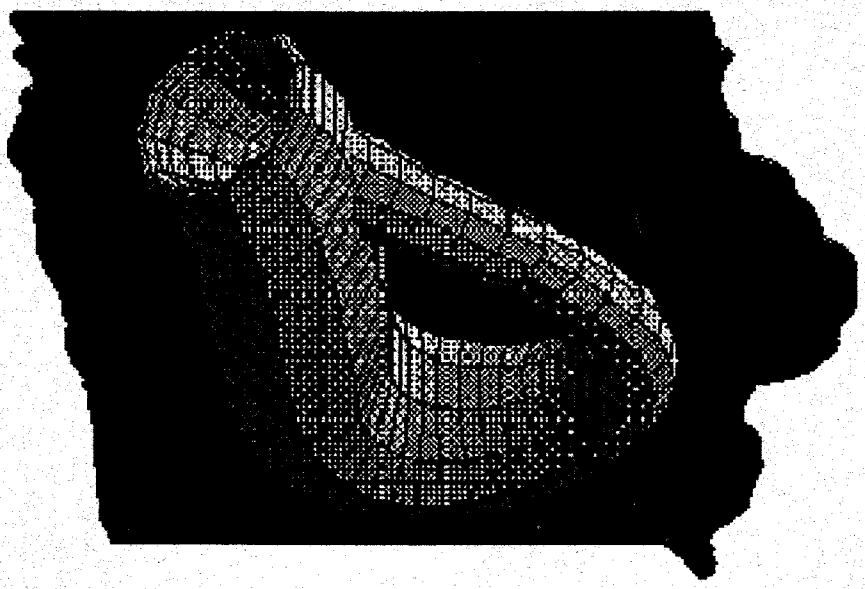
Iowa Section Newsletter



Spring 1999

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VOLUME XV No. 2 April 1999

Joint Meetings of the Iowa MAA, ASA, and IMATYC
The University of Iowa, Iowa City, Iowa
April 16 and 17, 1999

Friday, April 16

1:00 – 4:30	Registration and Book Exhibit	3 MacLean Hall
2:00 – 3:00	ASA Session I	Ohio State Room Iowa Memorial Union
2:00 – 3:00	Mathematics Student Papers	Minnesota and Northwestern Rooms Iowa Memorial Union
3:00 – 3:30	Break	3 MacLean Hall
3:30 – 5:00	ASA Session II	Ohio State Room
3:30 – 4:15	MAA Liaisons Meeting	113 MacLean Hall
4:30 – 5:45	Mathematics Faculty Discussion *"What can our students do with a degree in mathematics?"*	113 MacLean Hall
5:30 – 7:30	ASA Dinner (All Participants Welcome) RESERVATIONS REQUIRED	Holiday Inn of Iowa City
Or Dinner on Your Own		
7:45 – 8:45	MAA Polya Lecture I Colin Adams, Mark Hopkins Professor and Department Head, Mathematics Department, Williams College *"Making calculus fun"*	W151 John Pappajohn Business Administration Building (PBAB)
8:45 – 10:00	Reception	Galleria PBAB

Saturday, April 17

8:00 – 3:30	Registration and Book Exhibit	3 MacLean Hall
8:30 – 9:30	ASA Keynote Speaker Robert V. Hogg *"Statistics: A Look Back and a Peek Forward"*	40 Schaeffer Hall
9:30 – 10:00	Break	3 MacLean Hall
10:00 – 11:00	MAA Polya Lecture II Mel Slugbate, Real Estate Broker, Slugbate and Mossbutter Real Estate, Williamstown, MA (sponsored by his brother-in-law Colin Adams, Williams College) *"Real estate in Hyperbolic Space: Investment Opportunities for the Next Millenium"*	40 Schaeffer Hall
11:00 – 11:45	MAA Business Meeting	40 Schaeffer Hall
12:00 – 1:00	MAA Luncheon (All Participants Welcome) RESERVATIONS REQUIRED	South Room, Iowa Memorial Union
12:00 – 1:00	IMATYC Luncheon and Business Meeting RESERVATIONS REQUIRED	River Room 1, Iowa Memorial Union
Or Lunch on Your Own		
1:00 – 3:30	Mathematics Contributed Papers I	114 MacLean Hall
1:00 – 3:30	Mathematics Contributed Papers II	118 MacLean Hall
1:00 – 4:00	Mathematics Contributed Papers III	110 MacLean Hall
1:30 – 3:30	ASA Session III	40 Schaeffer Hall

Friday Afternoon Sessions

Mathematics Student Papers
Iowa Memorial Union: Minnesota Room

2:00 – 2:15 Jayadeu S. Artheya, Iowa State University
Separating Homologous Genes by Use of a Distance Over Partitions: A Graph-Theoretic Algorithm

2:20 – 2:35 David Carlson, Drake University
Some Interesting Sums

2:40 – 2:55 Danhua Huang, The University of Iowa
Markov Chain Monte Carlo and its Applications

Iowa Memorial Union: Northwestern Room

2:00 – 2:15 Xiajie Hou, The University of Iowa
The Second Order Melnikov's Function in Slowly Varying Oscillator

2:20 – 2:35 Mirela Iancu, The University of Iowa
Differentiable Null-Space Method for Solving the Differential Algebraic Equations of Multibody Dynamics

2:40 – 2:55 Matt Schuette, The University of Iowa
Modeling the Chickenpox Vaccination Program

ASA Session I
Iowa Memorial Union: Ohio State Room

2:00 – 2:20 Yeh-Fong Chen, The University of Iowa
Properties of the MLE under the DAL Restriction

2:20 – 2:40 Jae-kwang Kim, Iowa State University
Variance estimation after imputation

2:40 – 3:00 Michelle Larson, The University of Iowa
(TBA)

ASA Session II
Iowa Memorial Union: Ohio State Room

3:30 – 3:55 K. B. Athreya, Iowa State University
Prediction Under Convex Loss

4:00 – 4:25 Grace Chen, The University of Iowa
Non-integer dimension objects: From modeling to statistical inference

4:30 – 4:55 TBA

Saturday Afternoon Sessions

Mathematics Contributed Papers I
114 MacLean Hall

1:00 – 1:25 Bernadette Baker, Drake University
The Schema Triad-A Calculus Example

1:30 – 1:55 A.M. Fink, Iowa State University
The Lagrange Multiplier Theorem Does Not Work

2:00 – 2:25 Cathy Gorini, Maharishi University of Management
Natural Law Seminars in Mathematics at M.U.M.

2:30 – 2:55 Michael M. Miller, University of Northern Iowa
Archimedes and the Concept of Center of Gravity

3:00 – 3:25 Douglas A. Swan, Morningside College
Non-Euclid and Euclid Every Day:
Reorganizing Modern Geometries

Mathematics Contributed Papers II
118 MacLean Hall

1:00 – 1:25 Marc Chamberland, Grinnell College
Jacobian Conjectures:
Global Asymptotic Stability And Injectivity

1:30 – 1:55 Emily Moore, Grinnell College
Extending Graph Colorings

2:00 – 2:25 George Nelson, The University of Iowa
Ideals of Rings, Limits and Logic

2:30 – 2:55 Tuong Ton-That, The University of Iowa
Poincare's Proof of the So-called Birkhoff-Witt Theorem

3:00 – 3:25 Charles Ashbacher, Kirkwood Community College
The Pseudo-Smarandache Function

Mathematics Contributed Papers III
110 MacLean Hall

1:00 – 1:25 Ruth Berger, Luther College
Poincaré Draw, A Sketchpad for Non-Euclidian Geometry

1:30 – 1:55 Anne Dow, Maharishi University of Management
Some Mathematica Animations for Calculus

2:00 – 2:25 Al Hibbad, Central College
What's New in Version 4 of Mathematica

2:30 – 2:55 Walter Seaman, The University of Iowa
Teaching Differential Geometry in the Computer Laboratory

3:00 – 3:25 Keith Stroyan, The University of Iowa
Calculus and Mathematica

ASA Session III
40 Schaeffer Hall

1:30 – 1:55 Russ Lenth, The University of Iowa
On the Analysis of Unbalanced Unreplicated Experiments

2:00 – 2:25 Dale Zimmerman, The University of Iowa
The PRISM: A Graphical Diagnostic for Covariance Structure in Longitudinal Data

2:30 – 2:55 Mary Kathryn Cowles, The University of Iowa
A Bayesian Approach to Estimating the Proportion of Treatment Effect Captured by a Surrogate Endpoint

General Information

Updated Information: Check the Iowa MAA website for updates and announcements.

http://maa-ia.cornell-iowa.edu

Registration Information: Registration will be at the meeting. The registration desk and book display in room 3 MacLean Hall will be open from 1:00-4:30 on Friday and 8:00-3:30 on Saturday. The fee is $5 for regular members, free for students. Tickets for the ASA dinner are $14.95 and tickets for the IMATYC and MAA luncheons are $10.25. Tickets will be available at registration but we need to have reservations for the ASA dinner by April 12 and reservations for the luncheons by April 9. (See next page for more information.)

Directions and Parking: Some excellent maps of the region, Iowa City and The University of Iowa can be found at

http://www.uiowa.edu/~maps/

Parking is available in the Iowa Memorial Union Parking Ramp across Madison Street from the Iowa Memorial Union, in the Old Capitol Mall parking ramp at the corner of Capitol and Burlington streets, and in the Holiday Inn-Downtown Ramp at the corner of Burlington and Dubuque. All of these ramps are within a short walk of the conference. The best way to approach campus is from Exit 244 (make sure you don't miss the new Coral Ridge Mall – biggest in the state of Iowa – at Exit 240) on I-80. Proceed south on Dubuque to Market. Take a right on Market to the T intersection with Madison and then another left on Madison. The IMU ramp will be on your left. MacLean Hall and Schaeffer Hall are on the Pentacrest. The Pentacrest is a four block large area consisting of four large buildings surrounding the original Capitol building of the state of Iowa and green space directly SE of the IMU. MacLean Hall is the building SW of the Old Capitol.

MAA Liaisons Meeting, Friday 3:30 p.m., 113 MacLean Hall:
The Mathematical Association of America's liaison program is intended to provide a contact person at each institution. A list of the current liaisons for the institutions in Iowa can be found on the Iowa Section web page

http://maa. ia.cornell-iowa. edu/liaisons. htm

This session will be an opportunity for liaisons to meet each other and discuss the role of the liaisons in their home institution in the Section and in the Association. All institutions are encouraged to send a representative to this session, especially those which to not currently have a liaison. This meeting is being organized by Alex Kleiner, Departmental Liaison Coordinator for the Iowa Section.

Questions?

Contact David Manderscheid (Iowa MAA Chair-Elect) at david-manderscheid @ uiowa.edu or Sandy Stockman at sandra-stockman @ uiowa.edu

ASA Dinner, Friday: There will be a Friday dinner for all meeting participants. It will be held in Holiday Inn. The menu of the buffet includes:
(a) Salad Bar: Seasonal greens, dressings and toppings, your choice of prepared salads, vegetable, potato or rice, bread basket with butter, coffee, tea or milk;
(b) Entrees: Sliced sirloin of beef in burgundy sauce, Chicken breast with champagne mushroom sauce
(c) Prepared Salads: Marinated vegetables, fresh fruit tray, dilled cucumber and tomato salad
(d) Vegetables: medley of vegetables, stir fry vegetables;
(e) Potato and Rice: new potatoes, wild rice blend; and
(f) Desserts of many kinds. The cost is $14.95.
Advance reservations are required. Please let the Statistics and Actuarial Science Administrative Assistant, Marge Keaough (**mkeaough@stat.uiowa.edu or 319-335-0712**) know by **April 12** if you plan to attend. Tickets can be picked up at the time of registration.

MAA Luncheon, Saturday: There will be a luncheon Saturday for all meeting participants. It will be held in the South Room of the Iowa Memorial Union. The menu is a buffet featuring lasagna or a vegetarian entrée of rigatoni with asparagus, artichokes, and peppers. Also included are a vegetable, tossed salad, rolls, and beverages. The cost is $10.25 per person. **Advance reservations are required.** Please let the Mathematics Department Administrative Assistant, Sandy Stockman (**sandra-stockman @ uiowa.edu or 319-335-0781**) know by **April 9** if you plan to attend. Tickets can then be picked up at the time of registration.

IMATYC Luncheon and Meeting, Saturday: The spring meeting of IMATYC will be held at noon on Saturday in the River Room 1 of the Iowa Memorial Union. A pasta buffet luncheon is being offered for $10.25 per person which includes tax, tip, and limited beverage selection. If you plan on attending and are interested in the buffet, please contact Cyrus Brown by phone, **(515) 964-6290**, e-mail, **cjbrown @ dmacc.cc.ia.us**, or FAX, **(515) 965-7083**, by **April 9**.

Accommodations: Prices listed are for a single room.

Holiday Inn-Downtown, $68 + 12% tax
Phone: 319-337-4058 or 800-848-1335
corner of Burlington and Dubuque

Iowa House, $69 or $74 (river view) + 5% tax
Phone: 319-335-3513 or
800-555-IOWA (this # works only between 8 and 5)
corner of Madison and Jefferson

Heartland Inn, $49.95 + 12% tax
Phone: 319-351-8132 or 800-334-3277
on Hwy 6 just west of campus between
Rocky Shore Drive and First Avenue

Abstracts for the Papers

Polya Lectures:

Making Calculus Fun

Colin Adams, Williams College Colin.Adams@williams.edu

This talk is about how to make calculus fun: for your students, for your taxidriver, for the person sitting next to you on the plane. That's right, you will learn how to talk about calculus AND be popular at the same time.

Real Estate in Hyperbolic Space: Investment Opportunities for the Next Millenium

Mel Slugbate, Real Estate Broker
Slugbate and Mossbutter Real Estate, Williamstown, MA
(sponsored by his brother-in-law Colin Adams, Williams College)

The skyhigh stock market got you nervous? What goes up must come down? Antsy about stocks, bonds and mutual funds? Afraid of risky investments in Euclidean space? Then real estate in hyperbolic space is for you.

We will discuss the enormous potential of this new investment opportunity and describe the many fascinating properties of hyperbolic space that make it such an attractive place to live. This is the financial equivalent of the 1980's junk bond. Don't miss it. Bring your checkbook and credit references! No previous real estate background assumed!

Recommended for faculty and students alike! According to Siskel and Ebert, "Two fingers up!"

Mathematics Student Papers:

Markov Chain Monte Carlo and its Applications

Danhua Huang, The University of Iowa

Markov Chain Monte Carlo is well-known technique to solve the Monte Carlo integration using Markov Chains. Its applications are rapidly into many scientific subjects -- Bayesian analysis, Biomedicine, Finance, Computer science, Education testing and so on. Metropolis Hasting algorithm is the major algorithm in the MCMC. Gibbs Sampler is one of popular computer-intensive algorithms in MCMC. The one of the significance applications is solving the analytically and numerically difficulty integration problems.

Separating Homologous Genes by Use of a Distance Over Partitions: A Graph-Theoretic Algorithm

Jayadev Athreya, Iowa State University jayadev@iastate.edu

DNA sequences cannot be read in full, but rather in fragments which must be re-assembled into a complete sequence. For this problem we are given a contig, that is, part of a gene assembled from overlapping fragments of the gene, and the fragments from which it has been constructed. At most positions along the DNA sequence, only one nucleotide should appear except for sequencing errors.

If two alleles are present there will be some positions along the sequence at which two nucleotides appear in significant numbers. At those positions the DNA sequences will be partitioned by the nucleotides that appear there, and so the distinct but similar partitions can be identified. Our goal is to be able to distinguish such partitions. The problem is trivial with no errors in reading the nucleotides, but the data typically has numerous errors. We handle this problem by defining a metric on the space of partitions. The mathematics in this paper centers aroumd the calculation of this distance, for which we use a graph-theoretic algorithm.

Some Interesting Sums

David Carlson, Drake University

A problem in a recent issue of The College Mathematics Journal asked for the sum of an infinite series, where the sum was taken over the odd integers. This talk will show how to sum the given series as well as some related series. Generalizations of the problem will be discussed as time permits.

The Second Order Melnikov's Function in Slowly Varying Oscillator

Xiaojie Hou, The University of Iowa xhou@math.uiowa.edu

In this paper, we give a version of the second order Melnikov's function and the criteria for the existence of chaos for the slowly varying oscillator. Our results extend the results of Wiggins.S and Holmes.P, ([1], [2]). An example is given to illustrate the application of our results. Sustained chaotic attractors can be observed in the phase space by numerical stimulation.

References:

[1] Wiggins.S., and Holmes. P., Homoclinic orbits in slowly varying oscillators, SIAM, J. Math.Anal, vol 18(1987), 612--629.

[2] Wiggins.S and Holmes. P. Periodic orbits in slowly varying oscillators, SIAM. J. Math.Anal, vol 18(1987), 592--611.

Differentiable Null-Space Method for Solving the Differential-Algebraic Equations of Multibody Dynamics

Mirela Iancu, J. Freeman, The University of Iowa iancu@math.uiowa.edu

Many algorithms for solving the differential-algebraic equations of multibody dynamics use projection methods. The approach used in this presentation is the differentiable null-space projection method, where the projection is performed at the velocity level, not at position level, as projection methods are generally used. The algorithm is used to solve the recursive formulation of the equations of multibody dynamics. The recursive formulation involves writing the kinematics equations for subsystems of the multibody mechanical systems - forward propagation of position and velocity, and then writing the dynamics equations for the entire mechanical system with respect to a base body - backward propagation of forces and dynamics equations.

Modeling the Chickenpox Vaccination Program

Matt Schuette, The University of Iowa schuette@math.uiowa.edu

The varicella-zoster virus (VZV) causes primary chickenpox (varicella) in humans and then remains dormant in the body. Shingles (zoster), the reactivation of VZV, occurs most often in the elderly and immuno-compromised and is characterized by a painful localized rash which may lead to permanent nerve damage.

In 1995, the FDA approved the use of a VZV vaccine in the United States and the CDC has added the vaccine to its recommended childhood immunization schedule (1998). There are concerns about the effects of varicella vaccinations: (1) Will an age-shift in the incidence of chickenpox lead to a noticeable increase in the number of cases of chickenpox in never-vaccinated adolescents and adults, where complication and death rates are highest?; (2) Since lower incidences of chickenpox in the population lead to a reduction in the amount of natural boosting to VZV immunity, will this cause a significant increase in the incidence of shingles in some or all age groups?

We will present results of computer simulations of an age-structured epidemiological model and what they imply about the current United States VZV vaccination strategy.

Mathematics Contributed Papers:

The Lagrange Multiplier Theorem Does Not Work

A. M. Fink, Iowa State University fink@math.iastate.edu

Most calculus books introduce the method of Lagrange Multipliers when doing two dimensional optimization problems. Then they proceed to have a set of exercises to which the theorem does not apply. We will give examples from textbooks and research papers by Mathematicians where the theorem is misapplied.

The Schema Triad - A Calculus Example

Bernadette Baker, Drake University Bernadette.Baker@drake.edu
Laurel Cooley, York College - City University of New York
Maria Trigueros, Instituto Technologico Autonomo Mexico

In this paper, students' cognitive constructions of a schema were examined and analyzed from the perspective of the Action-Process- Object-Schema (APOS) theory. Data consisted of interviews with students who had completed at least two semesters of calculus while they worked on a nonroutine graphing problem. We found that two schema and their interaction were critical in the students' efforts to solve the problem. The two schema, which we called the Property Schema and the Interval Schema, as well as the triad of schema development - intra, inter, trans will be described and the results of the analysis will be reported.

Natural Law Seminars in Mathmematics at M.U.M.

Cathy Gorini and Dave Streid, Maharish University of Management

The first-year program at M.U.M. was recently restructured to consist of a sequence of Natural Law Seminars. Each seminar focuses on a specific discipline, introducing students to the style of thinking of the discipline and relating the principles of the discipline to general principles of knowledge. This paper will describe the three first-year mathematics seminars: Numbers, Infinity, and Symmetry.

Non-Euclid and Euclid Every Day: Reorganizing Modern Geometries

Douglas A. Swan, Morningside College das001@alpha.morningside.edu

For the first time, I have my students working in both Euclidean and NonEuclidean geometry in almost every class this spring semester. They use NonEuclid and Sketchpad. My objectives for the future teachers are:

1] to compare the structures of Euclidean and NonEuclidean geometries, and

2] to understand the roles of definitions, axioms and proofs in mathematics.

It is important to be able to make conjectures based on experimentation and then move on to supporting or rejecting the conjectures. Working both in familiar Euclidean Geometry and in the unfamiliar Non-Euclidean Geometry they have a much clearer understanding of the role of proofs. Counter examples dispose of false conjectures with a single case. Belief in a conjecture's validity is built by looking at many disparate cases, but it takes a deductive proof to convince a skeptical person that a conjecture must always hold. Once it passes this test then the conjecture becomes a theorem that can be relied on in other investigations and proofs in an expanding understanding of geometry.

I will discuss the syllabus of the course. We are using Active Geometry, by David A. Thomas and Geometry: Plane and Fancy, by David A. Singer.

Archimedes and the Concept of the Center of Gravity

Michael H. Millar, University of Northern Iowa milllar@math.uni.edu

Archimedes was the first great applied mathematician We can see this in his work "On the Equilibrium of Planes: Book I" where Archimedes begins by postulating seven properties pertaining to the centers of gravity of certain planar figures. Then, in a remarkable sequence of fifteen propositions, he shows how to use these postulates to arrive at a determination of the centers of gravity of triangular and trapezoidal figures. We will look at a select few of these propositions to see the power of the axiomatic method at work in the hands of a master mathematical craftsman.

Jacobian Conjectures: Global Asymptotic Stability and Injectivity

Marc Chamberland, Grinnell College chamberl@math.grin.edu

There are three problems which are each referred to as the "Jacobian Conjecture". One problem asks whether certain dynamical systems admit global asymptotic stability, while the other two ask whether certain maps are injective. All of these problems prescribe conditions on the eigenvalues of the Jacobian matrix of the maps in question. A huge amount of literature has been generated by these problems, going back to 1939. In the 1990's two of these conjectures have been settled. This talk will give some history behind these problems, their current status, and some related recent results of the speaker.

This will be a talk for a general audience with a bias towards analysis and applied math.

Extending Graph Colorings

Emily H. Moore, Grinnell College mooree@math.grin.edu

Suppose G is a graph with chromatic number r. Let P be a subset of the vertices. It is known that if the distance between any two vertices of P is at least 4, then any (r+1)-coloring of P extends to an (r+1)-coloring of G. But if we are limited to only r colors, in general no distance between vertices of P can guarantee that an r-coloring of P extends to an r-coloring of G.

We first explore results using r+1 colors. If P induces a set of k-cliques in G, a distance of 4k between these cliques guarantees a color extension. If in addition $k <= r < 2k$, a smaller distance suffices. We construct graphs to show that these results are nearly sharp.

Second, we explore questions of extending colorings using only r colors. While we cannot say anything in general, if we restrict the types of graphs we consider we can show there are distances between vertices in P (or between cliques induced by P) that guarantee a color extension.

Ideals of Rings, Limits, and Logic

Luis Cáeres-Duque and George Nelson, The University of Iowa

One can view the ideals of a commutative ring R as points in the Cantor space 2^R. It is a closed subpsace and, consequently, one can view these ideals as models of a certain propositional theory. We study limits of these ideals as well as its prime ideals in this space using a set theoretic operation called an ultraproduct of sets. One fundamental property of this operation is that an ultraproducts of ideals which are models of a given propositonal theory T is always also a model of T. The general property of a ring being Noetherian is equivalent to an ultraproduct of its ideals always equaling an intersection of these ideals over some set in the ultrafilter. These ideas can be used to show that in a denumerable Noetherian ring R that this topological space of ideals is homeomorphic to a countable successor ordinal with its interval topology; moreover, if the Krull dimension k of R satisfies $0 < k < w$, one can also show that the subspace of prime ideals of R is homeomorphic to either $w^k + 1$ or $(w^{k-1} + 1)\cdot j$ for some j with the interval topology.

Poincare's Proof of the So-called Birkhoff-Witt Theorem

Tuong Ton-That, The University of Iowa tonthat@math.uiowa.edu

A methodical analysis of the research related to the article "Sur les groupes continus",of Henri Poincaré reveals many historical misconceptions and inaccuracies regarding his contribution to Lie theory. A thorough reading of this article confirms the precedence of his discovery of many important concepts; especially that of the universal enveloping algebra of a Lie algebra over a field of characteristic zero, the canonical map (symmetrization) of the symmetric algebra onto the universal enveloping algebra, and foremost, of his rigorous, complete, and enlightening proof of the so-called Birkhoff-Witt theorem.

The Pseudo-Smarandache Function

Charles Ashbacher, Kirkwood Community College 71603.522@compuserve.com

The Pseudo-Smarandache function was defined by Kenichiro Kashihara in 1996.

Given n > 1 and an integer, the value of the Pseudo-Smarandache function Z(n) is the smallest integer m such that n evenly divides the sum of all integers from 1 through m.

The number of divisors d(n), the sum of divisors sigma(n) and the Euler phi function phi(n) are all classic functions of number theory.

In this paper, we examine some of the consequences of the alternating iteration of the Pseudo-Smarandache function with each of the classic functions of number theory.

Poincaré Draw, A Sketchpad for Non-Euclidean Geometry

Ruth I. Berger, Luther College bergerr@luther.edu

"Do the three heights of a triangle always intersect in one point?" As you probably already know Geometer's Sketchpad provides a nice tool to have students investigate this question in Euclidean Geometry. I will introduce you to a software that allows students to carry out the same investigation in the Poincaré disk model of Non-Euclidean Geometry. The program is called "Poincaré Draw " and was written by a student at Wabash College in Indiana. This dynamical software can also be used for many other constructions in the Poincaré disk model. It came in handy in my Geometry class and you might consider using it to let your student's gain more hands-on experience with Non-Euclidean Geometry.

Some Mathematica Animations for Calculus

Anne Dow, Maharishi University of Management mdow@mum.edu

In this talk I will present some simple Mathematica animations I am developing to help students visualize various basic concepts and theorems in single and multivariable calculus. These include the mean value theorem for integrals and parameterization of a 2-dimensional surface.

Teaching Differential Geometry in the Computer Laboratory

Walter Seaman, The University of Iowa walter-seaman@uiowa.edu

We have taught the one-year undergraduate Introduction to Differential Geometry 1 and 2 twice using "Modern Differential Geometry of Curves and Surfaces" (both first and second editions) by Alfred Gray, and will teach it again next year. Mathematica is heavily integrated into these materials. Using Gray's materials, we have written Mathematica computer laboratory notebooks exploring topics exploiting Mathematica's algebraic, numerical and graphical capabilities. These notebooks have been used as a basis for discussion in computer laboratory meetings of the classes and for homework and test problems. We will discuss some of these notebooks. Topics covered will include:

i. animations of Frenet frames moving along curves and the graphical influence of curvature and torsion on the twisting of the frames as they move
ii. graphics of space-curves with prescribed curvature and torsion functions and animations of such curves when the prescribed functions vary
iii. colorings of surfaces by various curvature functions and animations of isometric and non-isometric deformations of the surfaces
iv. animations of the Gauss map
v. animations of hypercube projects into two-space and three space.

These graphics lead to challenging Mathematical problems, which are explored in exercises in the notebooks.

What's New in Version 4 of Mathematica?

Al Hibbard, Central College hibbarda@central.edu

This talk will give an overview of some of the new features included in version 4 of Mathematica, which is just about to be released (if not already). Some of these new features include packed arrays (for large datasets), use of assumptions in Simplify (and related functions), specification of domains for variables, real-time 3D graphics, improved visualizations for I/O, spelling checker and hyphenation, Developer and Experimental contexts, and many others.

Calculus and Mathematica

Keith Stroyan, The University of Iowa keith-stroyan@uiowa.edu

Calculus Wiz is an add-on Mathematica package that can help students solve problems in traditional calculus 1 and 2. Solutions can be done either with buttons that require no programming (or special syntax) or by completing template programs. In either case, the Wiz puts the solutions in a separate notebook. The package has various search features to help students find the solver they need.

This talk will show you how the Wiz works.

ASA PAPERS:

Properties of the MLE under the DAL Restriction

Yeh-Fong Chen, Student, The University of Iowa
(Advisor: Prof. Richard Dykstra)

The "decreasing on the average" (DAL) restriction of a collection of normal means is a less restrictive condition than the usual monotone restriction. It allows the model to have "reversals" over short ranges of values of the parameter set. This type of restriction is closely associated with the "starshaped restriction" for a vector of parameters, and "uniform stochastic ordering" or "hazard rate ordering" for CDFs. Dykstra and Robertson (1983) derived the maximum likelihood estimator of the parameter vector subject to the DAL restriction. In this talk, the derivation of the MLE will be presented in a special form which will make it possible to derive the means and variances of the MLE estimates in all situations. These values suggest the asymptotic distributions of the estimates in certain cases. We also wish to examine the properties of the partial sums of the parameters and their asymptotic behavior.

Variance estimation after imputation
Jae-kwang Kim, Student, Iowa State Univerisity

Imputation is commonly used to compensate for item nonresponse. Variance stimation after imputation has generated considerable discussion and several variance estimators have been proposed. We propose a variance estimator, based on a pseudo data set used only for variance estimation. Standard complete data variance estimators applied to the pseudo data set lead to a consistent estimation for linear estimators under various imputation methods. The algebraic equivalence of the proposed method and the adjusted jackknife method of Rao and Sitter (1995) is illustrated. This method is directly applicable to the variance estimation for two-phase sampling.

Non-Integer dimension objects: From modeling to statistical inference
Grace Chan, Faculty, The University of Iowa

In the first part of this talk, a number of real life examples will be introduced to demonstrate that traditional Euclidean geometry alone may not be able to model them accurately. Mandelbrot and others called these objects --- fractals. They also defined a number of dimensions that can take non-integer values. These dimensions are usually known as fractal dimensions.

The second part of this talk will focus on statistical applications of fractal geometry. In particular we model stochastic process' sample path as fractal, discuss how to estimate its fractal dimension and make statistical inference.

On the analysis of unbalanced unreplicated experiments
Russell V. Lenth, Faculty, The University of Iowa

The typical unreplicated experiment is a balanced factorial or fractional factorial experiment in several two-level factors. Often there are no degrees of freedom for error. Several methods are commonly used to analyze such experiments, including normal or half-normal plots, and various robust scale estimators that can be used to form test statistics. In general, these methods rely heavily on the property that the effects are independent and have the same variance.

When the design becomes unbalanced (perhaps due to a missing run), these techniques become much more complicated and subjective. Kunert and others have proposed some ideas that extend the robust-scale-estimation approach. In this paper, we explore the extension of the Bayesian approach due to Box and Meyer. Their method relies on independence of effects only to the extent that it helps makes things computable. By applying Markov chain Monte Carlo techniques, the computation becomes tractable for unbalanced experiments. We will discuss software issues, give some results, and compare them with other methods.

The PRISM: A Graphical Diagnostic for Covariance Structure in Longitudinal Data

Dale Zimmerman, Faculty, The University of Iowa

Analysis of continuous longitudinal data using a general linear mixed model requires the specification of a form for the covariance matrix of within-subject observations. Two existing graphical techniques which may aid in covariance structure specification are the parallel axis plot and the ordinary scatterplot matrix. These may be quite useful for detecting some covariance structures, but not so useful for detecting others. I introduce another graphical diagnostic, the Partial-Regression-on-Intervenors Scatterplot Matrix (PRISM), which is more useful for detecting certain kinds of serial correlation structures. I demonstrate the properties of the PRISM for some ``ideal'' covariance structures and illustrate its use in model specification for data from a few longitudinal studies.

A Bayesian Approach to Estimating the Proportion of Treatment Effect Captured by a Surrogate Endpoint

Mary Kathryn Cowles, Faculty, The University of Iowa

Surrogate endpoints in clinical trials are biological markers or events that may be observed earlier than the clinical endpoints (such as death) that are actually of primary interest. To address the question of whether trials based on surrogate endpoints reach the same conclusions as would have been reached had the true endpoints been used, Freedman, Graubard, and Schatzkin (1992) and Lin, Fleming, and Degruttola (1997) have developed frequentist methods for obtaining confidence intervals for the proportion of treatment effect captured by the surrogate endpoint.

Markov chain Monte Carlo methods enable estimating the Bayesian posterior distribution of the proportion of treatment effect captured. Resulting credible sets do not depend on asymptotic approximations and can be computed using datasets for which the frequentist methods may be inaccurate or even impossible to apply. We illustrate with Bayesian generalized linear models and proportional hazards models for clinical trial data.

Iowa Section Nominating Committee Report

The Iowa Section Nominating Committee (Emily Moore, Lynn Olson, and Ron Smith) has submited the following nominations. Elections will be held at the business meeting at the University of Iowa on Saturday, April 17, 1999.

Chair Elect:

Sergio Loch Grand View College
Bruce Sloan Simpson College

Secretary/Treasurer:

Mark Johnson Central College

Sergio Loch received a B.S. from the National Military Academy of Brazil in 1981 and a B.S. from the Federal University of Santa Maria, Brazil, in 1986 and his Ph.D. from University of Wisconsin at Milwaukee in 1992. His research interests are in Numerical Solution Differential Equations and Mathematics Education. He was an NSF Postdoctoral Fellow at University of Minnesota, he taught at University of Wisconsin-Milwaukee and Waukesha County Community College. He joined Grand View College Faculty in 1993 and has been the Chair of the Department of Mathematics and Computer Sciences since 1996. He is a 1995 Project NExT fellow and RUMEC member.

Bruce Sloan, Professor of Mathematics, has been at Simpson College since 1988. He received a B.A. degree from Sterling College (Kansas), M.S. from Emporia State University (Kansas) and Ed.D. (mathematics) from Oklahoma State University. Previous teaching positions were at the University of Nebraska at Omaha and Bellevue College (Nebraska). He currently serves as Chair of the Division of Natural Science, is a Faculty Athletic Representative for Simpson and is a member of the Simpson Presidential Search Committee. Area of interest is the history of mathematics. He is currently a participant in the Institute in the History of Mathematics and Its Uses in Teaching, summers of 1998 and 1999, that is sponsored by the MAA and NSF. He also continues to explore and incorporate new methods for improving the quality and effectiveness of mathematics instruction.

Mark Johnson received his B.A. from St. Olaf College in 1983 and his Ph.D. from the University of Wisconsin-Madison in 1994. He has been at Central College since then, teaching both mathematics and computer science. His interests include set-theoretic forcing and sets of reals, using writing in the teaching and learning of mathematics, and working with the student problem-solving group. He was a 1994-95 Project NexT fellow.

Treasurer's Report

Iowa Section Secretary-Treasurer Steven Nimmo submitted the following preliminary report for the current year.

	Debits	Credits	Balance
Starting Balance (4-16-98)			$2,402.10
Transfer from Competition Account		$ 76.74	$2,478.84
1998 Competition Expenses	$76.74		$2,402.10
Registrations (46 @ $5)		$230.00	$2,632.10
Book Sales		$ 45.00	$2,677.10
Student Prizes (MAA Books)	$68.00		$2,609.10
MAA Book Sales	$91.00		$2,518.10
MAA Dues Rebate		$500.00	$3,018.10
MAA Book Sales Commission		$ 46.00	$3,064.10
1998 Spring Newsletter	$208.71		$2,855.39
1998 Call for Papers	$ 96.96		$2,758.43
1998 Fall Newsletter	$195.07		$2,563.36
Interest		$ 21.58	$2,584.94
Ending Balance (4-16-99)			$2,584.94

MAA Sponsored Summer Workshops

The MAA is sponsoring several summer workshops for 1999. A short description of each is listed below. For further information, including application procedures, visit the web addresses or get in touch with the contact persons.

Remember to check the Professional Development section of MAA Online (http://www.maa.org) for these and other professional development opportunities of interest to collegiate mathematicians.

STATS: Statistical Thinking with Active Teaching Strategies
June 13-19, 1999; Hope College, Holland,MI

Designed for mathematicians who teach courses in introductory statistics but have little formal training in the subject, the goals of the workshop is to help faculty participants to:

* teach statistical thinking with more data and concepts, less theory and fewer recipes
* explore active learning alternatives to the lecture method in their teaching of statistics
* make effective use of technology in their statistics courses
* use authentic assessment practices in evaluating the work of their statistics students
* discover a myriad of print and electronic resources for teaching statistics
* engender lasting collegial relationships among mathematicians who teach statistics

Sponsored, in part, by a grant from the National Science Foundation.

Contact: Maureen Callanan, MAA, (202) 387-5200, mcallana@maa.org
Web address: http://www.dickinson.edu/~rossman/STATS/

EPADEL Section Summer Workshop
J in the Math Classroom: Visualization, Number Theory and Linear Algebra
June 14-18, 1999: Messiah College Grantham, PA

This workshop is designed for mathematics faculty to explore using J in the mathematics classroom. J is high-level computer language with a mathematical bent. No previous experience with J is expected. Professor Cliff Reiter of Lafayette College will give an introduction to the language and offer illustrations from his classroom use of J in teaching mathematical visualization, linear algebra and number theory. Participants will explore uses of J of their choice. Selected topics from those fields could include such things as image processing, fractals, searches for empirical evidence of number theory conjectures, empirical discovery of quadratic reciprocity, implementing error correcting codes and exploring eigenvalues. Participants are expected to share their own experiences and brainstorm with other participants about what makes a valuable computer based mathematics laboratory experiment. Time for developing some of those ideas into classroom experiments using J is planned.

Contact: Marvin L. Brubaker, Messiah College, Grantham, PA 17027
(717) 766-2511, x7283; mbrubake@messiah.edu

Partnerships: Physics and Mathematics
June 19-26, 1999; Carroll College, Helena, MT

Teams of faculty who are interested in teaching with interdisciplinary materials will build cross-disciplinary partnerships and work together on interdisciplinary materials to use in teaching courses at their home institutions. Teams of 2-4 must include one mathematics and one physics faculty member. Topics will be drawn from all levels of the undergraduate curriculum in mathematics and physics. This is a workshop of the MAA Partnerships Project in interdisciplinary mathematics and is sponsored by a grant from the National Science Foundation.

Contacts: Tina H. Straley, Kennesaw State University
(770) 423-6738; tstraley@ksumail.kennesaw.edu
Brian J. Winkel, USMA;
(914) 938-3200; brian-winkel@usma.edu
Web: http://science.kennesaw.edu/~mburke/partnerships

Allegheny Mountain Section Short Course:
Teaching Dynamical Systems Across the Curriculum
June 21-24, 1999: Allegheny College, Meadville, PA
Application Deadline: May 15, 1999

The short course will focus on methods by which ideas from dynamical systems theory may be included in various parts of the undergraduate curriculum. These topics provide an ideal opportunity to give students (particularly lower division students) a glimpse of modern ideas in mathematics in a setting that is germane to the course at hand.

Registration Fee: $150; Room and Board: $130
Contact: George Bradley, bradley@duq3.cc.duq.edu
Duquesne University, Pittsburgh, PA,
Steve Bowser, sbowser@alleg.edu
Allegheny College, Meadville, PA 16336,
Web: http://webpub.alleg.edu/dept/mathweb/ssc98.html

Ohio Section Short Course:
The Mathematics of the Perfect Shuffle
June 23-25, 1999: Miami University, Oxford, OH

Presented by S. Brent Morris of the National Security Agency, this minicourse will examine the mathematics of the perfect shuffle, a permutation often used by mathematicians, magicians and computer scientists for seemingly different ends. The perfect shuffle has broad appeal because of its interesting mathematics and surprising applications to magic tricks and computer design. The basic shuffle and several generalizations will be introduced, and the group structure generated by the perfect shuffle will be explored. Participants will be taught several card tricks using different properties of the perfect shuffle. The course will conclude with a study of computer circuits.

Registration Fee: $125
Contact: Bob Dieffenbach,
Miami University, Middletown, OH 45042,
(513)727-3238; diefferm@muohio.edu
Web: http://miavx3.mid.muohio.edu/~rdieffenbach/shortcourse.htm

Partnerships: Business, Economics, Finance and Mathematics
July 11-16, 1999; Indiana University, Bloomington, IN

Teams of faculty who are interested in teaching with interdisciplinary materials will build cross-disciplinary partnerships and work together on interdisciplinary materials to use in teaching courses at their home institutions. Teams of 2-5 must include at least one mathematics faculty and one faculty from a business area. Topics come from mathematics pre-requisites and business areas that use mathematics in interesting and significant ways. This is a workshop of the MAA Partnerships Project in interdisciplinary mathematics and is sponsored by a grant from the National Science Foundation.

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