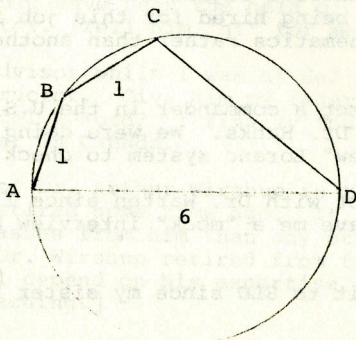
Math Club News

In addition to co-sponsoring the annual Fall Picnic with KME at Cuesta Park on October 3, the Math Club will sponsor two more faculty-student softball games this school year. These are scheduled for the second Saturdays of the Winter and Spring Quarters.

On November 13, 1980 the Club held a special co-op information meeting.

In addition the Club will work at exhibits for Poly Royal and will arrange for some sort of outing with the money made from its Poly Royal refreshment booth.

Math Club Officers
1980-1981

Greg Beserra
President

Jon Morin
Vice President

Estelle Basor
Faculty Advisor

Nancy Miller
Secretary-Treasurer

The 1980 spring banquet was held May 17 in Vista Grande Restaurant on campus. Guest speaker was Dr. Keith Milliken, a former Cal Poly faculty member and now a member of IBM's research team at the Thomas Watson Center in New York. Dr. Milliken shared with us the latest technological advances in marketing theory in the computer industry.

On the following morning, Sunday, May 18, Dr. and Mrs. George R. Mach hosted the annual KME alumni breakfast at their lovely home on Alrita Street high up on one of San Luis Obispo's hills.

At the first KME meeting of the Fall Quarter, Ken Larson, a former member of the Cal Poly Placement Center, and Al Peterson, a Cal Poly graduate, both of whom are now employed by Hewlett-Packard, explained the HP job philosophy and the direction the company will be moving in the next decade. (Incidentally, we welcome our alumni to come and give talks such as this. If you care to participate, please let us know.)

On October 3rd, KME and the Math Club jointly sponsored the annual Fall Picnic. About 90 attendees enjoyed a delicious meal of barbequed chicken, beans, tossed green salad, French bread, and assorted homemade desserts. In the softball game that followed, the students overpowered the faculty by a score of 13 to 9, despite home runs by faculty members Huehn, Weinstein, Murphy and Wolf.

KME has welcomed 20 new pledges at its Christmas 1980 social and 11 more pledges at its Winter Quarter pledge night. These pledges will be formally initiated as life members of KME at the annual KME banquet to be held on May 16, 1981.

KME graduates of 1981 were also honored at the Winter ceremony and were presented with authentic KME letter openers. These gifts are generously donated each year by Dr. and Mrs. Mach.

KME officers for the 1980-81 school year are:

President	Cristi Strain (Napa)
1st Vice President	Phil Diaz (Long Beach)
2nd Vice President	Lori Canter (Ventura)
Pledge Master	Bob Dick (Fall) (Gilroy)
	Lisa Meacham (Winter) (Bishop)
Treasurer	Lisa Beverly (Los Gatos)
Secretary	Leigh Cheek (San Jose)
Newsletter	Susan Robertson (Pleasanton)
	Kerry King (Coalinga)
Publicity	Kerry King (Coalinga)
	Ciril Bada (Carson)
Social	Kirtley Bacon (Santa Barbara)
School Council Rep	John Munson (Los Altos)
	Andrew Mascak (Lompoc)
Poly Royal Board	Kevin Gregory (Los Altos)
Curriculum Committee	Leigh Cheek (San Jose)
Alumni Rep	Scott Ready (Orinda)

KME Officers
1980-1981

Standing (left to right):   Kevin Gregory
                                   Phil Diaz
                                   Scott Ready
                                   Cristi Strain
                                   Dr. George Mach
                                   John Munson
                                   Ciril Bada
                                   Leigh Cheek

Seated (left to right):   Lori Canter
                                   Dr. Dina Ng
                                   Kirtley Bacon
                                   Lisa Beverly

Outstanding Student Award

The Mathematics Department has awarded the "outstanding student" designation for the school year 1979-80 to <u>two</u> students: Andrew Johnson of Orange, California, and Peter Panec of Northridge, California. Faculty making the selection were Bernard Banks (chairman), Estelle Basor and Steve Noltie.

Andy Johnson

Peter Panec

Outstanding Graduating Seniors

The annual honors luncheon honoring the academically outstanding graduating seniors in the School of Science and Mathematics was held on Thursday, May 29, 1980. This year's senior with the highest grade point average (3.99) was a Math major, Donald B. Gibson. Math majors, all with g.p.a.'s higher than 3.70, and their advisors who were honored at the luncheon are:

Donald Gibson	Ralph Warten
Andrew Johnson	Euel Kennedy
Jerry Lew	Elmo Keller (CSc)
Peter Panec	Robert Wolf
Mary Stegman	Arthur DeKleine

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Math-Science Career Day

The annual Math-Science Career Day, designed for the benefit of Math, Science, Statistics and Computer Science majors, was held on campus in the Math-Home Economics Building on Thursday, January 29, 1981. Representatives from the following companies took part: Pacific Telephone, Hughes Aerospace, Bell Labs, Chevron, Burroughs, GTE Sylvania, and Hewlett-Packard. Math Department alumni participating were Ron Green '78 (representing GTE Sylvania), Robert Watanabe '79 (from Burroughs), and Alice Woo '79 (from Hewlett-Packard). Special thanks are due Dr. John Lowry and Dr. Adelaide Harmon-Elliott of the Cal Poly Mathematics Department for their efforts in making this event a success. John served as moderator, his usual assignment, and Adelaide did her usual outstanding job of making the arrangements and lining up the speakers, even though she is officially on sabbatical leave, studying at U.C. Santa Barbara.

Cooperative Education Program 1977-80

Cal Poly's Cooperative Education Program offers our majors the opportunity to "earn while they learn," to receive university credit, and retain their student status while they are working with industries or government for periods of three to six months.

Since Winter Quarter 1977, approximately 50 math majors have been on Co-op assignments. The following table indicates the number of students on Co-op during each quarter of the past four years.

Number of Students on Assignment

	W	SP	SU	F	TOTAL
1977	1	2	3	3	9
1978	5	8	11	6	30
1979	2	6	15	7	30
1980	4	6	4	0	14

On the average about 5 to 10 math students are on assignment in a given quarter.

One of our Co-op students, Mary Stegman, has co-authored three technical reports as part of her Co-op experience. These reports were issued by the Naval Ocean Systems Center in San Diego, CA. The titles are: "The Effect of Update Randomization on REVGEN Output: Broadband Energy Detector," "The Effect of Update Randomization on REVGEN Output: Matched-Filter Processor," and "A Physical Approach to Non-Rayleigh Surface Reverberation."

A Student Relates Her Experience in the
Cooperative Education Program

At the end of my sophomore year, IBM at San Jose hired me into their cooperative education program as a computer programmer. The extent of my computer science capabilities at that time included a quarter of FORTRAN and ASSEMBLER, which was not much experience even as a math major. But despite my lack of computer skills, I managed to do very well learning APL the first month there. (It was heaven-sent after a quarter of ASSEMBLER!) After the initial learning period, my main responsibility was to provide programming support for the financial people, using APL, to enhance existing reporting capabilities, and to add new reports to an on-line interactive management information system. I felt very fortunate to work with such an experienced APL programmer who helped instill in me his excellent programming habits. Moreover, we had to work as a team to get the job done and that was a good opportunity for me to build my communication skills and my ability to get along with others in a working environment. I learned what kind of behavior to expect from others in such an environment and also what was expected of me. As a co-op, you can make mistakes and learn from them before starting a permanent job. I now feel much more prepared and at ease about my future job, for I know I am quite capable of meeting job responsibilities and working with people. In addition, I have made some valuable contacts that have and still can help me in the future. (I worked for the same people the next summer, and I could have a permanent job at IBM if I desire.)

The co-op program has also helped in my selection of college electives. Before I went to IBM, I really hadn't planned on taking many computer courses; however, I now see how valuable a computer background can be, and I have planned my schedule accordingly. Probably one of the most important things I discovered as a co-op was the fact that I don't want to be a computer programmer the rest of my life. But there were many other types of jobs there that I might be interested in, especially in the marketing field, and I was able to talk to a sales representative and to a systems engineer about the possibilities.

I found the cooperative education experience very beneficial in many ways. It gave me an idea of what to expect after college while providing helpful experience when I get there. It increased my self-confidence. Moreover, the co-op program has helped clarify my college and career goals. (The money wasn't bad either!)

<div align="right">Cristi Strain</div>

One should be careful to get out of an experience only the wisdom that is in it - and stop there; lest we be like the cat that sits down on the hot stove lid. She will never sit down on a hot stove lid again - and that's well; but she also will never sit down on a cold one anymore either. (Mark Twain)

New Service for Cal Poly Students

A new service designed to benefit local businesses while
assisting university students in meeting their educational
goals has been instituted by Cal Poly's Placement Center.
Known as the Work Experience Program, it was established last
fall to enhance students' career development by placing them
in selected career-related work settings.

Pamela Summerl (Placement), coordinator of the new program,
said the work experiences usually come in the form of part-time
or summer jobs that provide students with opportunities to gain
valuable experience, learn responsibility in a work setting,
and examine their career goals on a daily basis. Work schedules
and length of employment of university students in the Work
Experience Program depend on the individual needs of the em-
ploying organization and student's availability, Ms. Summerl
said.

"During the academic year a student's study schedule changes
quarterly, so an ideal job arrangement would involve 10 to 20
hours of work per week for approximately 10 weeks," she con-
tinued. Selection of participants in the program can consist
of any of several procedures including preliminary screening
of applications by Placement Center staff, reviews of appli-
cations by the employer, and interviews by the employer.

Student participants are also provided assistance in preparing
for job searches and employment responsibilities, and staff of
the Placement Center will periodically contact both the student
and the employer to insure a successful experience for both.
Ms. Summerl said that although some exceptions are possible,
employers involved in the Work Experience Program will be ex-
pected to use prevailing wage rates for student employees in
the program.

Representatives of local businesses, industries, governments,
and service agencies interested in learning more about the pro-
gram can do so by telephoning Ms. Summerl at (805) 546-2501.

We'd like to make a deal with the computer. We
promise not to fold, spindle or mutilate if it will
stop asking us to sign our name over those little
holes in the space marked for signature.

Speaking of a certain lawyer, Abraham Lincoln once
said: "He can compress the most words into the
smallest ideas better than any man I ever met."

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40th Annual Putnam Competition

Ten Cal Poly students participated in the 40th annual William
Lowell Putnam Mathematical Competition on December 1, 1979. A
total of 2141 students from 338 colleges and universities in
Canada and the United States competed this year. The Cal Poly
team consisting of Ken Choy, Donald Gibson, and Peter Panec
(Math) ranked 104th of the 258 3 member teams entered.   Other
contestants from Cal Poly were Valerie Grosshans, Carl Darby,
Beverly Thomson (Math), Robert Martin (Physics), Richard Kopel
(Computer Science), Duane Wallace (Aero), and Timothy Beauchamp
(EL).

For the benefit of those who are curious, here are the 1979
Putnam Competition questions:

Problem A-1

Find positive integers n and $a_1, a_2, \ldots, a_n$ such that
$a_1 + a_2 + \ldots + a_n = 1979$ and the product $a_1 a_2 \ldots a_n$
is as large as possible.

Problem A-2

Establish necessary and sufficient conditions on the
constant k for the existence of a continuous real
valued function $f(x)$ satisfying $f(f(x)) = kx^9$ for
all real x.

Problem A-3

Let $x_1, x_2, x_3, \ldots$ be a sequence of nonzero real numbers
satisfying

$$x_n = \frac{x_{n-2} x_{n-1}}{2x_{n-2} - x_{n-1}} \quad \text{for } n = 3, 4, 5, \ldots .$$

Establish necessary and sufficient conditions on x_1
and x_2 for x_n to be an integer for infinitely many
values of n.

Problem A-4

Let A be a set of $2n$ points in the plane, no three
of which are collinear. Suppose that n of them are
colored red and the remaining n blue. Prove or dis-
prove: there are n closed straight line segments, no
two with a point in common, such that the endpoints of
each segment are points of A having different colors.

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Problem A-5

Denote by $[x]$ the greatest integer less than or equal to x and by $S(x)$ the sequence $[x], [2x], [3x], \ldots$. Prove that there are distinct real solutions α and β of the equation $x^3 - 10x^2 + 29x - 25 = 0$ such that infinitely many positive integers appear both in $S(\alpha)$ and in $S(\beta)$.

Problem A-6

Let $0 \leq p_i \leq 1$ for $i = 1, 2, \ldots, n$. Show that

$$\sum_{i=1}^{n} \frac{1}{|x - p_i|} \leq 8n\left(1 + \frac{1}{3} + \frac{1}{5} + \ldots + \frac{1}{2n-1}\right)$$

for some x satisfying $0 \leq x \leq 1$.

Problem B-1

Prove or disprove: there is at least one straight line normal to the graph of $y = \cosh x$ at a point $(a, \cosh a)$ and also normal to the graph of $y = \sinh x$ at a point $(c, \sinh c)$.

[At a point on a graph, the normal line is the perpendicular to the tangent at that point. Also, $\cosh x = (e^x + e^{-x})/2$ and $\sinh x = (e^x - e^{-x})/2$.]

Problem B-2

Let $0 < a < b$. Evaluate

$$\lim_{t \to 0} \left\{ \int_0^1 [bx + a(1-x)]^t \, dx \right\}^{1/t} .$$

[The final answer should not involve any operations other than addition, subtraction, multiplication, division, and exponentiation.]

Problem B-3

Let F be a finite field having an odd number m of elements. Let $p(x)$ be an irreducible (i.e., nonfactorable) polynomial over F of the form

$$x^2 + bx + c, \quad b, c \in F.$$

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For how many elements k in F is $p(x) + k$ irreducible over F?

Problem B-4

(a) Find a solution that is not identically zero, of the homogeneous linear differential equation

$$(3x^2 + x - 1)y'' - (9x^2 + 9x - 2)y' + (18x + 3)y = 0.$$

Intelligent guessing of the form of a solution may be helpful.

(b) Let $y = f(x)$ be the solution of the nonhomogeneous differential equation

$$(3x^2 + x - 1)y'' - (9x^2 + 9x - 2)y' + (18x + 3)y = 6(6x + 1)$$

that has $f(0) = 1$ and $(f(-1) - 2)(f(1) - 6) = 1$. Find integers a, b, c such that $(f(-2) - a)(f(2) - b) = c$.

Problem B-5

In the plane, let C be a closed convex set that contains $(0,0)$ but no other point with integer coordinates. Suppose that $A(C)$, the area of C, is equally distributed among the four quadrants. Prove that $A(C) \leq 4$.

Problem B-6

For $k = 1, 2, \ldots, n$ let $z_k = x_k + iy_k$, where the x_k and y_k are real and $i = \sqrt{-1}$. Let r be the absolute value of the real part of

$$\pm\sqrt{z_1^2 + z_2^2 + \cdots + z_n^2} \, .$$

Prove that $r \leq |x_1| + |x_2| + \cdots + |x_n|$.

Nature has everywhere written her protest against idleness; everything which ceases to struggle, which remains inactive, rapidly deteriorates. It is the struggle toward an ideal, the constant effort to get higher and further, which develops manhood and character. (Alfred A. Montapert)

The following students received Bachelor of Science degrees in Mathematics, June 1980:

Kevin Roy Aaron*
Lisa Ann Ballingall
Alan Curtis Bell
Bruce R. Brant**
Ernest Buenafe**
Kenneth Chan Choy**
Charley Bradford Cross**
Diane Marie Dahlgren*
Barbara Elsbeth Driscoll
Robert Arthur Evans, Jr.
Andrew S. Finn
Catherine Lynn Gabrielson
Donald S. Gibson**
Marie L. Grossi*

Cynthia Carol Jones**
Thomas Don Jones*
Jerry Tung Tat Lew**
Peter Anthony Panec**
Ronald Keith Peet*
John D. Pietro
Jere Douglas Ray
Stephen Edward Schaniel*
Mary E. Stegman**
Mamie Wei Hsin Sun
Nancy A. Tennyson**
Kenneth John Valente**
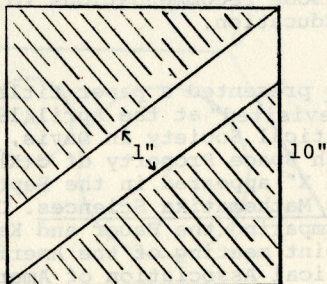Edward Woodrow Wild, Jr.*

  *Graduated with honors
**Graduated with highest honors

The following students received Master of Science degrees in Mathematics:

Charles Anthony Pasquini, Jr.
Osamu Yamamoto
Jonathan Virgil Ziebell

???

BRAINTEASER #3 Given the 10" x 10" square, with a 1" wide diagonal strip as shown, find the area of the shaded region.

10"

???

Faculty News Briefs

Sabah Al-hadad has authored the new Math 102 textbook titled "Agricultural Mathematics." This is the third textbook in Sabah's career. In 1977, he published his first book, "Topics for Agricultural Mathematics," used for Math 103. "College Algebra with Applications," which Sabah co-authored with Chester H. Scott, was published in 1979. "Agricultural Mathematics" made its debut in Math 102 in the Fall of 1980. Currently, it is only available in the University's bookstore, but it will be more widely distributed next fall by Kendall/ Hunt Publishing Co. of Dubuque, Iowa.

The following letter was received April 1980:

Dear Dr. Judd,

This is just to let you know that my mother Olive M. Andersen passed away last year. She had moved to the San Diego area to be closer to her family, but her heart remained in San Luis Obispo. She always appreciated and remembered her years with the Mathematics Department.

Konrad Andersen
4324 Miriam Pl.
La Mesa, CA 92041

[Editor's note: Mrs. Andersen was on our faculty during the years 1957-1972.]

Alfred M. Bachman has been appointed by Commissioner Ruth Hadley to chair an Instructional Materials Evaluation Panel (IMEP) in San Luis Obispo. Dr. Bachman will select a panel of teachers at various grade levels to evaluate mathematics textbooks for use by California school children grades K-8 for the next six years. Similar panels will be established in six other areas of the state. The purpose of the IMEP program is to come up with some recommendations to be presented to the State Board of Education.

Donald G. Hartig presented a paper titled "The Riesz Representation Theorem Revisited" at the April 1979 meeting of the American Mathematical Society in Davis, CA. Another of his papers, "A Banach Space Property of C(X) Characterizing Local Connectedness in X" appeared in the September 1980 issue of Pure and Applied Mathematika Sciences. Don presented another paper titled "Comparing the Bauer and Kakutani Representation" at the annual joint meeting of the American Mathematical Society and the Mathematical Association of America held in San Francisco in January, 1981.

J. Myron Hood co-authored an article titled "A Computer Simulation of Evolutionary Forces Controlling the Size of a Multigene Family" which appeared in a recent issue of the Journal of Molecular Evolution.

Kempton L. Huehn and Martin T. Lang presented a demonstration and talk titled "Computer Graphics Programs for the Mathematics Classroom" at the Western Educational Computing Conference held in San Diego during November 1980.

A problem authored by Eric Langford, Visiting Professor during the school year 1977-1978, appeared in the October 1980 issue of the American Mathematical Monthly, pages 680-681.

Peter Ross was in charge of the poster exhibits at the Fourth International Congress on Mathematical Education at U.C. Berkeley, August 1980. He also presented a talk on "Students' Difficulties in Solving Calculus Word Problems."

Ahmed Zayed has had two articles published recently. "On the Singularities of Ultraspherical Expansions" appeared in the December 1980 issue of Transactions of the American Mathematical Society. A second article titled "On the Laguerre Series Expansions of Entire Functions" appeared in the January 1981 issue of the Tamkang Journal of Mathematics. Ahmed also gave a talk titled "Series of Szego Polynomials as Hyperfunctions" at the annual meeting of the American Mathematical Society on January 8, 1981.

???

BRAINTEASER #4 A template is in the shape of right trapezoid PQRS with two circles, A and B. Circle A is 2 cm. from sides $\overline{PQ}$ and $\overline{PS}$ and has a diameter of 6 cm. Circle B is 2 cm. from sides $\overline{PQ}$, $\overline{QR}$, and $\overline{RS}$. PQ = QR = 20 cm. and $\angle QRS = 60°$. What is the width of the material between the circles at the narrowest point?

???
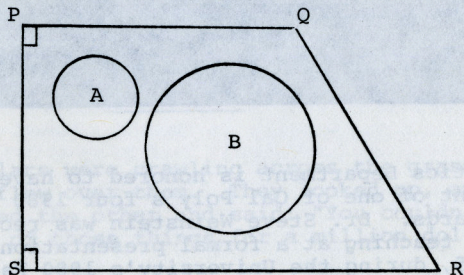
Distinguished Teaching Award

Dr. Steve Weinstein

The Mathematics Department is honored to have among its faculty
the recipient of one of Cal Poly's four 1980 Distinguished
Teaching Awards. Dr. Steve Weinstein was recognized for his
outstanding teaching at a formal presentation held on Monday,
September 15, during the University's 1980 Fall Conference.
He received a plaque and a $100 check, courtesy of the Armistead
B. Carter Endowment Fund.

Dr. Weinstein earned his B.A., M.A., and Ph.D. degrees in mathematics at U.S.C. His doctoral dissertation was in the area of operator theory, on the problem of factorization of operators. Dr. Weinstein explains, "I gave certain conditions under which an infinite-dimensional linear operator, such as an integral operator, can be factored into a composition of more easily invertible operators. This is analogous to the factorization of matrices into upper and lower triangular matrices."

Before teaching at Cal Poly, Dr. Weinstein obtained a General Secondary Teaching Credential and taught for two years at Bell High School in southeast Los Angeles. He also taught night classes at East Los Angeles Junior College for a year, and taught one or two courses each semester at U.S.C. while a graduate student there.

Since coming to Cal Poly in September 1969, Dr. Weinstein has taught approximately 110 mathematics classes. Currently, his two main non-teaching departmental responsibilities are coordinating the written contest for the Poly Royal high school math contest and assisting the department head in the scheduling and assignment of math classes. Dr. Weinstein assumed this latter role as Assistant Departmental Scheduler after the implementation of computer-assisted registration.

Dr. Weinstein is married; he and his wife Eleanor have two sons, Tom and Stan, ages 15 and 13. The family has a travel trailer and enjoys making at least one trip every summer and two or three short trailer-camping trips during the year.

"I feel fortunate to be at Cal Poly and to live in this area," says Dr. Weinstein. "I find the students and the faculty to be very friendly. From conversations with friends at other campuses, I believe that on the whole Cal Poly's students are the best in the C.S.U.C. system."

A man who had just been promoted to vice-president boasted so much about it to his wife that she finally retorted: "Vice-presidents are a dime a dozen. Why, in the supermarket they even have a vice-president in charge of prunes." Furious, the husband phoned the supermarket in the expectation of refuting his wife. He asked to speak to the vice-president in charge of prunes. "Which kind?" was the reply, "Packaged or bulk?"

—————————

Two caterpillars were crawling across the grass when a butterfly flew over them. They looked up, and one of them nudged the other and said: "You couldn't get me up in one of those things for a million dollars!"

—————————

New Faculty

James R. Mueller

Received his B.A. in Physics from the University of Wisconsin at Milwaukee in 1975. He will earn his Ph.D. this year in applied math from the California Institute of Technology. The topics of his dissertation are: I) Uniform Asymptotic Analysis of Integrals with Three Coalescing Saddle Points, and II) Analysis of the Rewetting of a Vertical Surface with Internal Heat Generation Using a Wiener-Hopf Technique. Jim was a teaching assistant at Cal Tech. His hobbies are folk music (fiddle playing) and backpacking. Asked about his impressions of San Luis Obispo, Jim says, "I don't miss the smog of Pasadena in the least!"

Peter Ross

Received his B.S. from the Massachusetts Institute of Technology, and his M.A. and Ph.D. from the University of California, Berkeley. The title of his dissertation is "Student Difficulties in Solving Calculus Word Problems." Peter has taught at San Francisco State University, U.C. Santa Barbara, and U.C. Berkeley. He also did secondary and elementary school teaching in India, the San Francisco Bay area, and Carbondale, Illinois. His professional interests lie in the development of math curricula. Peter is single, but "Uncle Pedro" to a whole passel of nephews and nieces. He enjoys most participant sports, especially volleyball.

David M. Terlinden

Received his A.B. from Pomona College (Claremont) in 1974, and his M.A. (1978) and Ph.D. (1980) from the University of California, Riverside. The title of his dissertation is "Two Spectral Problems for Operators Generating Differential Equations." While working on his degrees, David was a teaching assistant at U.C. Riverside.

Ahmed I. Zayed

Received his B.S. and M.S. from Cairo University in Egypt, and his Ph.D. from the University of Wisconsin in 1979. The title of his dissertation is "Generalized Functions and Boundary Value Problems." Ahmed has taught at the University of Wisconsin, the University of Alberta (Canada), Cairo University, and the American University in Cairo. Ahmed enjoys traveling, hiking, and playing basketball and racquetball.

Did you know that ninety percent of all the scientists who ever lived are alive today? (from Nation's Business)

New Faculty

Ahmed Zayed

James Mueller   Peter Ross   David Terlinden

New Staff

Elaine Bauer

Born and raised in Ventura, CA.
She moved to San Luis Obispo in
1970 and worked at Cal Poly.
After being away for several
years, she is very happy to be
back.

Some of her hobbies and interests
include gardening, fishing, sewing,
cooking and enjoying the outdoors
and nature.

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Mathematics Faculty Promotions, 1980

To Full Professor:

> Jack E. Girolo
> Stuart Goldenberg
> Kempton L. Huehn
> Paul F. Murphy

To Associate Professor:

> Estelle L. Basor
> Robert S. Wolf

Mr. Laumann Retires

George C. Laumann, Associate Professor of Mathematics and a member of the faculty since 1957, retired at the end of the Spring Quarter 1980. He will, however, continue to teach for one quarter each school year under the special "early retirement" plan for state university faculty enacted in 1977. He will be permitted to continue under this plan until he reaches age 70.

Glad to have you aboard, George, even if it's only for one quarter each year! And happy traveling in your motor home with wife Una during the months when you're not teaching! And hey, let us know about that super new telescope you're planning to build!

> When we have to keep our eye on the ball, our ears to the ground, our shoulders to the wheel, our nose to the grindstone, our heads level, and both feet on the ground, it's a wonder we get any work done in such a position!

The development of a new product is a three-step process: first, an American firm announces an invention; second, the Russians claim they made the same discovery twenty years ago; third, the Japanese start exporting it.

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Sabbatical Leaves, 1979-1980

Dr. Paul Murphy

Dr. Murphy and his family lived in a faculty apartment on the campus of Michigan State University while he was on sabbatical leave during the 1979-80 academic year. Dr. Murphy said that he especially appreciated the efforts of M.S.U. faculty in helping to make the year worthwhile for him. He was provided with a private office, with easy access to an excellent mathematics library (on the floor below his office). He was encouraged to lecture in seminars and graduate courses. In addition to his study and research, Dr. Murphy taught one course per quarter, which he found to be a pleasant change from his normal teaching assignment here at Cal Poly.

The experience was quite a change for the Murphy family, and will be remembered fondly, said Murphy. The only complaint came from the children: there just were not enough snowstorms causing schools to close.

Dr. Jean McDill

Dr. McDill was privileged to spend her sabbatical leave last winter at the University of Bremen in West Germany as a member of a research group in categorical topology. While there, she participated in a weekly seminar, attended two international conferences, and became acquainted with some of the leading researchers in her field of study. She was also able to work on research of her own and she said that she felt a great sense of freedom in being able to spend whole days at the University library without having to think about time or class schedules.

Jean and her eleven year old daughter found living in Bremen an exciting experience. They enjoyed the trams, the flower market, the people and customs - and even the frustration, with occasional flashes of triumph, of coping with the German language. Mother and daughter found some time to explore the area and managed to sneak in trips to Paris, Vienna, Copenhagen and Rome. Dr. McDill said that the two of them had a marvelous feeling of being on an adventure - and they still talk about it as "the year we ran away from home."

People can be divided into three groups: those who make things happen, those who watch things happen, and those who wonder what happened. (John Newbern)

We act as though comfort and luxury were the chief requirements of life, when all that we need to make us really happy is something to be enthusiastic about. (Charles Kingsley)

Mathematics Department Colloquia
February 1980 – February 1981

Date	Speaker	Topic
2- 7-80	Ky Fan UCSB	A Minimax Inequality and its Applications
2-14-80	Robert Kane Purdue	What is Basic in Mathematics?
2-29-80	William Fitzgibbon UCSD	Nonlinear Evolution Equations in Functional Differential Equations
3- 6-80	S. Walter Wei	Minimality, Stability, and Plateau's Problem
3- 6-80	Alan Kay Xerox Research	Personal Computing in the 1980's
3-11-80	Carl F. Morgenstern UCSC	Combinatorial Equivalences of Gödel's Theorem
3-12-80	Jeanne Tamaki	On an Algorithm of Hu and Tucker
3-13-80	Michael Hurley	Density of Basins of Attractors
4- 4-80	Henry Kramer	Digitizing Pictures and Printing Them
4-10-80	Raymond Wong UCSB	Group Actions on Infinite Dimensional Spaces - A Survey
4-11-80	Russell Frank U. of Chicago	Geometry of Complete Intersections
4-14-80	Huseyin Kocak UCSC	Geometry of Integrable Hamiltonian Systems
4-17-80	Don Hartig Cal Poly SLO	Topological Measure Theory
4-21-80	David Terlinden UCR	A Spectral Containment Theorem for Generators of Nth Order Differential Equations
4-28-80	Kimball Hughes UCLA	Some New Congruences for Partition Functions
5- 6-80	Peter Hilton Case Western Reserve	Modeling Within Mathematics
5-22-80	John Petro UCR and Western Michigan U.	Boolean Algebra - the Golden Thread of Mathematics
5-30-80	Alan Weinstein UCB and Cal Tech	Symplectic Geometry

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Date	Speaker	Topic
9-26-80	Paul Murphy Cal Poly SLO	Clifford's Theorem
10- 2-80	Kent Morrison Cal Poly SLO	The Connected Component Group of an Algebra
10- 8-80	Ahmed Zayed Cal Poly SLO	Generalized Functions and Boundary Value Problems
10-16-80	Don Rawlings Cal Poly SLO	The Q-Analogue Fad
10-24-80	J. W. Helton UCSD	Complex Variables, Functional Analysis and Amplifiers with Large Gain
10-30-80	P. C. Chiang UCLA (Visiting from Peking U., China)	On the Least Number of Fixed Points
11-13-80	Buck Ware Cal State Chico	Small Divisors - What's the Problem?
11-20-80	James Dugundji USC	Remarks on the Lefschetz Fixed-Point Theorem
12- 4-80	Jim Mueller Cal Poly SLO	Traveling Wave Solutions in a Water Reactor Emergency Core Cooling System
12- 5-80	Frank Flanigan San Diego State	The Normal Embedding Problem for Groups
1- 6-81	Dave Gibbs Murray State U., Kentucky	Witt Rings and Periodic Maps on Manifolds
1-12-81	George Strecker Kansas State U.	Bigger is Better, or What are Completions
2- 5-81	John Guckenheimer UC Santa Cruz	One-Dimensional Dynamics
2-12-81	Peter Ross Cal Poly SLO	Helping Students Solve Calculus Word Problems
2-13-81	Richard Cushman U. of Utrecht, Holland Visiting Prof. at UC Santa Cruz	The New Qualitative Properties of the Spherical Pendulum
2-19-81	Arthur Ogus UC Berkeley	The Weil Conjectures
2-26-81	Helga Shirmer Carleton U., Visiting at UCLA	Fixed Point Sets

Note Concerning Department Colloquia: Special thanks should
go to Cal Poly Mathematics Department faculty members Estelle
Basor, Arthur DeKleine, and Kent Morrison for their stellar
work in lining up colloquia speakers and making this program
such a resounding success.

A QUICK WAY TO FIND OUT THE RANK OF A

MATHEMATICS FACULTY MEMBER

Professor	Associate Professor	Assistant Professor	Instructor	Graduate Assistant
Leaps tall buildings with a single bound	Must take running start to leap over tall buildings	Can leap over short build- ings only	Crashes into buildings when attempting to jump over them	Cannot recognize buildings at all
Is faster than a speeding bullet	Is as fast as a speeding bullet	Not quite as fast as a speeding bullet	Slower than a slow bullet	Wounds self with bullet when attempting to shoot
Is stronger than a loco- motive	Is stronger than a bull elephant	Is stronger than a bull	Shoots the bull	Smells like a bull
Walks on water consistently	Walks on water in emergencies	Washes with water	Drinks water	Passes water in emergencies
Talks with God	Talks with the angels	Talks to himself	Argues with himself	Loses argu- ments with himself
Creates con- sistent set of axioms	Proves origi- nal theorems	Accepts axioms	Proves axioms	Disproves axioms

=============

Nothing is easier than fault-finding; no talent, no
self-denial, no brains, and no character are required
to set oneself up in the grumbling business.
(Robert West)

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Results of the 28th Annual
Poly Royal Mathematics Contest

1. The Written Contest - for high school seniors only

   Number of participants: 206

   Number of high schools represented: 70

   Winning team: Rolling Hills High School

   Individual winner: Mitchell Sklar of Beverly Hills
   High School

2. The Tri-Math-Lon (formerly called the "Chalk Talk Contest")
   for high school juniors only

   Number of participants: 44

   Winner: Armand MacMurray of Henry M. Gunn High School,
   Palo Alto

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Brevity is not only the soul of wit, but the soul
of making oneself agreeable, and of getting on with
people, and indeed of everything that makes life
worth living. (Samuel Butler)

———————

If all our misfortunes were laid in one common heap,
whence everyone must take an equal portion, most
people would be content to take their own and
depart. (Socrates)

———————

Andrew Carnegie was once asked what he considered
most important in industry: labor, capital or brains.
With a laugh Carnegie replied, "Which is the most
important leg of a 3-legged stool?"

———————

<u>FEATURE ARTICLE</u>

Math Trouble Stems from Pre-College

by

Cheryl Johnson

While educators at all levels of education struggle with the fact that Johnny cannot read, others battle with the issue that most of the "Johnnies" do not comprehend math either.

At a recent Mathematics Education Forum lecture held at Cal Poly for elementary and secondary school teachers on the Central Coast, a specialist in mathematics education told the audience that difficulties are related to the way in which mathematics is taught.

According to the May 6 edition of the <u>Telegram-Tribune</u>, Dr. Peter Hilton attributed student learning problems to the fact that teaching is "intimidating" and the problems presented to them "contrived" and "unrealistic."

"In listing the criticisms, the most basic is of the curriculum at the elementary level," said Hilton, a visiting professor of mathematics at the University of Santa Clara, in an interview with the <u>Mustang Daily</u> some days after his lecture.

It is, however, no fault of the teachers, Hilton said. The curriculum has been forced upon them and institutionalized by tests.

Present techniques of teaching mathematics do not encourage the student to learn to think, but place a premium on memorization, said Hilton, a member of the faculty of Case Western Reserve in Cleveland, Ohio.

Students get frightened about what will be asked on tests rather than gain an understanding of the concepts, he said.

Because students are lead to believe there is a single right path to finding the single right answer, they become scared they will be marked wrong and made to look foolish if they do not answer in the prescribed manner, added Hilton.

By the time the student reaches the college level, "to a considerable extent, the damage has already been done," he said.

"Students find it impossible to break out of that pattern; when they come to college, they tend to think in the same terms - 'I have to do well on the test,'" Hilton added.

Because the college student tries to achieve a proficiency which will last him only until the test is over, he or she does not learn that mathematics is a "continual, growing, accruing" subject, he said.

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"The essential nature of mathematics is naturally lost," Hilton said.

"That essential nature is that the importance in mathematics is not in finding the correct answer, but in asking the proper question.

"Teachers should be trying to get the students to see where they are going rather than show they have achieved a certain proficiency in technique," said Hilton.

Because of technological advances and innovations made possible by the use of computers and hand calculators, a rethinking should be occuring in terms of mathematical curricula, Hilton said, adding that such fields as the sciences, engineering, commerce and the social sciences should provide new and exciting mathematical applications.

Hilton said universities are taking these new developments into account - Cal Poly among them.

He also said he does not consider himself a "voice crying in the wilderness," but his approach recognizes much of the trouble stems from the pre-college experience.

"It will not be enough to set our house in order on the college level," he added.

Dr. Alan Holz, who specializes in teacher preparation for mathematics on the elementary school level, said Hilton's criticisms that math has become a manipulative, symbolic subject without connection to the real world are not totally unique and many people in math education feel much the same about the issue.

But Holz, who as chair of the forum series, invited Hilton to speak, added he did not feel Hilton's comments are an indictment against the way mathematics is taught.

"These are all things that people in the field are aware of, are cognizant of ... it isn't like he was coming out with a totally new idea," said Holz, who believed the purpose behind Hilton's lecture was to provide a forum for discussion on the issue.

Holz also said he felt the problems presented in the mathematics curriculum must have meaning for the students.

"It isn't a matter of semantics or changing the language, but of stating a realistic problem," he said.

Hilton's criticisms of mathematics in general are about as applicable to Cal Poly as they are to the public schools, Holz added.

"They do not come well prepared, that is certainly true," said Dr. Ralph Warten, a calculus professor at Poly, of the students entering the university.

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"Some people don't know that they don't know mathematics. They can do the calculations, but that's only part of it," said Dr. Harmon-Elliott, who also teaches mathematics education for elementary teacher preparation.

Holz agreed with Hilton that the increasing mathematical complexity of technology is having an impact on the average person, who is having trouble coming to grips with it.

"It affects our lives so much, but at the same time we are afraid to deal with it."

Unified Field Theory

In the beginning there was Aristotle,
And objects at rest tended to remain at rest,
And objects in motion tended to come to rest,
And soon everything was at rest,
And God saw that it was boring.

Then God created Newton,
And objects at rest tended to remain at rest,
But objects in motion tended to remain in motion,
And energy was conserved and momentum was
  conserved and matter was conserved,
And God saw that it was conservative.

Then God created Einstein,
And everyting was relative,
And fast things became short,
And straight things became curved,
And the universe was filled with inertial frames,
And God saw that it was relatively general, but
  some of it was especially relative.

Then God created Bohr,
And there was the principle,
And the principle was quantum,
And all things were quantified,
But some things were still relative,
And God saw that it was confusing.

Then God was going to create Furgeson,
And Furgeson would have unified,
And he would have fielded a theory,
And all would have been one,
But it was the seventh day,
And God rested,
And objects at rest tend to remain at rest.

                                    Tim Joseph

1. The only lockers which will be unlocked at the end of the sequence of events will be those on which an odd number of operations were performed, i.e. if the locker has a number with an odd number of divisors. The only integers with an odd number of divisors are the perfect squares, therefore, lockers 1, 4, 9, 16, 25, ..., 100 will be unlocked and all of the others will be locked.

2. Let α and β be the central angles shown. In $\triangle AOB$,

$1^2 = 3^2 + 3^2 - 2 \cdot 3 \cdot 3 \cos \alpha$,

so $\cos \alpha = \frac{17}{18}$. In $\triangle COD$,

$$CD^2 = 3^2 + 3^2 - 2 \cdot 3 \cdot 3 \cos \beta$$
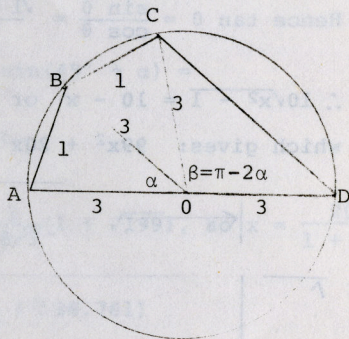$$= 18(1 - \cos \beta)$$
$$= 18(1 - \cos(\pi - 2\alpha))$$
$$= 18(1 + \cos 2\alpha)$$
$$= 36(\frac{1 + \cos 2\alpha}{2})$$
$$= 36 \cos^2 \alpha$$
$$= 36(\frac{17}{18})^2$$
$$= (\frac{17}{3})^2, \text{ so } CD = 5\frac{2}{3}.$$

3. I. Consider Figure A. Define x as shown and let $K_1, K_2,$ and K_3 be the areas of the 3 respective regions. Then $K_1 + K_2 + K_3 = 100$. But $K_1 = K_3 = \frac{1}{2}(10)(10 - x)$ and $K_2 = (h)(b)$ where h = height of parallelogram = 1, b = base of parallelogram, with $b = \sqrt{10^2 + (10 - x)^2}$.

Thus $100 = 2[\frac{1}{2}(10)(10 - x)] + (1)\sqrt{100 - (10 - x)^2}$
$$= 100 - 10x + \sqrt{200 - 20x + x^2}$$

or $10x = \sqrt{200 - 20x + x^2}$.

Hence $100x^2 = 200 - 20x + x^2$ or $99x^2 + 20x - 200 = 0$.

$\therefore x = \dfrac{-20 \pm \sqrt{20^2 - 4(99)(-200)}}{2(99)}$. Using the positive value,

$x = \frac{10}{99}(\sqrt{199} - 1)$ and $K_1 + K_3 = 10[10 - \frac{10}{99}(\sqrt{199} - 1)]$
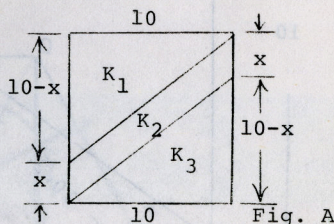$$= \frac{100}{99}(100 - \sqrt{199})$$

(≈ 86.76)

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II. Define x as shown above and
     let θ be defined as shown in
     Figure B. Then

     $\tan \theta = \dfrac{10 - x}{10}$ and

     $\sin(90° - \theta) = \dfrac{1}{x}$.
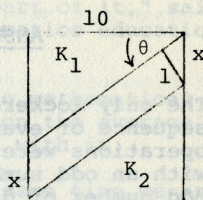
     But $\sin(90° - \theta) = \cos \theta = \dfrac{1}{x}$.

Fig. B

Thus $\sin \theta = \sqrt{1 - \cos^2\theta} = \sqrt{1 - 1/x^2}$.

Hence $\tan \theta = \dfrac{\sin \theta}{\cos \theta} = \dfrac{\sqrt{1 - 1/x^2}}{1/x} = \dfrac{10 - x}{10}$, or $\sqrt{x^2 - 1} = \dfrac{10 - x}{10}$.

$\therefore 10\sqrt{x^2 - 1} = 10 - x$ or $100(x^2 - 1) = (10 - x)^2$

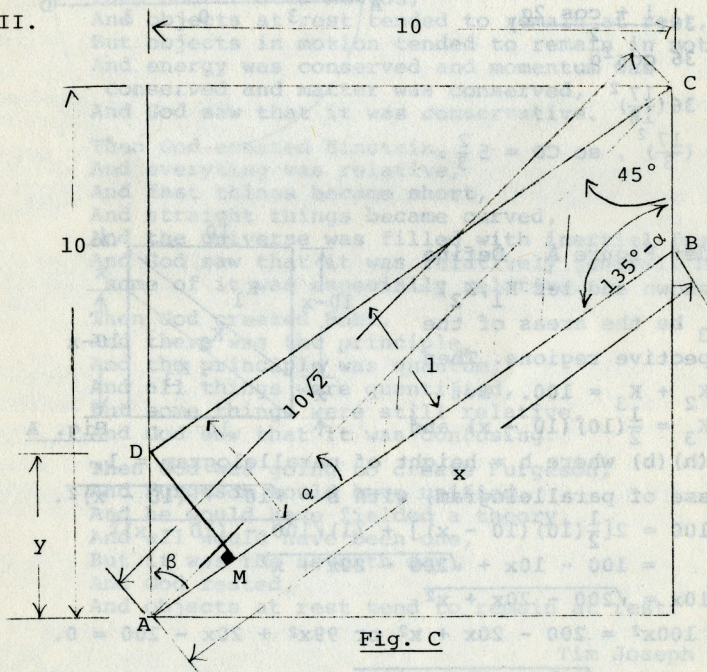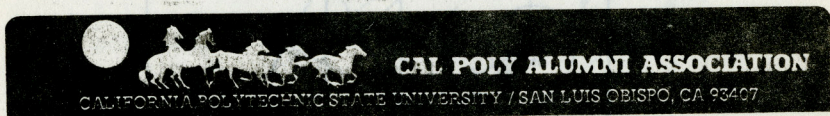which gives: $99x^2 + 20x - 200 = 0$ and proceed as in I.

III.

Fig. C

In $\triangle ABC$, $AC = 10\sqrt{2}$, $\alpha = \angle BAC$, $135° - \alpha = \angle ABC$, $AB = x$.
Area of strip ABCD = x. Desired area = 100 - x. In $\triangle AMD$,

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$\beta = \angle MAD$, $\beta = 45° + \alpha$.   BC = AD = y; MD = 1.

By Law of Sines, $\dfrac{\sin(135° - \alpha)}{10\sqrt{2}} = \dfrac{\sin 45°}{x} = \dfrac{\sin \alpha}{y}$.

But $\sin \beta = \sin(45° + \alpha) = \dfrac{1}{y}$, so

$\dfrac{\sin(135° - \alpha)}{10\sqrt{2}} = \sin \alpha \sin(45° + \alpha)$; $\sin 135° \cos \alpha -$

$\cos 135° \sin \alpha = 10\sqrt{2} \sin \alpha (\sin 45° \cos \alpha + \cos 45° \sin \alpha)$

$\Rightarrow \sin \alpha = \dfrac{1}{10\sqrt{2}}$.

From $\dfrac{\sin 45°}{x} = \dfrac{\sin \alpha}{y} = \sin \alpha \sin(45° + \alpha) =$

$\dfrac{1}{10\sqrt{2}} \dfrac{1}{\sqrt{2}}(\cos \alpha + \sin \alpha)$, we get

$\dfrac{20}{x\sqrt{2}} = \sqrt{1 - (\dfrac{1}{10\sqrt{2}})^2} + \dfrac{1}{10\sqrt{2}} = \dfrac{1}{10\sqrt{2}}(1 + \sqrt{199})$, so $x = \dfrac{200}{1 + \sqrt{199}}$.

Desired area = $100 - \dfrac{200}{1 + \sqrt{199}}$ (≈ 86.761)

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4.

Let points A and B be the centers of the two circles and let T be the foot of the perpendicular from Q to $\overline{SR}$. Then QT = PS = $10\sqrt{3}$, since $\triangle QRT$ is a 30-60-90 triangle. Let C, D, and E be the feet of the perpendiculars from B, A, and A to $\overline{PQ}$, $\overline{PQ}$, and $\overline{BC}$, respectively. Then BC = $\frac{1}{2}$ PS = $5\sqrt{3}$ and BE = BC - CE = BC - AD = $5\sqrt{3} - 5$.

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Let F and G be the feet of the perpendiculars from B to $\overline{QR}$ and $\overline{RS}$, respectively. Then triangles BRG, BRF, BFQ, and BCQ are all 30-60-90 triangles, with $\triangle BRG \stackrel{\sim}{=} \triangle BRF$, $\triangle BFQ \stackrel{\sim}{=} \triangle BCQ$, and $CQ = 1/\sqrt{3} \cdot BC = 5$. Then $AE = CD = 10$ and $AB = \sqrt{(AE)^2 + (BE)^2} = \sqrt{100 + (5\sqrt{3} - 5)^2} = 5\sqrt{8 - 2\sqrt{3}}$. Let H and K be the points of intersection of $\overline{AB}$ with the circles centered at A and B, respectively. If r is the radius of circle B, then $r = BC - 2 = 5\sqrt{3} - 2$. Then $HK = AB - 3 - r = 5\sqrt{8 - 2\sqrt{3}} - 3 - (5\sqrt{3} - 2) =$ $5\sqrt{8 - 2\sqrt{3}} - 5\sqrt{3} - 1$ ($\stackrel{\sim}{=} .9886$ cm.)

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