IOWA SECTION MAA
NEWSLETTER

A Personal View of the Editor

The Mathematics Community is faced with two large questions at this time. One
is the question of external funding of research. This is mainly a concern of
the Universities but I believe the ethical questions should be addressed by
everyone. Furthermore, funding requests by small colleges are likely to
increase in the mathematical education area.

What are we to do in order to increase the quality of elementary and
secondary mathematics? Then what changes are we going to make at the college
level? Note that I take it for granted that we are going to make changes. We
must. The small colleges, I believe, must lead the way. The University's
departments have too many people looking over their shoulder to move quickly.
Confront curriculum and computers.

GOVERNOR'S REPORT

The MAA meeting in San Antonio had four discussions which raised concerns of general interest. The first was a request to endorse certain recommendations from the Carnegie and Holmes reports on Teacher Education. One of these was the recommendation that the undergraduate degree in elementary education be dropped. The MAA is not endorsing this at this time. It would be more appropriate for us to have a recommendation for what should replace it or ways to alter it. For example, if the replacement would be "take two math courses from the liberal arts curriculum", then a course in pre-calculus would not be as appropriate as ones they now take.

The dues will be raised to keep the percentage of dues to expenses constant. The MAA is doing a lot more these days with curriculum questions and math PR and it all costs money.

The policy of the MAA is to invest in companies that minimize investment in South Africa.

The MAA hopes to initiate a program that establishes student chapters using existing math clubs as a basis. (More elsewhere.)

The Governor (and editor of this newsletter) will not be able to attend the annual meeting this year. I'll be in Copenhagen presenting an invited talk on Almost Periodic Functions at the Bohr Centenary Celebration. No one wins the Governor's prize announced in the Fall issue since no one is eligible to win. (Is the maximum over $\emptyset$ defined?) Keep news items coming my way. I'll also accept essays.   -- A. M. Fink

Professor John Bruha of the University of Northern Iowa has accepted the position of American Junior High School Examination Coordinator for the State of Iowa.

Nomination Committee Report

As a carryover from last year Charles Jepsen of Grennell College is the Vice Chair.

Candidates for Secretary/Treasurer are

>Thomas Iversen, Central College
>David Oakland, Drake University

A. M. Fink will continue as Governor and Greg Dotseth will be the Chair.
The election will take place at the business meeting at UNI.

Math Club

One of the agenda items for the business meeting is formulating a recommendation for the section to forward to a MAA committee on the issue of Student Chapters of MAA.

A Proposal for Student Chapers of the MAA

The Committee on Student Chapters has proposed to the Board of Governors that Student Chapters of the MAA be formed at the various universities and colleges. Further, they suggest that the MAA Sections act as Parent Sections for Student Sections which would meet in parallel with them. The Board has not acted upon this, but did ask the Committee on Sections to contact the various Sections to get their comments and suggestions in regard to the effect this would have on the Sections. The Committee is to report its findings and recommendations to the Board in August.

The matter was discussed at the Section Officers Meeting in San Antonio and the group supported the idea with reservations on the cost; the cost has not yet been determined but has been suggested to be $10 per year plus $5 for the College Mathematics Journal or Mathematics Magazine and $10 for the Monthly.

The purpose here is to ask each of the Section Officers to review the parts of the proposal as they affect the Sections and send their comments to David Ballew, Computer Science, Western Illinois University, Macomb, Ill 61455 by May 15; I need this so that the Committee can review the comments and a report can be filed by the Board's deadline. If you can have your Section's discuss it at your meeting, this is strongly encouraged.

The following is a summary of the full Committee Report as it applies to the Sections:

"it is proposed that MAA Student Chapters be established at college campuses by inviting each Mathematics Department to affiliate its existing mathematics club with the MAA as a MAA Student Chapter or, if no such club exists, to simply create an MAA Student Chapter...There should be no charge for creating an MAA Student Chapter, and each Chapter should be entitled to receive literature and assistance...

"The MAA Student Chapters within an MAA Section should constitute an 'MAA Student Section' to be considered part of the 'Parent MAA Section'. The Parent MAA Section should have the responsibility of assisting with and coordinating the Section activities of its Student Section.

"It is proposed that the Parent MAA Section appoint a coordinator (or a coordinating committee) to work with the faculty advisors of its MAA Student Chapters to organize activities for its MAA Student Section.

"Membership in MAA Student Chapters is intended primarily for full-time undergraduate students. However, it is recognized that deviations from this guideline may be appropriate for some colleges, and the ultimate decision on the elegibility for membership should be left to the college. However, 'interest' should be the primary qualification for membership -- academic record or other criteria that would tend to make the Chapter an 'honorary' group should not be considered.

It is recommended that Section Newsletters be expanded, if necessary, to include space for activities of its Student Chapters, and that FOCUS allocate space for articles of interest to students. (Editors note -- the students would get FOCUS as part of their membership.) Student members should be added to the mailing lists for Section Newsletters.

"Activities that Parent Sections might include: Speakers from Section colleges; Student Paper Competitions; Mathematics Contests; Career Fairs; Student oriented talks and activities at Section Meetings; Mini-courses for Students; Cooperative activities with Pi Mu Epsilon, Kappa Mu Epsilon, or their student honoraries."

I might note that there has been considerable discussion of the effect that this proposal might have upon the student honoraries like Pi Mu Epsilon and

Kappa Mu Epsilon. Milt Cox, who is the current President of Pi Mu Epsilon, was on the Committee making the recommendation on Student Chapters as were other members of the honoraries. It is their opinion that the organizations can work together, have meetings together and, in general, develop a stronger organization. They have stated that this proposal should be considered as an 'opportunity', not as a threat.

The Committee on Sections will appreciate your responses and your help.

Treasurer's Report

Balance December 31, 1985			$884.83

Income

National Allotment	160.00		
Interest on Bank Acct.	48.42		
Meeting Fees	142.00		
MAA Book Sale	148.80		
		$499.22	

Expenses

Printing	74.14		
Postage	139.30		
MAA Book Sale	148.80		
Student Book Awards	61.60		
Refreshments	49.13		
Service Charge	8.32		
		$481.29	

Balance December 31, 1986			$902.76

Alan J. Heckenbach
Secretary/Treasurer

JOINT MEETINGS OF THE IOWA SECTIONS OF MAA, SIAM, ASA

University of Northern Iowa
April 24-25, 1987

GENERAL SCHEDULE OF EVENTS

FRIDAY, APRIL 24

12 Noon	Registration	Maucker Union
12 Noon - 5:00 PM	Student Papers	Ambassador Room - Maucker Union
3:00 - 5:00 PM	Films	** To be announced **
5:00 - 7:00 PM	Dinner on Own	
7:00 - 8:00 PM	Speaker: Ivan Niven University of Oregon "The Way It Was"	Lantz Auditorium, Room 2532 McCollum Science Hall
8:15 - 10:00 PM	Informal Mixer Sponsored by ASA with support from Harcourt, Brace, Javanovich and MacMillan	Georgian Lounge - Commons

SATURDAY, APRIL 25

8:00 - 8:30 AM	Registration	Lobby - McCollum Science Hall
8:30 - 9:30 AM	Lecture, ASA Speaker Oscar Kempthorne, ISU "Relationships between Mathematics and Statistics"	Lantz Auditorium, Room 2532 McCollum Science Hall
9:45 - 10:45 AM	Lecture, Ivan Niven "Coding Theory Applied to Combinatorics"	Lantz Auditorium
11:00 - 11:30 AM	Business Meeting and Student Awards	McCollum Science Hall MAA - Lantz ASA - 1536 SIAM - 1753
12 Noon - 1:00 PM	Lunch on Own	
1:00 - 4:00 PM	Concurrent Section Meetings	McCollum Science Hall Rooms 2229, 2430
1:30 - 5:00 PM	Films	1532 McCollum Science Hall

Schedule of Papers

STUDENT PAPERS

FRIDAY, APRIL 24   Ambassador Room – Maucker Union

1:00 – 1:25   William O. Martin, ISU: "Compactness"

1:30 – 1:55   Kurt Kleinschnitz, Maharishi International University
"Modeling Field-Like Behavior in Human Consciousness"

2:00 – 2:25   Dave Bishop, UNI: "Projections in Three-Dimensional
Hyperbolic Geometry"

2:30 – 2:55   Ruth Gornet, Drake: "Bipartite Graphs"

CONCURRENT SECTION MEETINGS

SATURDAY, APRIL 25

Session A   2229 McCollum Science Hall

1:00 – 1:25   Ronald K. Smith, Graceland: "Chaos in Our Ranks"

1:30 – 2:25   Hyo Myung, UNI: "Connection Algebras and Riccati
Differential Equations in Lie Groups"

2:30 – 2:55   Michael Weinless, Maharishi International University:
"Topos Theory: Integration of Classical and Intuition-
istic Mathematics"

3:00 – 3:25   Alex Kleiner, Drake: "Terminal Polynomials"

3:30 – 3:55   Ken Koehler, ISU: "A Graphial Aide for Selecting a
Distribution Function"

Session B   2430 McCollum Science Hall

1:00 – 1:25   Eric Hart, Maharishi International University: "Why is
Proof So Difficult and How Can We Better Teach It? A
Perspective from Research"

1:30 – 1:55   S.N.U.A. Kirmani, UNI: "Some Results on Record Values"

2:00 – 2:25   Catherine A. Gorini, Maharishi International University:
"The Set-Theoretic Foundations of Topological Structure"

2:30 – 2:55   Russell B. Campbell, UNI: "Regular Systems of
Inbreeding with Mutation"

3:00 – 3:25   Russell V. Lenth, Iowa: "Tracking Wildlife with
Statistics"

3:30 – 3:55   Tim Robertson, Carolyn Pillers, Iowa: "A Geometric
Regularity from Order Restricted Inference"

Relationships between Mathematics and Statistics

Oscar Kempthorne
Iowa State University

ABSTRACT: Mathematics is by now an ancient discipline that needs no justification. Statistics is a discipline of very recent origin. In Great Britian, for instance, there was only one professor of statistics in the '40s. Now, there are about 50 and it is common for a university mathematics department to have 4 professors, in pure mathematics, in applied matheamtics, in statistics, and in computer science. Statistics is surely a discipline that grew out of mathematical thinking, but is strongly different from the usual applied mathematics.

The lecture will give an overview of the origin and nature of statistics. It will discuss relationships between mathematics and statistics, paying special attention to aspect in which the disciplines are strongly similar and aspects in which they are strongly different.

The discipline of statistics needs much of modern, 20th century mathematics. The discipline of mathematics needs to understand and appreciate better the problems that statistics addresses.

There has been significant partial failure of each field to appreiciate the problems and the roles of the other.

Statistical thinking is increasingly crucial for the development of an informed public and of an advanced society.

Nationwide, this will have to be taught in mathematics departments. So mathematics teachers must have received some reasonable exposure to statistics. Also, of course, teachers of statistics must have received some reasonable exposure to mathematics, as indeed has happened throughout the development of statistics (but not enough).

Obviously, also, statistics must have moderately deep exposure to numerical analysis and computation of a sort oriented to its needs.

The splitting of mathematical thinking into non-intercommunicating branches is bad for the needs of humanity and must be reversed.

A Graphical Aide for Selecting a Distribution Function

Kenneth J. Koehler
Iowa State University

ABSTRACT: A fundamental step in the application of most statistical procedures is the determination of an appropriate probability model for the variation among potential observations. P-P probability plots provide visual assessments of how well proposed probability distribution functions describe particular data sets. When a proposed distribution is unacceptable, curves can be displayed on the P-P plot to indicate viable alternatives. The efficiency of the technique is illustrated with an analysis of the distribution of cystine content of number five yellow corn.

Regular Systems of Inbreeding with Mutation

Russell B. Campbell
University of Northern Iowa

ABSTRACT: Regular systems of inbreeding can be interpreted as regular digraphs. Classical questions of identity by descent have been studied by recursion formulae or associated with random walks. The present work employs difference equations with result from recursion formulae at equilibrium to evaluate identity by type in the presence of mutation. Greater identity occurs under half-sib mating than under first cousin mating with either recurrent or non-recurrent weak mutation.

The Set-Theoretic Foundations of Topological Structure

Catherine A. Gorini
Maharishi International University

ABSTRACT: The most fundamental mathematical understanding of shape and form lies in the set-theoretic foundations of topology; the most fundamental understanding of matter and energy lies in the unified field theories of physics. In this paper, topology and unified field theories will be compared to the understanding of consciousness as the foundation of the physical world presented by Maharishi Mahesh Yogi.

Why is Proof so Difficult and How Can We Better Teach It?
A Perspective from Research

Eric W. Hart
Maharishi International University

ABSTRACT: Mathematical proof is difficult to teach and difficult to learn, as all concerned will agree. But why is this so? And what can we do about it? This paper focuses on a recent research project that looked at these questions in the context of elementary group theory. Results of the research are briefly presented and some methods for teaching proof are discussed. The general recommendation, given with specific examples, is to teach proof wholistically -- emphasizing a synthesis of conceptual understanding, analysis of correct and incorrect proofs, and instruction in proof heuristics.

Projections in Three-Dimensional Hyperbolic Geometry

Dave Bishop
University of Northern Iowa

ABSTRACT: A descriptive approach to both the constructions and projections of various figures in hyperbolic 3-space.

Tracking Wildlife with Statistics

Russell V. Lenth
The University of Iowa

ABSTRACT: In studying the behavior of large animals such as deer, wildlife biologiists sometimes attach radio-transmitter collars to the animals. The animals positions can then be determined (approximately) by taking bearings on the signal from several known locations. Thus, the data consists of 4-tuples of the form $(t, x_i, y_i, 8_i)$ $i = 1, 2, \ldots, n$, where t_i is the time of the ith bearing (x_i, y_i) are the two-dimensional coordinates of the observer's position and 8_i is the compass bearing itself. The latter is assumed to be the only random quantity in each 4-tuple. We typically can take at most three bearings at a given point in time, and so pointwise estimation of the animal's position is quite inefficient. Moreover, there is a strong potential for out-liers in the data.
     There are two basic approaches to modelling this type of data. One is to use a regression-like model to estimate the animal's path, and the other is to view the animal's movements as a stochastic path and develop a spatial time-series model. Little headway has been made in the latter approach due to the complexity of such models, and to the fact that the animal's coordinates are not directly observed; hence, the talk concentrates on the regression approach. The estimation procedure, computation, and diagnostics are discussed and illustrated using some telemetry data collected on mule deer in northwestern Colorado.

Connection Algebras and Riccati Differential Equations in Lie Groups

Hyo Myung
University of Northern Iowa

ABSTRACT Invariant affine connections on a Lie group G are described in terms of algebras (g, α) defined on the Lie algebra g of G, and invariant connections of torsion free correspond to Lie-admissible algebras. The tangent field X(t) of a geodesic satisfies the Riccati differential equation $dX/dt + \alpha(X, X) = 0$ in the algebra (g, α), and the solution is expressed in terms of the subalgebra of (g, α) generated by X(0). Specific solutions to the equation are given for the rotation group (S)(3) with pseudo-Riemannian structure.

Chaos in Our Ranks

Ronald K. Smith
Graceland College

ABSTRACT: Class rank is determined by taking a weighted average of grade points. Donald Saari has described the behavior of ranks based on weighted averages in general as "ultimate chaos". We translate one of his results on the existence of very bad examples into the context of class rank, and then explore a related question: Given n sets of student grades and an arbitrary ranking, find all schools (i.e. all grading scales) where that ranking is achieved.

Modeling Field-Like Behavior in Human Consciousness

Kurt Kleinschnitz
Maharishi International University

ABSTRACT: Over the past decade researchers have found evidence that human consciousness may behave in a field-like manner. Over 35 studies in all continents and at city, national, regional, and world-wide scales have found societal disorder can be reduced by utilizing the Maharishi Technology of the Unified Field. This paper will briefly survey these studies, discuss the criteria that a model for such behavior should meet, and present a recently developed model for the phenomena.

Compactness

William O. Martin
Iowa State University

ABSTRACT: Compactness is a topological property which is often first encountered in courses on real analysis and topology, though a form is also very important in mathematical logic. One theme of this paper is that compactness is a useful property which often simplifies proofs.

    A broad description of the formulation and role of compactness in topology is followed by three equivalent forms of the property for real numbers. Proofs are given of several theorems about continuous, real-valued functions which require the property: such functions are uniformly continuous, bounded, and attain maximum and minimum values on compact domains. The proof that closed and bounded real intervals are compact is also given.

    The Cantor set is compact and uncountable, and is proven to have measure zero. The compactness theorem of formal logic is used to establish the existence of non-standard models with infinitesimals.

Topos Theory: Integration of Classical and Intuitionistic Mathematics

Michael Weinless
Maharishi International University

ABSTRACT: Recent developments in topos theory have integrated intuitionism into the framework of classical mathematics. The 'meaning' of an intuitionistic theory is thereby understood, from a classical perspective, in terms of a self-referral structure of knowledge called sheaf semantics, in which the objects of a topos represent simultaneously the 'stages of knowing' (values of the knower) and sets (objects of knowledge).