

M * A * T * H

COLLOQUIUM

THE MATHEMATICS DEPARTMENT OF SONOMA STATE UNIVERSITY
PRESENTS A SERIES OF INFORMAL TALKS OPEN TO THE PUBLIC

Wednesdays at 4:00 p.m.

Darwin Hall, Room 143

Coffee at 3:30 p.m.
Darwin Hall, Room 135

- SEPT 12 THE GEOMETRY OF FABRICS IN TWO AND THREE DIMENSIONS**
Professor Jean J. Pedersen of the Department of Mathematics, the University of Santa Clara, will present a discussion of surprising results obtained by exploring three dimensional analogues of some exciting facts in two dimensions.
- SEPT 19 OLD AND NEW RESULTS IN THE THEORY OF PRIME NUMBERS**
Professor Don Duncan of the Department of Mathematics, Sonoma State University, will discuss some solved and unsolved problems in the theory of prime numbers, including the latest discoveries, such as the largest known prime to date ($2^{44,497}-1$).
- SEPT 26 THE APPLICATIONS OF COLOR MICROCOMPUTER GRAPHICS**
Mr. Scott Anderson, a Sonoma State University B.S. graduate in physics, and now a member of Data Processing Directrix of Matrix Computer Systems, will demonstrate the applications of color microcomputer graphics to Fourier Analysis, autocorrelation functions, games, music, and art.
- OCT 3 QUANTITATIVE THEORIES OF CANCER**
Professor Alice S. Whittemore of the Department of Family, Community and Preventive Medicine, Stanford University, will review the development of mathematical theories for the induction of cancer at the cellular level. Consequences of the theories for tumor incidence as a function of duration and concentration of exposure will be compared with the results of human studies and animal experiments.
- OCT 10 AHMOSE, EGYPTIAN SCRIBE, AND THE RHIND PAPYRUS**
Professor Milton Hoehn of the Department of Mathematics, Santa Rosa Junior College, will give historical highlights of the Rhind Mathematical Papyrus and discuss a few of the problems. Illustrated with slides.
- OCT 17 TOPOLOGICAL SEMIGROUPS ARE NOT MUCH LIKE GROUPS**
Professor Jane M. Day of the Department of Mathematics, College of Notre Dame, will survey topological semigroups development from 1950 to now, starting with the initial work of A. D. Wallace to generalize the theory of topological groups, through the discovery of very odd examples by him and students, and more recent work of Hofman and Mostert on the structure of irreducible semigroups.
- OCT 24 DEFINITIONS IN EUCLIDEAN GEOMETRY**
Professor Leon Henkin of the Department of Mathematics, University of California, Berkeley, will discuss the use of notions called "primitives" in Euclidean geometry to define the many concepts in the subject, and explore relationships among several collections of such "primitives."
- OCT 31 TEACHING A COMPUTER TO DRAW LETTERS**
Mr. Sumner Stone of the Department of Mathematics, Santa Rosa Junior College, will look at letter shapes, why they are so diverse, and how an algorithm for drawing them may be developed. Demonstration and slide show will be included.
- NOV 7 COMBINATORIAL SCHEDULING,
OR BY JUST HOW MUCH CAN TOO MANY COOKS SPOIL THE BROTH**
Dr. R. L. Graham of Bell Labs, visiting professor at Stanford University, will describe recent attempts to understand why scheduling problems are often so difficult and to what extent scheduling difficulties may be overcome.
- NOV 14 FRAGMENTS FROM THE HISTORY OF TOPOLOGY: RIEMANN AND POINCARÉ**
Professor Max K. Agoston of the Department of Mathematics, San José State University, will discuss the origins of algebraic topology up to the end of last century, emphasizing the contribution of Riemann and Poincaré to the topological classification of surfaces and the foundation of combinatorial topology.
- NOV 21 THANKSGIVING RECESS**
- NOV 28 SPLITTING AND DISCONNECTING THE REALS**
Professor Charles Phillips of the Department of Mathematics, Sonoma State University, will discuss a proposed development of a number system with applications to measurement, integration, and probability by using ultra filters.
- DEC 5 WHY ARE SOME PROBLEMS SO HARD?**
Professor Ken Rebman of the Department of Mathematics, California State University, Hayward, will review a general theory about why some seemingly simple problems are difficult for even the best mathematicians and the fastest computers.

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- FEBRUARY 13** **BOOLEAN ALGEBRA IN DIGITAL ELECTRONICS**
Professor Richard Karas of the Department of Physics and Astronomy, Sonoma State University, will discuss Boolean logic expressions, implemented by integrated circuits which form the basis of digital electronics from simple controllers through microprocessors to large computers.
- FEBRUARY 20** **CORPORATE LIFECYCLE AND THE MATH OF FUTURE FUNDING**
Mr. Jim McBride, Manager, Corporate LifeCycle, Fireman's Fund Insurance Company, San Rafael, a 1976 Sonoma State University graduate in Mathematics, will discuss the Retired Lives Reserves concept, a method of prefunding continuous group term life insurance.
- FEBRUARY 27** **STABILITY OF A TENNIS RACKET**
Professor Veril L. Phillips of the Department of Mathematics, San Jose State University, will discuss the mathematics which describes the stable and unstable rotations of rigid bodies.
- MARCH 5** **PROOF AND DISCOVERY USING LINEAR INEQUALITIES**
Professor Allan B. Cruse of the Department of Mathematics, University of San Francisco, will show how results from the theory of linear inequalities can be used to reveal and verify unobvious facts about finite designs, including 'graphs'.
- MARCH 12** **CAN CUBES AVOID MEETING FACE TO FACE?**
Professor Raphael M. Robinson of the Department of Mathematics, University of California, Berkeley, will consider such questions as: If a family of unit cubes covers space without overlapping, must a cube share a complete face with another cube? What happens if we allow multiple tilings?
- MARCH 19** **NAIVE NOTIONS OF LIMIT, INTUITION AND PARADOX**
Professor Patrick J. Boyle of the Department of Mathematics, Santa Rosa Junior College, will show why intuition can be a valuable investigative asset. It can, however, lead one to paradoxical conclusions or prove useless to explain certain results. These points will be illustrated via a wide range of largely geometric examples.
- MARCH 26** **A KALEIDOSCOPE OF EQUIVALENCE RELATIONS**
Professor Clement E. Falbo of the Department of Mathematics, Sonoma State University, will present a geometric version of equivalence relations. Problems of constructing minimum equivalence relations containing various given sets will be solved and some beautiful graphs of equivalence relations will be shown.
- APRIL 2** **SPRING RECESS**
- APRIL 9** **GOING STRAIGHT ON CURVED SURFACES**
Professor Thomas Volk of the Department of Mathematics, Sonoma State University, will discuss the nature of geodesic curves on various surfaces in Euclidean 3 - space.
- APRIL 16** **SITTING ON THE BAR, OR WAITING FOR THE ELEVATOR**
Professor David Sklar of the Department of Mathematics, Sonoma State University, will discuss some elementary properties of a family of discrete random variables that arose in the investigation of a common backgammon situation, sitting on the bar, and in the study of an unusual queue, waiting for the elevator. The discussion will involve some elementary probability theory and the summation of some nice infinite series.
- APRIL 23** **THE CERTAINTY AND CERTIFIABILITY OF THINGS WE THINK WE KNOW**
Dr. Carl S. Ledbetter, Acting Dean of Academic Planning, Sonoma State University, will deal with the mathematical, philosophical, logical, psychological, empirical, (and sociological) implications of the methods by which we certify knowledge, investigating the compelling nature of mathematical proof and exploring the contrast with things we know because of evidence of other sorts.
- APRIL 30** **NATURAL LEARNING AND EULERIAN NUMBERS**
Professor Dave Logothetti of the Department of Mathematics, University of Santa Clara, will describe why most collegiate mathematics instruction may be backward, and present some ideas on how to turn it around, illustrated with Eulerian numbers, Pascal's triangle, crazy cartoons, and corny jokes.
- MAY 7** **GRAPHICAL REPRESENTATION OF MULTIVARIATE DATA WITH APPLICATION IN SOVIET INFLUENCE IN SUB-SAHARAN AFRICA**
Dr. Peter C. C. Wang of the Department of Mathematics and National Security Affairs, Naval Postgraduate School, Monterey, will present a qualitative assessment of the Soviets' influence in 25 sub-Saharan African countries, based on quantitative analysis of raw data.
- MAY 14** **AN INTRODUCTION TO SAMPLING THEORY AND ITS APPLICATION TO FORESTRY**
Professor Howard Stauffer of the Department of Mathematics, University of British Columbia, will describe some work he is doing for the British Columbia Forest Service developing sampling methodology. He will discuss the t-distribution and give some examples from forestry.



FALL 1980

THIRTEENTH SERIES

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- SEPTEMBER 10** **SURFACES OF CONSTANT MEAN CURVATURE**
Professor Robert Gulliver, visiting professor in the Department of Mathematics, Stanford University, will describe properties of surfaces with a given boundary curve, containing a given volume, and having the smallest possible area. Old, new, and even unsolved problems will be illuminated.
- SEPTEMBER 17** **SOME TOPOLOGY OF THREE DIMENSIONS**
Professor Hans Samelson, Department of Mathematics, Stanford University, will describe the unique difficulties of living in a three-dimensional world.
- SEPTEMBER 24** **A SATELLITE FREED OF ALL DISTURBANCES**
Professor Dan DeBra, Department of Aeronautics and Astronautics, Stanford University, will speak. In the near vacuum of outer space, satellites are subject to very small residual disturbances: radiation of the sun; upper atmospheric particles, etc. These disturbances can be cancelled exactly, giving a reading of the earth's gravitational field.
- OCTOBER 1** **UNIFORM PARTITIONS OF AN INTERVAL**
Professor V. Drobot, Department of Mathematics, University of Santa Clara, will present the illustrious history of the subject. In the second half of his talk, he will explain some modifications of the concept, exploring connections with number theory and the theory of probability.
- OCTOBER 8** **THE USE OF LANDSAT DATA AND SAMPLING THEORY FOR AGRICULTURAL INVENTORIES**
Mr. Thomas W. Gossard, Space Sciences Laboratory, University of California, Berkeley, will talk about the use of satellite data to generate estimates of agricultural acreage in California.
- OCTOBER 15** **HOW TO FACTOR NUMBERS**
D. H. Lehmer, Professor Emeritus of Mathematics, University of California, Berkeley, will give a simple account of the problem of factoring a composite number (a) when nothing is known about the number, and (b) when the number is of special form.
- OCTOBER 22** **RADIOTELEGRAPHY AND FOUR-DIMENSIONAL GEOMETRY**
Dr. Nelson M. Blachman, Senior Scientist at the GTE Sylvania Systems Group in Mountain View, will explain why the problem of discriminating between two different possible signals in the presence of noise is often basically four-dimensional. He will give some of the relevant aspects of four-dimensional geometry. These include surprises for creatures accustomed to only three dimensions.
- OCTOBER 29** **THE ELLIPSOID ALGORITHM FOR LINEAR PROGRAMMING**
Dr. Leonard Tornheim of Chevron Research Corporation will describe a recent algorithm, remarkably different from the simplex algorithm. Unlike the latter, the ellipsoid algorithm requires only "polynomial time".
- NOVEMBER 5** **BAER'S THEOREM AND FOUNDATIONS OF GEOMETRY**
Professor James T. Smith, Department of Mathematics, San Francisco State University, will give an elementary proof of Baer's Theorem, using linear algebra. The theorem — that no finite projective plane has an elliptic polarity — will be explained and applied to a problem in foundations of geometry.
- NOVEMBER 12** **MATHEMATICS IN INDUSTRY**
Dr. George Angwin of Singer-Link (Sunnyvale) will compare and contrast the two worlds of mathematics — academic and industrial. He has lived in both societies.
- NOVEMBER 19** **THE BRACHISTOCHRONE PROBLEM AND THE CALCULUS OF VARIATIONS**
Dr. James Foster of Lockheed (Sunnyvale) will give applications, extensions, and history of the brachistochrone problem (path of quickest descent) and other problems of the calculus of variations.
- NOVEMBER 26** **THANKSGIVING RECESS**
- DECEMBER 3** **QUADRATURE BY THE TRAPEZOIDAL RULE**
Dr. Henry Fettis, retired, U.S. Air Force, will compare several quadrature formulas. The trapezoidal formula is the first learned by most students, and is considered a rough method. It turns out, surprisingly, that for a certain class of integrands, it is the most accurate of all formulas.
- DECEMBER 10** **WHAT IS NOETHERIAN?**
Professor A. Seidenberg, Department of Mathematics, University of California, Berkeley, will give a definition of "Noetherian ring" suitable for constructivist arguments. He will show that if the ring (of numbers) R is Noetherian, then $R[x]$ is also.



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Bettye ✓
FEBRUARY 18 ✓

COMBINATORIAL PROBLEMS IN GEOMETRY

Dr. Paul Erdős, world renowned Hungarian number theorist, will speak on solved and unsolved problems in this field, such as the Gallai-Sylvester Theorem: If n points in the plane do not lie on a line, then there exists a line containing exactly two of them.

Dan ✓
FEBRUARY 25 ✓

SPLINE FUNCTIONS

Dr. Clement E. Falbo, Department of Mathematics, Sonoma State University, will describe a new method for solving "variable-coefficient" linear differential equations. The spline solutions yield a computer algorithm that is a hybrid between numerical methods and exact solutions.

Rich ✓
MARCH 4 ✓

TOWARD SYMMETRY WITH STEINER

Dr. Rick Luttmann, Department of Mathematics, Sonoma State University, will discuss research results from his sabbatical last year on the questions as to when an infinite sequence of Steiner symmetrizations converges, and to what.

Bill ✓
MARCH 11 ✓

WHALES, WHALING, AND MATHEMATICAL MODELS

Dr. Roland H. Lamberson, Department of Mathematics, Humboldt State University, will survey several mathematical models of the whaling industry and compare the predictions of each of these models with the development and decline of that industry during the post World War II period. He will also consider the question whether it would be "economically optimal" to drive certain species of whales to extinction.

RHJ ✓
MARCH 18 ✓

THE DISTRIBUTION OF INCOME: A CORE MODEL OF EARLY 19th CENTURY CAPITALISM

Dr. Gerald V. Egerer, Department of Economics, Sonoma State University, will apply elementary differential calculus to a model of an agrarian economy in which the population is divided into landowners, capital-owning tenant farmers, and farm labourers. A number of assumptions are adopted, broadly corresponding to the thinking of that time, and the resulting model articulated with a view to discovering how income is distributed among rents, profits, and wages.

Clam ✓
MARCH 25 ✓

MAURITS ESCHER'S "CIRCLE LIMITS": APPLICATIONS OF HYPERBOLIC GEOMETRY

Dr. Donald W. Crowe, Department of Mathematics, University of Wisconsin, on leave at California State University, Chico, will introduce the Poincaré model for hyperbolic geometry and show how it applies to Escher's four Circle Limit prints including the famous "Angels and Devils". This talk will show in detail how some of Escher's delightful prints, inspired by mathematics and physics, illustrate exotic facts from non-Euclidean geometry.

Steve ✓
APRIL 1 ✓

RUBIK'S CUBE: A SOLUTION FROM THE THEORY OF FINITE GROUPS

Dr. Carl Ledbetter, Director of the Southern California Earthquake Preparedness Project, but a mathematician in real life, will apply some nice mathematics to this intriguing puzzle. Extracting from his joint paper with Nering of Arizona State University, he will show that by considering the puzzle as a group of symmetries, an elegant solution can be found from among the 8.6×10^{22} configurations.

Chuds ✓
APRIL 8 ✓

CRAB FISHING WITH DIFFERENCE EQUATIONS

Dr. Ken Yanosko, Department of Mathematics, Humboldt State University, will explain how mathematical models and computer simulations can be used to study the cyclic behavior of certain populations, with particular reference to recent work on the Northern California Dungeness Crab fishery.

APRIL 15 ✓

SPRING RECESS and INCOME TAXES DUE: NO COLLOQUIUM

Tom ✓
APRIL 22 ✓

DOING THE TWIST

Mr. Richard Montgomery, Sonoma State University mathematics and physics graduate, will discuss the following riddle, which has applications to a recent reformulation of physics in terms of complex analytic geometry: "When rotated once it is changed; but when rotated twice it is not — what is it?"

Jean S. ✓
APRIL 29 ✓

CONVEX POLYHEDRA WITH REGULAR FACES

Mr. Craig Burbank, mathematics student at Sonoma State University, will talk about a general scheme for description and classification of these polyhedra, including relationships between individual polyhedra. In addition, he will give examples of polyhedra in this family that are special cases of more general polyhedron families.

Norm ✓
MAY 6 ✓

A BAG OF M & M's

Ms. Carol Olmstead, Department of Mathematics, Santa Rosa Junior College, and Sonoma State University graduate, will offer some tidbits for those who find both Music and Mathematics tasty! The mathematical basis for several musical scales will be presented, along with a number of other interesting ties between these two ancient and enduring arts, involving symmetries, cycles, transformations, progressions, a bit of Bach, and a morsel of Mozart.

Ed ✓
MAY 13 ✓

THE RISE, AND FALL, AND RISE OF QUATERNIONS

Dr. Eldon J. Vought, Department of Mathematics, California State University, Chico, will talk about the curious history of this concept: Sir William Rowan Hamilton, who discovered quaternions around 1840, believed that they would constitute the framework for the physical theories of the future. However, following his death in 1865 quaternions fell into obscurity, until the last decade when interest in them revived and they became a useful tool in applied mathematics.



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- SEPTEMBER 16** **ANGLE TRISECTION**
Dr. William J. Barnier, Department of Mathematics, Sonoma State University will speak on "How you can. Why you can't."
- SEPTEMBER 23** **ALGEBRAIC AND TRANSCENDENTAL VALUES OF THE TRIGONOMETRIC FUNCTION**
Dr. Donald Duncan, Department of Mathematics, Sonoma State University will give a discontinuous continuation of Professor Barnier's presentation.
- SEPTEMBER 30** **HAMILTONIAN CIRCUITS—FROM THE 4-COLOR PROBLEM TO ORGANIC CHEMISTRY**
Dr. David Barnette, Department of Mathematics, University of California, Davis will tell how a certain problem dealing with paths along edges of polyhedra led to many unsuccessful attempts to solve the 4-color problem but eventually had very surprising applications in other fields.
- OCTOBER 7** **THE TRAGEDY OF TOSCA AND THE PROBLEM OF DISARMAMENT**
Professor Steven Smale, University of California, Berkeley will discuss these questions from the perspective of the theory of games and the mathematics of time.
- OCTOBER 14** **DRAMA IN MATHEMATICS—A DEMONSTRATION WITH PARTITIONS**
Dr. Henry L. Alder, Department of Mathematics, University of California, Davis will emphasize the beauty, the excitement, the surprises—in short, the drama in mathematics.
- OCTOBER 21** **EULER, DESCARTES, POINCARÉ AND POLYA (ON POLYHEDRA)**
Professor Jean Pedersen, Department of Mathematics, University of Santa Clara will discuss two remarkable, and seemingly different, theorems about polyhedra.
- OCTOBER 28** **OTHER INTERESTING COLORING PROBLEMS**
Dr. John Mitchem, Department of Mathematics and Computer Science, San Jose State University will tell how two mathematicians combined with three computers in 1976 to solve the famous Four Color Map Problem. Other interesting, easily understood but difficult to solve coloring problems will be discussed.
- NOVEMBER 4** **PARABOLAS AND PARALLELOGRAMS**
Professor Thomas M. Green, Department of Mathematics, Contra Costa College will examine the elementary plane geometry properties of the tangents and chords of a parabola.
- NOVEMBER 11** **COMPUTER GENERATED MAPS—THEIR EFFECTIVENESS IN COMMUNICATING MAGNITUDE, GRADIENT, AND PATTERN INFORMATION**
Dr. Joseph W. Frasca, Department of Geography, Sonoma State University will speak on the four-way factorial analysis of variance design which is used to assess the efficiency of two and three dimensional computer produced surfaces in communicating height, slope, and pattern information to map readers.
- NOVEMBER 18** **HOW TO QUICKLY DO THE SUM $1 + 1/\sqrt{2} + \dots + 1/\sqrt{196833}$**
Professor Buck Ware, Department of Mathematics, California State University, Chico, will speak on the Euler-Mascheroni constant γ_s associated with the function $f(x) = 1/x^s$ used to measure the discrepancy between the integral of f and the infinite series $\sum f(n)$. A surprising conjecture on the behavior of the coefficients of the power series for γ_s is posed.
- DECEMBER 2** **AREA RATIOS IN CONVEX POLYGONS**
Professor Mac Larsen, Department of Mathematics and Computer Science, San Jose State University will construct a new polygon by connecting certain points on the sides of a given convex polygon, and explore the applicability of a formula for the ratio of the areas of the two polygons.
- DECEMBER 9** **NONLINEAR TRANSFORMATIONS WITH APPLICATIONS TO EVALUATING INFINITE SERIES**
Professor Lloyd Gavin, California State University, Sacramento will discuss the use of some nonlinear transformations which accelerate convergence of slowly converging series.



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| FEBRUARY 10 | LATTICES AND LOGIC
Professor George Epstein, Department of Computer Science, University of Indiana, and Visiting Professor, Department of Mathematics, San Francisco State University, will discuss the process man uses to reason deductively. He will provide different pictures to reveal the distinctions between different deductive systems. |
| FEBRUARY 17 | WHAT'S A DIGITAL SIGNATURE?
Professor William Nico, Department of Mathematics, Tulane University, will look at some of the problems which arise from man's desire to establish secure communications in an insecure environment and present some of their proposed solutions. |
| FEBRUARY 24 | THE MONSTER
Professor Geoffrey Mason, Department of Mathematics, University of California, Santa Cruz, will present an exposition of the recently concluded hunt for the Fischer-Griess Monster simple group of order 8080, 17424, 79451, 28758, 86459, 90496, 17107, 57005, 75436, 80000, 00000, and its life in the 196,883rd dimension. |
| MARCH 3 | ENGINEERING DATA HANDLING, NOW AND IN THE FUTURE
Professor Peter C. C. Wang, Department of Mathematics, Naval Postgraduate School, Monterey, will speak on the dynamic nature of the technological development of mass storage and retrieval of digitized data and of methods to avoid the almost immediate obsolescence of newly developed systems. The use of optical disks and lasers in storage will be discussed. |
| MARCH 10 | PATTERN AND CHANCE IN COMPUTER GRAPHICS
Dr. James Murphy, Department of Computer Science, California State University, Chico, will present slides of computer-generated line drawings showing the play between the pattern of mathematical functions and the chance element of pseudo-random numbers. |
| MARCH 17 | MAGIC WITH MULTIPLICATIVE FUNCTIONS
Mr. Nick Franceschine of the Wyatt Co., San Francisco, will exhibit a number of interesting results from this branch of number theory, including ties to the Riemann Zeta Function. |
| MARCH 24 | RANDOM WALKS--SIMPLE RESULTS, SURPRISING CONCLUSIONS
Professor Evan Fisher, Department of Mathematics, University of Santa Clara, will discuss some aspects of the simple random walk that run counter to our intuition. |
| MARCH 31 | HOW TO GAMBLE IF YOU MUST
Sister Madeleine Rose, Professor of Mathematics, Holy Names College, will discuss odds and strategies of the most common casino games. Knowing the odds is not a guarantee of winning, but not knowing them is certain disaster. Perhaps you may learn how to lose less! |
| APRIL 14 | PARADOX OF SOCIAL CHOICE--A WAY OF RESOLUTION
Professor Serge Ovchinnikov, Mathematics Department, San Francisco State University, will discuss a possible way of escape from the famous Arrow's paradox of social choice. The method of resolution is based on multi-valued logic. |
| APRIL 21 | A POTPOURRI OF a^b , b^a AND e
Professor Hal Andersen, Department of Mathematics, Santa Rosa Junior College, will present a selection of tidbits regarding e , $\int_1^x \frac{1}{t} dt$, and the commutativity of a^b . An inquiring mind, a modicum of mathematical talent, and a sympathetic nature are prerequisites for this talk. |
| APRIL 28 | SPACE-FILLING TORI
Professor Dan Wheeler, Department of Mathematics, Menlo College, will tell of some surprising polyhedra tori that link together to fill three-dimensional space. Polyhedral models will be used to illustrate the talk. |
| MAY 5 | DOES A TUNA IN HAND MEAN N IN THE SEA?
Professor Roland Lamberson, Department of Mathematics, Humboldt State University, will use mathematical models to examine the relationship between catch and effort in certain fisheries, with particular attention given to the unexpected collapse of fisheries such as the Pacific sardine. |
| MAY 12 | A NARRATIVE DESCRIPTION OF A TRANSACTION PROCESSING SYSTEM
Dr. James Gray, Tandem Computers, of Cupertino, will discuss how banks, airlines and car rental agencies use computers to keep their books--a "tour of the work flow through a typical transaction processing system." |



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- SEPTEMBER 15 THE DISTANCE BETWEEN PÓLYA PATTERNS
Professor Russell Merris, Department of Mathematics, California State University, Hayward--
Suppose the faces of a polyhedron are colored using n colors. Two colorings are equivalent
if one can be obtained from the other by a rotation of the polyhedron. Equivalent colorings
form a color pattern. Pólya's Theorem enumerates the color patterns. The talk will describe
this enumeration together with some recent work of the speaker concerning the concept of dis-
tance between the patterns.
- SEPTEMBER 22 SOME SECRETS EVERY MATHEMATICS TEACHER SHOULD KNOW
Professor Kurt Kreith, Department of Mathematics and MAT Program Director, University of Cali-
fornia, Davis--Future teachers of mathematics should be provided with an understanding of ele-
mentary mathematics from an advanced point of view. This talk will deal with topics from the
secondary school curriculum which can be addressed under this heading. It provides an intro-
duction to the Master of Arts in Teaching (MAT) degree program at UC Davis which seeks to com-
bine such mathematical background with the pedagogical training required for the teaching
credential.
- SEPTEMBER 29 DOING WITHOUT CALCULUS
Professor W. Barnier, Department of Mathematics, Sonoma State University, will show how many
max-min problems solved in first semester calculus can be solved using high school algebra.
- OCTOBER 6 THE IMPLICIT FUNCTION THEOREM REVISITED
Professor Hans Samelson, Chairman, Department of Mathematics, Stanford University, will discuss
the implicit function theorem and its modern form--the transversality theorem--and apply to
problems like the impossibility of embedding the projective plan in R^3 and to Hopf's Theorem
on vector fields in manifolds.
- OCTOBER 13 CALCULUS REVISITED
Professor Richard W. Hamming, Department of Computer Science, Naval Postgraduate School in
Monterey--"After 30 years of doing industrial mathematics, I returned to teaching only to find
that there is a good deal of ferment concerning the calculus course. The forces acting on the
subject include the rise of discrete mathematics, the changing preparation and needs of the
students, and our changing perception of mathematics generally. The talk discusses many of
these forces and a number of things I never knew about the calculus until I began to rethink
the topic."
- OCTOBER 20 THE VIRTUES OF FLAT FILES
Dr. Richard Gordon, Instructional Computing Consultant, Sonoma State University Computing
Center--"In this talk, I will discuss the merits of 'flat' files, the economy with which infor-
mation can be stored, and the speed with which data bases can be altered to meet changing
requirements. Specific examples will be taken from the files used at SSU to store information
about student enrollment."
- OCTOBER 27 SCORING PREDICTIONS
Dr. Reed Dawson, Department of Mathematics and Computer Sciences, San Jose State University,
will show how philosophies of the value of money lead to valuations of prognosticators like
weather forecasters and military analysts who assign probabilities to their predictions.
- NOVEMBER 3 THE MEANS JUSTIFY THE EXTREMES
Professor Terry Shell, Department of Mathematics, Santa Rosa Junior College, will discuss geo-
metric inequalities and their applications, including packing problems and optimization prob-
lems usually done with calculus.
- NOVEMBER 10 SOME UNSOLVED MATHEMATICAL PROBLEMS IN MEDICAL IMAGE PROCESSING
Dr. Paul Scheibe, ADAC Laboratories, Sunnyvale, will discuss medical image processing and
provide an introduction to a set of related unsolved mathematical problems. The problems
range from integral equations to mathematical programming. Numerical solutions will be related
to the physical problems being modeled.
- NOVEMBER 17 AFTER THE QUATERNIONS, WHAT?
Professor Buck Ware, Department of Mathematics, California State University, Chico--"Complex
numbers are ordered pairs of reals, and quaternions are ordered pairs of complexes. Why can't
you blithely continue to build new algebras out of old? You first find yourself lost in a
morass of nonassociativity, then in more serious trouble (discovered by Frank Adams) of a topo-
logical nature."
- DECEMBER 1 ARTIFICIAL INTELLIGENCE
Dr. Ken Larson, Department of Mathematics/Computer Science, Sonoma State University, will give
a general introduction and overview of methods in artificial intelligence.
- DECEMBER 8 IS YOUR COMPUTER'S ARITHMETIC FOR REAL?
Professor Michael Lyle, Department of Mathematics/Computer Science, Sonoma State University,
will motivate and describe the proposed IEEE standard for binary floating point arithmetic
(REALs in PASCAL and FORTRAN), and relate some experiences in implementing it at UC, Berkeley
on a DEC VAX 11/780.



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- FEBRUARY 9 CHEMICAL REACTIONS AND DIFFERENTIAL EQUATIONS
Professor Lois Rosenthal, Chemistry Department, The University of Santa Clara -- Chemists use differential equations to describe how various conditions affect the rate of a reaction. With many chemical systems, the equations cannot be solved analytically. However, as I will show, a simple numerical methods technique may be used to study the kinetics of very complicated chemical reactions.
- FEBRUARY 16 A CHARACTERIZATION AND ENUMERATION OF THE HOMOMORPHISMS OF FINITE BOOLEAN ALGEBRAS
Professor Theodore E. Ferretta, Jr., Mathematics Department, California State University, Hayward -- Let A and B be finite Boolean algebras. In this talk, it will be demonstrated that in describing a homomorphism from A to B it is sufficient to only describe it for certain key elements (the atoms) of A and B. From this result will follow a characterization and enumeration of all the homomorphisms from A to B.
- FEBRUARY 23 INTERCEPTING MOVING OBJECTS IN A CONNECTED NETWORK
Professor T. D. Parsons, Mathematics Department, California State University, Chico, will address the problem of intercepting all continuously moving objects on a finite connected graph in a finite span of time by sending out interceptions. In particular, the least number of interceptions guaranteeing success will be determined. Applications to video computer games such as "Pac-Man" will be considered. The lecture will show how mathematicians formulate and analyze mathematical models arising from real life problems.
- MARCH 2 STATISTICAL PROBLEMS IN BIOLOGY AND MEDICINE
Professor Lincoln E. Moses, Statistics Department, Stanford University -- Statistics is useful in medical research in many ways. Examples, to be discussed, include: assessment of the implications of routine experience, measurement, planning of experiments and studies.
- MARCH 9 TRANSPORTATION AND ASSIGNMENT PROBLEMS
Professor C. E. Falbo, Mathematics/CIS Department, Sonoma State University, will solve certain practical problems from OPERATIONS RESEARCH. Applications range from scheduling and assignment problems in athletics and the legal profession to transportation and storage problems in business. The methods illustrated here are very powerful, yet require only basic arithmetic.
- MARCH 16 PARKING A CAR: A MATHEMATICAL MODEL
Professor John Sawka, Mathematics Department, The University of Santa Clara--How can one most efficiently parallel park? How much room does it take? Why does it take more room if you drive head-in instead of backing in? These and other interesting questions concerning the movement of a car are answered with a simple mathematical model.
- MARCH 23 SAMPLING SIGNALS
Professor Dale H. Mugler, Mathematics Department, The University of Santa Clara--One method of signal transmission involves sampling a given signal at certain time-instances, subsequently transmitting the resulting digital signal in the form of narrow pulses, and finally reconstructing the original analog signal at the receiver. This talk will focus on the mathematical means of reconstructing a signal from its samples, including basic techniques for determining the rate at which a signal must be sampled, methods used for non-bandlimited signals, and recent developments aimed at producing faster numerical methods for the signal reconstruction.
- APRIL 6 PARALLEL PROCESSING
Reverend Dennis C. Smolarski, S.J., Mathematics Department, The University of Santa Clara, will discuss what many suggest will be the next major advance in the use of computers--simultaneous (parallel) execution of sections of the same program or algorithm rather than sequential (serial) execution. He will discuss recent theoretical and practical advances on the level of single operations, of algebraic expressions, of entire programs, and of programming languages, and conclude with practical questions for theoretical mathematicians.
- APRIL 13 FROM MULTI-OPS TO MEGAFLOPS IN 25 YEARS
Tep Dobry, Lecturer, Department of Mathematics/CIS, Sonoma State University, will describe the major contributions of hardware and software organization to improvement of computing system speed over the years. Current directions in the field will also be discussed.
- APRIL 20 LOCAL AREA COMPUTER NETWORKS
Michael Lyle, Lecturer, Department of Mathematics/CIS, Sonoma State University--How to get my computer to talk to yours--ethernets, ringnets, loopnets, and busses, along with standardization efforts and editorial comments on future directions.
- APRIL 27 THE ALGEBRA OF (SEMI-) MAGIC SQUARES
Professor Peter Ross, Mathematics Department, The University of Santa Clara -- Magic squares of a given size form a vector space; what is its dimension? In addition to answering this question, the talk will discuss other interesting algebraic features of spaces of magic or semi-magic squares.
- MAY 4 FIRST DIGIT PROBLEM
Professor Vladimir Drobot, Mathematics Department, The University of Santa Clara -- It is an empirical fact that the digit "1" occurs in nature more often than other digits. Some mathematical models to explain this phenomena will be discussed.

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Darwin Hall, Room 108

Coffee at 3:30 p.m.
Darwin 108 Lobby

- SEPTEMBER 14 A POLYNOMIAL-TIME ALGORITHM FOR THE PERSONNEL ASSIGNMENT PROBLEM
Professor Allan Cruse, Mathematics/CIS Department, Sonoma State University, will present a topic of interest to both mathematics and computer science audiences. A personnel manager wishes to assign n jobs to a set of n job applicants in such a way as to minimize the total cost to the Company of training each applicant to do the job assigned. An algorithm for a solution to this problem will be discussed.
- SEPTEMBER 21 THE COMMUNICATIONS COLLECTION
R. E. Claussen, Associate Staff Manager, Pacific Telephone, Sacramento, will briefly explain the similarity of the worldwide automatic dial telephone communications system and today's computers. Much of the same technology is used in both types of systems, and some of this common technology will be explained and demonstrated.
- SEPTEMBER 28 STATISTICAL PROJECTS OF THE U.S. DEPARTMENT OF AGRICULTURE
Professor Nancy Carter, Mathematics Department, Chico State University, will discuss some of the work currently being done by the Statistical Reporting Service of the U.S. Department of Agriculture. The talk will include some of the statistical research being conducted and will partly illustrate how one government agency uses statistics.
- OCTOBER 5 REFLECTIONS ON AND IN FOUNDATIONS OF GEOMETRY
Professor James T. Smith, Mathematics Department, San Francisco State University—In one approach to the foundations of geometry, axioms are developed to describe groups of motions. The geometries are then reconstructed from those groups using the natural correspondence between some geometrical concepts and some group theoretical ones. The fundamental work of Friedrich Bachmann and his precursors for plane absolute geometry will be outlined as well as that of his students and the speaker for higher dimensions. Applications to other geometries will be mentioned.
- OCTOBER 12 INTEGRAL SPLINES AND COMPUTER GRAPHICS
Professor James Murphy, Computer Science Department, Chico State University, will present a survey of techniques used to represent curves and surfaces in Computer Graphics and in Computer-Aided Design. A new method, Integral Splines, will also be presented.
- OCTOBER 19 WHAT ARE THE CHANCES OF ...? OR COMPUTER METHODS FOR DETERMINING PROBABILITY
Professor Eddie Reiter, Mathematics and Computer Science Department, California State University, Hayward—Engineering projects are often concerned with possibility of failure in large, complex systems. Sets consisting of events that cause failure can be generated by computer methods. Several fast algorithms for doing this will be discussed. In other words, if the situation is complex (what are the chances of meltdown?), the computer may or may not be able to give the answer quickly.
- OCTOBER 26 BASAL BODY TEMPERATURE AND URINARY ESTROGEN EXCRETIONS: A STATISTICAL MODEL
Professor Julia A. Norton, Statistics Department, California State University, Hayward—During a menstrual cycle, many functions of a woman's body behave in a pattern, recognizable from cycle to cycle and from woman to woman. We will consider two of these functions, discuss a statistical model, look at some examples of the fitted model and discuss the potential for increasing precision in administering fertility drugs.
- NOVEMBER 2 L. E. J. BROUWER, INTUITIONISTIC MATHEMATICS
Professor Karel de Bouvere, Mathematics Department, The University of Santa Clara—L. E. J. Brouwer was 25 years old when he wrote his doctoral dissertation with the pretentious title "On the Foundations of Mathematics." The year was 1907, during the period to which present mathematicians refer as "the foundational crisis of the turn of the century." Both logicians (Frege, Whitehead-Russell) and formalists (Hilbert) projected their solutions. Brouwer rejected both efforts. His intuitionistic approach, extremist in his days, has stood the tooth of time.
- NOVEMBER 9 LIFE AMONG THE ACTUARIES
Mr. Dorr Clark of ADAC Laboratories, Sunnyvale, will speak on his experiences as a mathematician working in the actuarial field and will also discuss the lucrative career opportunities for mathematicians therein. This talk should be of interest to mathematicians, business management majors and economists.
- NOVEMBER 16 HARMONIC SERIES
Professor Warren Ruid, Mathematics Department, Santa Rosa Junior College, will discuss a host of interesting problems involving harmonic series, many of which have counter-intuitive results.
- NOVEMBER 30 COMPUTER INTERFACING WITH LIGHT PEN AND COLOR GRAPHICS
Professor Robert Plantz, Mathematics/CIS Department, Sonoma State University—A specific application from the container shipping industry will be used as an example of software design to provide the user with light pen interaction with a computer system. The light pen is used with a color display to plan the movements of containers to and from a ship. The talk will concentrate on the practical details of the design and how they grew from the operational requirements and the hardware/software constraints.
- DECEMBER 7 DBMS TRENDS INTO THE NINETIES
Professor Donna Crawford, Mathematics/CIS Department, Sonoma State University—Data base management systems (DBMS) are undergoing many changes since their first conception in the 1960's. The four major predicted trends for the nineties are to relational DBMS, totally integrated software systems, firmware in the form of software on a chip and DBMS's which incorporate distributed data processing (DDP). How will these trends affect the market place?



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- FEBRUARY 15** **WRITING ABOUT MATHEMATICAL SCIENTISTS**
Constance Reid, Author, San Francisco, California. The author Constance Reid will discuss the unique problems she has faced in writing the lives of such mathematical scientists as David Hilbert, Richard Courant, and Jerzy Neyman as well as the general problems of writing biography. The talk should be of interest to students of literature and history as well as those in the mathematical sciences.
- FEBRUARY 22** **THINGS TO LOOK AT, THINGS YOU CAN'T SEE**
Professor Patrick J. Boyle, Department of Mathematics, Santa Rosa Junior College, will present a glimpse at some mathematical ideas that are essentially evident from a picture, others whose picture seems clear but actually tell you very little, and finally pictures you can't picture.
- FEBRUARY 29** **THE FASCINATING WORLD OF "HOW MUCH TROUBLE WOULD IT BE...?"**
Mr. Randy Elmore, Software Manager, CRT Systems, Inc., Oakland, California, will speak on his experiences in the business application software field, with comments involving custom and "standard" software system development and "completion." The special design considerations involved when attempting to create "efficient yet flexible" and "powerful yet forgiving" software for use by the uninitiated computer operator will be discussed. This talk should be of interest to mathematicians, business management majors, and anyone involved in a creative software project.
- MARCH 7** **NAUGHTY KNOTTY PICTURES AND MODELS**
Professor Carlo H. Sequin, Department of Electrical Engineering and Computer Sciences, University of California, Berkeley. Starting from a review of basic plumbing skills, we will work our way to algorithms and applications of geometric modeling on the computer.
- MARCH 14** **A PORTRAIT OF IVAN NIVEN, MATHEMATICIAN**
Professor Roy Ryden, Department of Mathematics Humboldt State University, Arcata, California. A brief biography of Ivan Niven, President of the American Mathematical Society, with selected examples of his mathematical genius."
- MARCH 21** **IS ECONOMIC FORECASTING REALLY WORTH ANYTHING!**
Professor Betty Blecha, Department of Economics, San Francisco State University. What are the limits and contributions of economic forecasting? Do we really know more about economic forecasting now than we did twenty years ago?
- MARCH 28** **COMPUTERS AND PENSION PLANS**
Mr. Nick Franceschine, M.A., A.S.A., The Wyatt Company, San Francisco, will discuss the mathematical theory which underlies the funding of group pension plans, the ways in which computers are used in the pension industry, and the opportunities for a career in actuarial computer programming.
- APRIL 4** **CHARLES BABBAGE AND THE COUNTESS OF LOVELACE**
Professor Milton H. Hoehn, Department of Mathematics, Santa Rosa Junior College. Sketches from the lives of Charles Babbage (often called the Father of the Computer) and Ada Lovelace (after whom the programming language ADA is named); and the great computing engines—which were never completed.
- APRIL 11** **SOME GEOMETRIC COUNTING PROBLEMS**
Professor Ann M. Preston, Department of Mathematics, The University of Santa Clara, Santa Clara, California. Given an $N \times N$ array of squares with diagonals, how many squares are formed by the sides and diagonals? ... Given an $N \times N$ set of lattice points, how many squares, of all sizes, are formed? These problems lead to some interesting series and can be solved by the summation of these series.
- APRIL 25** **A MILLION-LINE PROGRAM: MEDS**
Dr. James Falbo, Staff Scientist, Scientific Calculations, Inc., Western Technical Center, Santa Cruz, California. MEDS, MicroElectronics Design System, is a million-line Fortran program written during the past three years. MEDS is a Computer-Aided Design (CAD) tool for automatic placement and routing of Integrated Circuits (IC). The talk will concentrate on the design and development of MEDS as a program. There will be further discussion of the role of programming tools, graphics, and our DBMS.
- MAY 2** **A MICROCOMPUTER TOOLKIT FOR CALCULUS**
Professor Carroll O. Wilde, Department of Mathematics, Naval Postgraduate School, Monterey, California. A new software package consisting of twenty-six programs and an accompanying workbook designed to facilitate and enhance the learning of calculus will be presented. These materials are being published by the Addison-Wesley Publishing Company and are the joint work of Ross Finney, Dale Hoffman, Judah Schwartz, and the speaker.
- MAY 9** **ALGOL - WHENCE AND WHITHER**
Professor George Ledin, Jr., Department of Computer Science, University of San Francisco. The story of ALGOL from someone who has observed it closely during the past quarter century. From modest beginnings (IAL, ALGOL 58) to classic achievement (ALGOL 60) to a heavy disappointment (ALGOL 68) via loyal-cult detours (ALGOL W) and unexpected success (Pascal) and toward mixed/unknown f (Modula-2, Ada). Mug shots of those responsible and true-life anecdotes revealed.