Calendar of AMS Meetings

THIS CALENDAR lists all meetings which have been approved by the Council prior to the date this issue of the Notices was sent to press. The summer and annual meetings are joint meetings of the Mathematical Association of America and the American Mathematical Society. The meeting dates which fall rather far in the future are subject to change; this is particularly true of meetings to which no numbers have yet been assigned. Programs of the meetings will appear in the issues indicated below. First and second announcements of the meetings will have appeared in earlier issues.

ABSTRACTS OF PAPERS presented at a meeting of the Society are published in the journal Abstracts of papers presented to the American Mathematical Society in the issue corresponding to that of the Notices which contains the program of the meeting. Abstracts should be submitted on special forms which are available in many departments of mathematics and from the office of the Society in Providence. Abstracts of papers to be presented at the meeting must be received at the headquarters of the Society in Providence, Rhode Island, on or before the deadline given below for the meeting. Note that the deadline for abstracts submitted for consideration for presentation at special sessions is usually three weeks earlier than that specified below. For additional information consult the meeting announcement and the list of organizers of special sessions.

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[Notice is published eight times a year (January, February, April, June, August, October, November, December) by the American Mathematical Society at 201 Charles Street, Providence, RI 02904. Second class postage paid at Providence, RI and additional mailing offices. POSTMASTER: Send address change notices to Membership and Sales Department, American Mathematical Society, Post Office Box 6248, Providence, RI 02940.] Publication here of the Society’s street address and the other information in brackets above, is a technical requirement of the U. S. Postal Service. The street address should never be used by correspondents, unless they plan to deliver their messages by hand.

Members are strongly urged to notify the Society themselves of address changes (in the manner described above), since (as explained above) reliance on the postal service change-of-address forms is liable to cause delays in processing such requests in the AMS office.
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National AMS Colloquium
of Chairmen of Departments in the Mathematical Sciences

The American Mathematical Society sponsored a National Colloquium of Chairmen of Departments in the Mathematical Sciences in Washington, D.C., on April 8 and 9, 1983. The Colloquium heard reports on the history and present status of funding in the mathematical sciences from Kenneth Hoffman, Chairman of the AMS Committee on Science Policy, and from the following representatives of Federal agencies: Edward Wegman, ONR, Jagdish Chandra, ARO, Donald Austin, DOE, Ettore F. Infante, NSF.

The program of the Colloquium consisted of talks and discussions, including OPENING REMARKS by Kenneth Hoffman, MIT, discussion of AGENCY SUPPORT by the agency representatives named above, a discussion of CONCERNS OF DEPARTMENT CHAIRMEN led by Guido Weiss of Washington University and John A. Nohel of the Mathematics Research Center, Madison; discussion of PRIORITIES led by William Browder of Princeton University and Heini Halberstam of the University of Illinois, Urbana-Champaign; and a final discussion of the KEY ISSUES led by Felix Browder of the University of Chicago, M. S. Baouendi of Purdue University and Hugo Rossi of the University of Utah.

The conclusion of the meeting was that a crisis of major proportions in mathematical research will soon be upon us in the United States. The worldwide preeminence of American mathematicians since the Second World War, an integral part of American economic and technological success, is threatened. Chronic underfunding of the mathematical sciences at the federal, local and university levels during the past decade has undermined the foundations of American leadership. A serious shortage of research-trained mathematicians is developing. Not only will mathematical research suffer, but the training of future generations of scientists and engineers will be adversely affected.

The chairmen agreed that recent initiatives of the Administration in the NSF research budget are a welcome first step in addressing this serious situation. However, only continuous efforts of this kind for many years at all levels will enable American mathematics to carry out its central role in American science and technology.

After Dr. Infante’s presentation of the current and projected picture of funding in the Mathematical Sciences Section of the NSF, the chairmen reached the following conclusions: they enthusiastically commented on the effort of the mathematical community to increase the base of support in the mathematical sciences in the federal agencies, and the projected improvement in the FY1984 NSF budget; strongly endorsed the infusion into the NSF budget of new support for graduate students; supported the concept of postdoctoral research appointments and recommended that they be used in combination with junior faculty appointments; and deplored the waste of mathematical talent and the negative effect on mathematical research caused by the past reduction in the number of senior research mathematicians supported on grants. They urged that the present level of support for senior investigators at least be maintained in FY1984 and that every effort be made to increase research support in the future to assure that every investigator who makes fundamental contributions to the mathematical sciences can receive adequate support.

They also expressed the hope that such national gatherings will be held regularly, subject to two modifications: that future meetings be more structured, with detailed agenda and preliminary papers, and that such meetings be jointly sponsored by a broader spectrum of professional societies. The AMS Committee on Science Policy will try to be the catalyst for bringing this about, probably through the use of a small organizing committee of department chairmen. Discussion within departments of the issues reflected in the reports in the April 1983 issue of the Notices (pages 268–301) is urged. Further information, including the names and addresses of the Federal Agency spokesmen involved, may be obtained from Kenneth M. Hoffman, Chairman of the AMS Committee on Science Policy, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139.
The most famous result of finite-dimensional linear algebra is the so-called principal axis theorem: real symmetric matrices can be diagonalized. An infinite-dimensional generalization is called the spectral theorem; that's old. A much deeper and more spectacular infinite version is at the same time much newer; it was discovered in 1973 by Brown, Douglas, and Fillmore (BDF). Their contribution has two parts: insight into a structure and construction of a proof. The insight is ingenious and beautiful; the proof is complicated and difficult. I hope and believe that the proof will become simple some day. Until then, all that a report like this can do is describe the insight.

**Diagonalization.** Given a real symmetric matrix $A$, find its eigenvalues (the roots of the characteristic equation), and find a corresponding orthonormal set of eigenvectors of length 1. The diagonalization procedure can be described in two equivalent ways, geometric and algebraic. (1) Express the linear transformation that $A$ defines as a matrix with respect to the orthonormal basis of eigenvectors so found. (2) Let $P$ be an orthogonal matrix (a rotation) that sends the original "natural" coordinate basis onto the one just found, and form $P'AP$ (where $P'$ is the transpose of $P$). Either way, the result is a diagonal matrix, a "diagonalized" version of $A$.

The complex generalization of the procedure is natural and important. If $A$ is not symmetric ($a_{ij} = a_{ji}$) but Hermitian (conjugate symmetric, $a_{ij} = \bar{a}_{ji}$), the eigenvalues are still real, an orthonormal basis of eigenvectors can still be found, and the result of either (1) or (2) is a diagonalization of $A$. In its algebraic version the diagonalization is $U^*AU$, where $U$ is unitary (the complex analogue of orthogonal) and $U^*$ is its conjugate transpose.

Hermitian matrices are clearly not the only ones that can be unitarily diagonalized: a trivial counterexample is a diagonal matrix (!) with some non-real entries. Is there a usable characterization of diagonalizability? The answer is one of the major accomplishments of linear algebra: a necessary and sufficient condition on a matrix $A$ that there exist a unitary matrix $U$ for which $U^*AU$ is diagonal is that $A$ and $A^*$ commute ($AA^* = A^*A$). The matrices that satisfy the condition are called normal. The principal axis theorem for normal matrices makes it easy to decide when two of them are unitarily equivalent (meaning $A = U^*BU$ for some unitary $U$). The condition is that they have the same diagonal form, or, more geometrically put, that they have the same eigenvalues, with, moreover, the same multiplicities.

**Imitation.** In both classical hard analysis and the modern soft kind, and in their applications as well, it is important to understand the infinite case. There are two ways to try to do that: imitate the finite case and keep as much as you can, or change it, modulate it, and see what can happen that's really new.

Imitation can go a long way quite smoothly. Vectors become infinite sequences $(x_1, x_2, x_3, \ldots)$ instead of finite ones, but inner products $(x, y) = \sum_n x_n y_n$ and norms $\|x\| = (\sum_n |x_n|^2)^{1/2}$ are defined the same way as always. For these definitions to make sense, it is, of course,
necessary to restrict suitably the infinite sequences considered (the series $\sum_n |x_n|^2$ must converge), but that only makes the theory easier, not harder. The norm induces a natural notion of distance ($d(x, y) = ||x - y||$); the metric space so obtained is complete, and all is well. The concept of dimension (for subspaces of the vector space being studied) makes sense and has all the right properties.

As a matter of topological courtesy, the linear transformations studied in the infinite case should be continuous. Continuous linear transformations are representable by matrices, as are all linear transformations in the finite case. The only phenomenon that some students find disconcerting at first is that not every matrix can occur as such a representation. Consider, for instance, the infinite matrix for which each entry above the main diagonal is 0 and each entry on or below is 1. That matrix does not map every square summable sequence (vector) to a square summable sequence. The matrices that do not misbehave in that way are called bounded. The perfect correspondence between linear transformations and matrices in the finite case becomes, in the infinite case, a perfect correspondence between continuous linear transformations and bounded matrices. In view of that correspondence people frequently speak as if linear transformations and matrices were one and the same thing, a harmless practice.

A bounded matrix has a norm. The norm of $A$ is, by definition, the maximum stretching factor, or, precisely, the supremum of the lengths of all the images under $A$ of vectors of length 1; it is denoted by $||A||$. Some other standard matrix concepts also come gratis. The adjoint $A^*$ of $A$ is the conjugate transpose; $A$ is Hermitian if $A = A^*$; $A$ is normal if $AA^* = A^*A$; and $U$ is unitary (surely nobody could denote a unitary matrix by $A^?$) if $UU^* = U^*U = 1$ (the identity matrix).

It is illuminating, throughout the theory, to examine the manifestations of the basic concepts in the special case of diagonal matrices. If $A = \text{diag}(\lambda_1, \lambda_2, \lambda_3, \ldots)$ is the diagonal matrix with the indicated diagonal entries, then $||A||$ is the supremum of all the $\lambda$'s (not the square root of the sum of the squares); $A^* = \text{diag}(\bar{\lambda}_1, \bar{\lambda}_2, \bar{\lambda}_3, \ldots)$; $A$ is Hermitian if and only if the $\lambda$'s are real; $A$ is automatically normal no matter what the $\lambda$'s are; and $A$ is unitary if and only if $|\lambda_n| = 1$ for all $n$.

One way to express the finite-dimensional diagonalization theorem is to write $U^*DU = N$.

The equation is intended to say that the set of all matrices of the form $U^*DU$, where $U$ is unitary and $D$ is diagonal, coincides with the set of all normal matrices. The corresponding infinite-dimensional statement is just plain false. One concrete counterexample is

$$
\begin{pmatrix}
0 & 1 & 0 & 0 \\
1 & 0 & 1 & 0 \\
0 & 1 & 0 & 1 \\
0 & 0 & 1 & 0
\end{pmatrix}
$$

It is easy to see that it is not unitarily equivalent to any diagonal matrix—it has, in fact, no eigenvalues at all. The infinite-dimensional spectral theorem has to be subtler than the finite-dimensional one; eigenvalues and eigenvectors have to be replaced by “approximate” eigenvalues and eigenvectors.

Modulation. What happens when we stop trying to imitate the finite case too closely and go instead to the other extreme to consider the strictly infinite theory only? The idea is to declare everything finite to be trivial, discard it, and work with what remains.

The rank of a linear transformation is the dimension of its range. If a linear transformation has finite rank, then it behaves in all algebraic respects like a linear transformation on a finite-dimensional space, and, from the present point of view, it is trivial.

Here is what that means in more detail. The set $\mathcal{B}$ of all bounded matrices is an algebra over the complex field, and the set $\mathcal{F}$ of all matrices of finite rank is an ideal in that algebra. To say that $\mathcal{F}$ is an ideal in $\mathcal{B}$ means that $\mathcal{F}$ is closed under the formation of linear combinations, and that, moreover, if $F$ is in $\mathcal{F}$ and $A$ is an arbitrary matrix in $\mathcal{B}$, then both $AF$ and $FA$ are in $\mathcal{F}$. To “discard” all matrices of finite rank means to identify them all with 0, or, in proper mathematical language, to form the quotient algebra $\mathcal{B}/\mathcal{F}$.

The identification process works, but not yet well enough. The trouble is topological. It is possible to have a sequence of discarded matrices that converges to a matrix that is not discarded. In other words, the set $\mathcal{F}$ is not closed, and that causes some unpleasantness. The cure is near at hand: close it. If $K$ is the closure of $\mathcal{F}$, the matrices in $K$ are called compact.

(Example: if $A = \text{diag}(\lambda_1, \lambda_2, \lambda_3, \ldots)$, then a necessary and sufficient condition that $A$ have finite rank is that
only finitely many of the \( \lambda \)'s be different from 0; for \( A \) to be compact it is necessary and sufficient that \( \lambda_n \to 0 \). The set \( \mathcal{K} \) is a closed ideal. The really profitable (or should I say profligate?) way to declare everything finite to be trivial is to form the quotient with respect to \( \mathcal{K} \) instead of \( \mathcal{F} \).

**Invertibility.** Recall now the elementary algebraic concept of spectrum. The spectrum of a matrix \( A \) is, by definition, the set of all those complex numbers \( \lambda \) for which \( A - \lambda I \) is not invertible. (The symbol \( A - \lambda \) is an abbreviation for \( A - \lambda \cdot I \).) For finite matrices the spectrum consists exactly of the eigenvalues, and, in particular, the spectrum of a diagonal matrix is the set of its diagonal entries. For infinite matrices invertibility is a somewhat subtler concept, and, in particular, the spectrum of a diagonal matrix is the closure of the set of its diagonal entries. What does spectrum mean after the finite case is discarded?

The question comes down to this: which matrices are invertible modulo \( \mathcal{K} \)? In ordinary language a matrix \( A \) is called invertible if there exists a matrix \( X \) such that \( AX = XA = I \), or, equivalently, \( 1 - AX = 1 - XA = 0 \). To say that \( A \) is invertible modulo \( \mathcal{K} \) should therefore mean that there exists an \( X \) such that both \( 1 - AX \) and \( 1 - XA \) are identified with 0—in other words, both are compact. In a technical term, in harmony with currently accepted usage, \( A \) is **essentially invertible**. (Most authors say instead that \( A \) is a Fredholm matrix.) Here is a nontrivial example. If

\[
S = \begin{pmatrix}
0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 \\
0 & 0 & 1 & 0
\end{pmatrix},
\]

then \( S^*S = 1 \) but \( SS^* \neq 1 \); the difference \( 1 - SS^* \) is, however, compact (in fact, it has rank 1). The matrix \( S \) is not invertible (its range contains only vectors whose first coordinate is 0), but it is essentially invertible; the matrix \( S^* \) acts as an essential inverse.

How can one tell whether a matrix is essentially invertible? The natural geometric condition for ordinary invertibility is that the linear transformation the matrix represents be one-to-one and onto. In other words, \( A \) is invertible exactly in case ker \( A \) is zero and ran \( A \) is the whole space. The abbreviations ker and ran stand for kernel (which is the same as null-space) and range. Equivalently, \( A \) is invertible if and only if nullity \( A = \text{co-rank} A = 0 \), where nullity is the dimension of the kernel and co-rank is the co-dimension of the range. A famous and useful theorem due to Atkinson gives the analogue of the geometric condition for essential invertibility: \( A \) is essentially invertible if and only if both the nullity and the co-rank of \( A \) are finite.

How non-invertible can an essentially invertible matrix be? Both the nullity and the co-rank are measures of non-invertibility; the larger they are, the less invertible the matrix is. For normal matrices the nullity and the co-rank are equal, and in the finite-dimensional case they are equal for all matrices, normal or not. For infinite matrices they can be different. One example is the matrix \( S \) mentioned above; nullity \( S = 0 \) and co-rank \( S = 1 \). The difference, nullity minus co-rank, is called the (Fredholm) index of a matrix, so that, for example, the index of \( S \) is \(-1\).

The spectrum of a matrix is defined in terms of invertibility, and the "essential" analogue of the definition makes good sense. The **essential spectrum** of a matrix is the set of all those complex numbers \( \lambda \) for which \( A - \lambda I \) is not essentially invertible. That's what the concept of spectrum becomes if finite-dimensionality is irretrievably discarded. How does it look for the standard illuminating example of a diagonal matrix \( A = \text{diag}(\lambda_1, \lambda_2, \lambda_3, \ldots) \)? The answer is easy and pleasant: the essential spectrum of \( A \) is the cluster set of the sequence of its diagonal entries. In other words, the essential spectrum of \( A \) consists of those complex numbers that are limits of convergent infinite subsequences of the sequence \( \{\lambda_1, \lambda_2, \lambda_3, \ldots\} \)—the numbers that are, roughly speaking, in the spectrum for infinitely many reasons. If, for instance,

\[
A = \text{diag}(\frac{1}{2}, 0, \frac{3}{2}, 0, \frac{4}{5}, 0, \frac{6}{5}, 0, \ldots),
\]

then the essential spectrum of \( A \) consists of the two numbers 0 and 1.

A somewhat harder example is the matrix \( S \); it turns out that its essential spectrum is the unit circle \( \{\lambda : |\lambda| = 1\} \). It follows that if \(|\lambda| \neq 1\), then \( S - \lambda \) is essentially invertible, and that, therefore, \( S - \lambda \) has an index. The calculation is neither trivial nor terribly deep; the result is that index \( (S - \lambda) = -1 \) if \(|\lambda| < 1\) and index \( (S - \lambda) = 0 \) if \(|\lambda| > 1\). This kind of question can be asked for every matrix \( A \); if \( \lambda \) is not in the essential spectrum of \( A \), what is the index of \( A - \lambda I \)? The answers define an integer-valued function on the complement of the essential spectrum, called the
index function of $A$; it plays an important role in the main theorem.

**Weyl-von Neumann-Berg.** Once these basic concepts about essential invertibility and, more generally, essential spectrum are at hand, it becomes possible to state the basic facts.

The first basic question is this: which matrices are essentially diagonalizable, or in the earlier, informal language, diagonalizable after everything finite has been thrown away? In other words: what is the class $\mathcal{U}^*(D+K)\mathcal{U}$, the class of matrices unitarily equivalent to diagonal matrices modulo $K$? For Hermitian matrices the answer has been long known and is simple and satisfying: every Hermitian matrix is essentially unitarily equivalent to a diagonal matrix. More explicitly: if $A$ is Hermitian, then there exists a diagonal matrix $D$ (with real diagonal entries), and there exists a compact Hermitian matrix $K$ such that

$$A \equiv D + K,$$

where $\equiv$ denotes unitary equivalence.

As an impressive special case, consider a Hermitian matrix $A$ that has no eigenvalues at all; one such example, already considered above, is $A = S + S^*$. The result just stated, due, incidentally, to Weyl (1909) and von Neumann (1935), implies that $A$ is essentially diagonalizable—that is, there exists a diagonalizable matrix $B$ such that $A - B$ is negligibly small (compact).

Isn’t that astonishing? When we first approach infinite matrices, we are told that diagonalization does not work; the spectral theorem has to be much trickier. When, however, we stop trying to imitate finite-dimensionality too slavishly and, instead, completely discard it, the result is stronger and simpler than the finite one. It is an easy corollary of the Weyl-von Neumann theorem that two Hermitian matrices are essentially unitarily equivalent if and only if they have the same essential spectrum; the extra complication of multiplicity is no longer needed.

Can the Weyl-von Neumann theorem be extended to normal matrices? I raised the question in 1970 and it was pooh-poohed by the experts: sure, they said, you just do “the same thing”. The same thing didn’t work. It took a remarkably complicated argument by I. D. Berg to break through the difficulties and prove that every normal operator is also unitarily equivalent to a $D + K$; the result is now known as the Weyl-von Neumann-Berg theorem.

**Essential normality.** It is tempting at this stage to think that we can rest on our laurels: the essentially infinite version of the principal axis theorem has been achieved in complete generality. Not so. The Weyl-von Neumann-Berg theorem answers the right question, the hard question, the question of essential unitary equivalence, but it answers it for the easiest class of matrices only, the class of normal matrices. The “right” class in the essentially infinite case consists of the essentially normal matrices.

What are they and how do they arise? They arise completely naturally—as soon as you see the definition, you will probably be surprised you didn’t think of it yourself. They are the matrices $A$ such that $A^*A - AA^*$ is essentially zero, or, in other words, compact. Example: the matrix $S$.

From what has already been said it is obvious that $S$ is essentially normal but not normal. It could happen that the theory of $S$ is covered by the Weyl-von Neumann-Berg theorem—it would be so covered if $S$ were of the form $N + K$, with $N$ normal and $K$ compact—but it is not (as a slight bit of additional argument shows).

What then is the truth for essentially normal matrices? Could it be that two of them are essentially unitarily equivalent if and only if they have the same essential spectrum? No, that’s not true: the facts are more interesting than that.

The matrix $S$ shifts the natural basis vectors forward by one unit. If, in other words, $e_1 = (1, 0, 0, \ldots), e_2 = (0, 1, 0, \ldots)$, etc., then $Se_1 = e_2$, $Se_2 = e_3$, etc. Consider a matrix $T$ that cyclically permutes all the basis vectors—say, for instance, the matrix whose effect on the $e_n$’s imitates the permutation

$$
\begin{align*}
1 & \rightarrow 3 \rightarrow 5 \rightarrow 7 \cdots \\
& \uparrow \\
2 & \leftarrow 4 \leftarrow 6 \leftarrow 8 \cdots
\end{align*}
$$

The matrix $T$ looks like this:

$$
\begin{pmatrix}
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}
$$

It takes a bit of proving, not too much, that the essential spectrum of $T$ is the same as that of $S$ (namely, the unit circle). Since, moreover, $T$
is normal (in fact unitary), it follows that the index of \( T - \lambda \) is equal to 0 for every number \( \lambda \) not on the unit circle, i.e., that the index function of \( T \) differs from the index function of \( S \) in the interior. Consequence: although \( S \) and \( T \) have the same essential spectrum, they cannot be essentially unitarily equivalent.

Once you understand the obstacle, you can easily guess your way around it. (Proofs are something else again.) The obstacle is the index function — very well, build that into the theorem. The result is the deepest and most valuable forward step in operator theory in the 1970s (and there were quite a few impressive ones) — it is the theorem of Lawrence G. Brown (Purdue), Ronald G. Douglas (Stony Brook), and Peter A. Fillmore (Dalhousie).

A necessary and sufficient condition that two essentially normal matrices be essentially unitarily equivalent is that they have the same essential spectrum and the same index function.

Note that the theorem, the crowning glory of the theory of normal matrices, reinstates something very like multiplicity (namely index) into the characterization of (essential) unitary equivalence.

Conclusion. I conclude with two comments, both having to do with the class \( \mathcal{N} + \mathcal{K} \). The notation indicates the set \( \mathcal{N} \) of all normal matrices and the set \( \mathcal{K} \) of all compact ones. The symbol \( \mathcal{N} + \mathcal{K} \) denotes their vector sum, that is the set of all operators of the form \( N + K \), with \( N \) in \( \mathcal{N} \) and \( K \) in \( \mathcal{K} \). In other words, \( \mathcal{N} + \mathcal{K} \) is the set of all compact perturbations of normal matrices.

Is \( \mathcal{N} + \mathcal{K} \) a closed set? The question itself is not vitally important, but people had tried unsuccessfully to find the answer, and prove it, for some time before the BDF breakthrough. The answer is yes; the set \( \mathcal{N} + \mathcal{K} \) is closed. The proof is an almost immediate corollary of BDF. The full power of the theorem is not needed, but even the part that is needed (the case in which the index function is identically 0) was virgin territory before BDF. No proof independent of the depth of BDF is known yet.

The Brown-Douglas-Fillmore step forward was a great one, it brought into being a new part of the operator industry, and it has already had many valuable generalizations and applications. It has not, however, answered all questions. My second comment is a sample unanswered question; it has to do with the invariant subspace problem. The problem is this: does every continuous linear transformation have a non-trivial closed invariant subspace? For the normal case the affirmative solution is classical and easy; for the compact case it could be called classical by now (Aronszajn and Smith, 1954). What about normal plus compact? That is: is the desired conclusion true in \( \mathcal{N} + \mathcal{K} \)? Not only is that unknown, but just as unknown is the answer to the same question for the apparently simpler class “Hermitian plus compact”.

Reference


Editors' Note. This article by P. R. Halmos is the fifth in the series of Special Articles published in the Notices recently. The series was created to provide a place for articles on mathematical subjects of interest to the general membership of the Society. The Editorial Committee of the Notices is especially interested in the quality of exposition and intends to maintain the highest standards in order to assure that the Special Articles will be accessible to mathematicians in all fields. The articles must be interesting and mathematically sound. They are first refereed for accuracy and (if approved) accepted or rejected on the basis of the breadth of their appeal to the general mathematical public.

Items for this series are solicited and, if accepted will be paid for at the rate of $250 per page up to a maximum of $750. Manuscripts to be considered for this series should be sent to Ronald L. Graham, Associate Editor for Special Articles, Notices of the American Mathematical Society, Post Office Box 6248, Providence, Rhode Island 02940.
The Data Subcommittee of the Committee on Employment and Educational Policy (CEEP) publishes the Annual AMS Survey covering salaries, faculty mobility, enrollments and other related material. In many of these reports the data are presented using a classification of departments into Groups. Departments with graduate programs are currently divided into six groups.

Since 1968, Groups I and II have been defined by reputational surveys, using first the 1964 Cartter evaluation and, subsequently the 1970 Roose-Andersen evaluations. In both of these studies Group I was defined as those U.S. mathematics departments whose rating of the quality of graduate faculty was in the 3.0 to 5.0 range and Group II consisted of those U.S. departments with ratings between 2.0 and 2.9. Since 1973 Group III has been defined in the AMS Survey reports as the remaining U.S. departments of mathematics which report a doctoral program.

In September 1982 a new assessment of graduate programs in the mathematical sciences, conducted by the Conference Board of Associated Research Councils, was published (see the April 1983 Notices, pages 257–267, for a report on this assessment). The Annual AMS Surveys will use this new assessment in assigning departments to Groups I and II. While the 1982 assessment of graduate programs did not establish any grouping of departments, it did retain the same scale and nomenclature in the rating of quality of graduate faculty that was used in both the 1964 and 1970 evaluations. CEEP has decided to maintain the same definitions for Groups I and II: Group I will consist of those 39 mathematics departments\(^1\) with scores of at least 3.0 in the quality of graduate faculty rating and Group II will consist of those 43 departments with scores in the range 2.0 to 2.9. Group III will continue to contain the remaining U.S. departments of mathematics with doctoral programs. The new Groups I and II are listed in Table I.

The 1970 Roose-Andersen survey had 27 departments in Group I and 38 in Group II, while the 1964 Cartter report had 25 departments in Group I and 21 departments in Group II.

Before 1968 several different methods were used to classify departments, including the number of pages published by departmental faculty members in Society journals and, before that, size of department and whether in a public or private university.

It is not expected that this new grouping of mathematics departments will produce any serious discontinuity in the various reports, especially the salary survey. The 1982-1983 salary figures (reported in the November 1982 Notices, pages 630–638) have been re-calculated using the new grouping and little difference was observed. The 1982-1983 salary figures for Groups I and II using the new and old definitions are given in Table II.

The 1964 and 1970 surveys did not include statistics as a separate discipline, while the recent assessment included a separate rating of programs in statistics and/or biostatistics. Group IV in the surveys (statistics, biostatistics and biometrics) will be updated to include programs rated in the 1982 assessment, together with other programs which report having a doctoral program in these disciplines.

The response rate to the various parts of the CEEP surveys has always been low for Group V, which consists of departments of computer science, operations research and applied mathematics. The Data Subcommittee of CEEP has decided to drop programs in computer science departments from future surveys, since the response rate in this discipline has been quite poor. The Subcommittee proposes to publish reports of surveys of computer science from other sources whenever they are available. It should be noted that many computer science programs in colleges and universities which do not have doctoral programs in mathematics are to be found in a mathematics or mathematical sciences department and thus are included in Groups M and B.

Lastly the Subcommittee has decided to include only U.S. departments in Groups M and B, since the response rate from Canadian departments in these two categories has been very low. Salary information for doctorate-granting mathematics departments in Canadian Universities will continue to be reported in Group VI in these surveys.

\(^1\)The University of Maryland had two departments, mathematics and applied mathematics, rated in the 1982 assessment of mathematics departments. Both had the same 3.5 assessment of quality of graduate faculty. The mathematics department is included in Group I, and the applied mathematics department is in Group V.
### Table I. Groups I and II Universities According to the New Rating

<table>
<thead>
<tr>
<th>Group I (Scores ranging from 3.0 to 5.0)</th>
<th>Group II (Scores ranging from 2.0 to 2.9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brandeis University</td>
<td>Arizona, University of</td>
</tr>
<tr>
<td>Brown University</td>
<td>California, University of (Davis)</td>
</tr>
<tr>
<td>California Institute of Technology</td>
<td>California, University of (Riverside)</td>
</tr>
<tr>
<td>California, University of (Berkeley)</td>
<td>California, University of (Santa Barbara)</td>
</tr>
<tr>
<td>California, University of (Los Angeles)</td>
<td>Case Western Reserve University</td>
</tr>
<tr>
<td>California, University of (San Diego)</td>
<td>Claremont Graduate School</td>
</tr>
<tr>
<td>Carnegie-Mellon University</td>
<td>Colorado, University of</td>
</tr>
<tr>
<td>Chicago, University of</td>
<td>Connecticut, University of</td>
</tr>
<tr>
<td>Columbia University</td>
<td>Dartmouth College</td>
</tr>
<tr>
<td>Cornell University</td>
<td>Delaware, University of</td>
</tr>
<tr>
<td>CUNY Graduate School</td>
<td>Duke University</td>
</tr>
<tr>
<td>Harvard University</td>
<td>Florida State University</td>
</tr>
<tr>
<td>Illinois, University of</td>
<td>Florida, University of</td>
</tr>
<tr>
<td>Illinois, University of (Chicago)</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>Indiana University</td>
<td>Georgia, University of</td>
</tr>
<tr>
<td>Johns Hopkins University</td>
<td>Iowa State University</td>
</tr>
<tr>
<td>Maryland, University of</td>
<td>Iowa, University of</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology</td>
<td>Kansas, University of</td>
</tr>
<tr>
<td>Michigan, University of</td>
<td>Kentucky, University of</td>
</tr>
<tr>
<td>Minnesota, University of</td>
<td>Louisiana State University</td>
</tr>
<tr>
<td>New York University</td>
<td>Massachusetts, University of (Amherst)</td>
</tr>
<tr>
<td>North Carolina, University of</td>
<td>Michigan State University</td>
</tr>
<tr>
<td>Northwestern University</td>
<td>New Mexico, University of</td>
</tr>
<tr>
<td>Ohio State University</td>
<td>North Carolina State University</td>
</tr>
<tr>
<td>Pennsylvania State University</td>
<td>Northeastern University</td>
</tr>
<tr>
<td>Pennsylvania, University of</td>
<td>Notre Dame, University of</td>
</tr>
<tr>
<td>Princeton University</td>
<td>Oklahoma, University of</td>
</tr>
<tr>
<td>Purdue University</td>
<td>Oregon State University</td>
</tr>
<tr>
<td>Rice University</td>
<td>Oregon, University of</td>
</tr>
<tr>
<td>Rutgers University</td>
<td>Pittsburgh, University of</td>
</tr>
<tr>
<td>Stanford University</td>
<td>Polytechnic Institute of New York</td>
</tr>
<tr>
<td>SUNY at Stony Brook</td>
<td>Rensselaer Polytechnic Institute</td>
</tr>
<tr>
<td>Texas, University of (Austin)</td>
<td>Rochester, University of</td>
</tr>
<tr>
<td>Utah, University of</td>
<td>Southern California, University of</td>
</tr>
<tr>
<td>Virginia, University of</td>
<td>SUNY at Albany</td>
</tr>
<tr>
<td>Washington University</td>
<td>SUNY at Buffalo</td>
</tr>
<tr>
<td>Washington, University of</td>
<td>Syracuse University</td>
</tr>
<tr>
<td>Wisconsin, University of</td>
<td>Temple University</td>
</tr>
<tr>
<td>Yale University</td>
<td>Tennessee, University of</td>
</tr>
<tr>
<td></td>
<td>Tulane University</td>
</tr>
<tr>
<td></td>
<td>Vanderbilt University</td>
</tr>
<tr>
<td></td>
<td>Virginia Polytechnic Institute &amp; State University</td>
</tr>
</tbody>
</table>

### Table II. 1982-1983 Salary Figures for Doctorate Granting Departments

<table>
<thead>
<tr>
<th>Group I</th>
<th>New Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>(20 of 27 reporting)</td>
<td>(31 of 39 reporting)</td>
</tr>
<tr>
<td><strong>WITH DOCTORATE</strong></td>
<td></td>
</tr>
<tr>
<td>Assistant Professor</td>
<td>Minimum: 190 (197-217) Median: 212 (212-226) Maximum: 280 (223-250)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group II</th>
<th>New Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>(30 of 38 reporting)</td>
<td>(36 of 43 reporting)</td>
</tr>
<tr>
<td><strong>WITH DOCTORATE</strong></td>
<td></td>
</tr>
<tr>
<td>Assistant Professor</td>
<td>Minimum: 180 (200-219) Median: 211 (211-240) Maximum: 260 (223-260)</td>
</tr>
<tr>
<td>Associate Professor</td>
<td>Minimum: 196 (229-269) Median: 260 (259-296) Maximum: 260 (259-269)</td>
</tr>
</tbody>
</table>

**NOTE:** The numbers in parentheses give the range of the middle fifty percent of salaries reported. The figures outside the parentheses represent the minimum and maximum salary listed by any reporting institution.
Sloan Fellowships Awarded

Sloan Fellowships for Basic Research for 1983-1984 have been awarded to eighty-eight outstanding scientists, including twenty mathematicians. The recipients were selected on the basis of their exceptional potential to make creative contributions to scientific knowledge.

The fellowships, granted by the Alfred P. Sloan Foundation, run for two years and are in the amount of $25,000. Candidates for fellowships are nominated by senior scientists familiar with their talents. Fellows need not pursue a specified research project and are free to shift the direction of their research at any time. The grants are administered by the Fellows' institutions.

S. S. Chern of the University of California, Berkeley, Peter D. Lax of New York University, Courant Institute of Mathematical Sciences, and David Mumford of Harvard University are the mathematicians on the fifteen-member selection committee.

The mathematicians awarded Sloan Fellowships for 1983, with their affiliations, are: SELMAN AKHULUT (Michigan State University), GUNNAR E. CARLSSON (University of California, San Diego), DAVID W. CATLIN (Princeton University), CHRISTOPHER R. CROKE (University of Pennsylvania), DAVID FRIED (Boston University), EVANS M. HARRELL (Johns Hopkins University), MICHAEL HARRIS (Brandeis University), VAUGHAN F. R. JONES (University of Pennsylvania), SERGIU KLAINERMAN (New York University, Courant Institute of Mathematical Sciences), DANIEL MICHELSON (University of California, Los Angeles), TUDOR S. RATIU (University of Michigan), BRUCE A. REZNICK (University of Illinois), ROBERT S. RUMELY (University of Georgia), PETER SARNAK (New York University, Courant Institute of Mathematical Sciences), PAUL D. SEYMOUR (Ohio State University), BIRGIT SPEH (Cornell University), DAVID A. VOGAN, Jr. (Massachusetts Institute of Technology), W. HUGH WOODIN (California Institute of Technology), CHIEN-FU WU (University of Wisconsin) and WOLFGANG ZILLER (University of Pennsylvania).

Guggenheim Fellowships

Fifteen John Simon Guggenheim Fellowships have been awarded in mathematics and related areas for 1983. The award winners and their proposed studies are: MARK J. ALOWITZ (Clarkson College of Technology), Studies in nonlinear evolution equations arising in physics; MARTIN DAVIS (Courant Institute of Mathematical Sciences, New York University), Logical antecedents of computer science; EDWARD FORMANEK (Pennsylvania State University), Studies in ring theory; DAVID GRIES (Cornell University), Studies in sequential and concurrent programming; JOHN GUCKENHEIMER (University of California, Santa Cruz), Mathematical models of turbulence; ROGER E. HOWE (Yale University), Dual pairs and the trace formula; HSANG-TSUNG KUNG (Carnegie-Mellon University), Studies in the design of computer systems; TZE LEUNG LAI (Columbia University), Studies in sequential statistical methods and adaptive stochastic control; H. BLAINE LAWSON, JR. (State University of New York, Stony Brook), Studies in differential geometry and topology; BARRY C. MAZUR (Harvard University), The arithmetic of elliptic curves; BORIS MOISEZON (Columbia University), The classification of algebraic surfaces; GARRETT M. ODELL (Rensselaer Polytechnic Institute), Studies in biomathematics; GEORGE C. PAPANICOLAOU (Courant Institute of Mathematical Sciences, New York University), Macroscopic properties of disordered media; GLENN R. SHAFER (University of Kansas), Constructive probability judgment and decision theory; and RICHARD P. STANLEY (Massachusetts Institute of Technology), Interactions between combinatorial mathematics and representation theory.

Mark Kae of the University of Southern California is chairman of the seven-member Committee of Selection.

Congressional Science Fellow Appointed

The Conference Board of the Mathematical Sciences has announced the appointment of CHARLES G. BIRD of the General Motors Research Laboratories as the AMS-MAA-SIAM Congressional Science Fellow for 1983-1984. This fellowship, which is one of some thirty such fellowships in various fields of science, has been offered annually for several years as part of a program administered by the American Association for the Advancement of Science. Congressional Science Fellows spend the fellowship year working on the staff of an individual congressman or of a congressional committee or in the congressional Office of Technology Assessment. The 1982-1983 Fellow, John Chu of the Polytechnic Institute of New York, is serving on the staff of Senator Daniel K. Inouye (D, Hawaii). The AMS-MAA-SIAM fellow will receive a stipend of $22,000 for the year.
Fulbright Awards for 1982-1983

Twenty-one Fulbright awards were made to American scholars in the mathematical sciences for the 1982-1983 academic year. The awards for lecturing, consultation, research, or travel were announced by the Council for International Exchange of Scholars.

The recipients of the awards, their proposed activity, and the institutions which they will visit are listed below.

In Computer Science: Robert McLean Aiken (University of Tennessee, Knoxville) will lecture in computer science at the National Institute of Statistics, Rabat, Morocco. Stefan Andrus Burr (CUNY, City College) will lecture and do research in computer science at the University of Coimbra, Portugal. Allen Paul Newell (Carnegie-Mellon University) will lecture in industrial administration at a seminar on artificial intelligence in Dubrovnik, Yugoslavia. Harry E. Pople, Jr. (University of Pittsburgh, Pittsburgh) will lecture in communications at a seminar on artificial intelligence in Dubrovnik, Yugoslavia. Andrew Frederick Seila (University of Georgia) will do research in computer science at the University of Zagreb, Yugoslavia. Ivan Hal Sudborough (Northwestern University) will do research in computer science at the National Technical University of Athens, Greece. Richard Johnston Wood (University of Maryland, College Park) will lecture in computer science at the University of Paris VI, France.

In Mathematics: Douglas M. Campbell (Brigham Young University) will do research in geometric function theory at Madras University, India, on an Indo-American Fellowship. Richard Clyde DiPrima (Rensselaer Polytechnic Institute) will do research in applied mathematics at Weizmann Institute of Science, Rehovoth, Israel. Rita Mae Ehrmann (Villanova University) will lecture in mathematics at University College of Botswana, Gaborone, Botswana. Michael D. Fried (University of California, Irvine) will do research in mathematics at the University of Helsinki, Finland. Alan L. Hopf enwasser (University of Alabama, Tuscaloosa) will lecture and do research in mathematics at the University of Oslo, Norway. David Corey Kurtz (Salem College) will lecture in mathematics at Chancellor College, Zomba, Malawi. George Frank McNulty (University of South Carolina, Columbia) will lecture in mathematics at Ateneo de Manila University, Philippines. John Niman (CUNY, Hunter College), will lecture in mathematics at Padagogische Hochschule, Bonn, Federal Republic of Germany. Alan Ross (Johns Hopkins University) will lecture in biostatistics at the University of Adelaide, Australia. Hardeo Sahai (University of Puerto Rico, Rio Piedras) will lecture in statistics at the National University in Bogota and Medellin, Colombia. Steve Selvin (University of California, Berkeley) will do research in medical science at the University of Southampton, England. Myles Tierney (Rutgers University, New Brunswick) will lecture and do research in mathematics at the University of Sydney, Australia. Julius M. Zelmanowicz (University of California, Santa Barbara) will do research in mathematics at the Technical University of Munich, West Germany. Raymond Andrew Zepp (National University of Lesotho, Roma, Lesotho) will lecture in mathematics at the University of Abidjan, Ivory Coast.

Bell Laboratories Graduate Scholarship Program

The Bell Laboratories scholarship program is designed to support Ph.D. candidates through completion of their academic program. The technical review subcommittee of Bell Laboratories corporate contributions committee (C. K. N. Patel, chairman; T. H. Crowley, T. L. Powers) will oversee the program. The subcommittee members will determine at which schools scholarships will be awarded and will help to select the scholars. It is expected that the program will be managed by universities at which scholarships are awarded. It is anticipated that twenty-five scholarships will be awarded annually and, in its steady state, the program will have one hundred scholarships in effect.

This program is open to citizens and permanent residents of the United States. The candidates must be recommended by their department chairmen. Continuing annual eligibility will be contingent upon several factors including approval by the department chairmen and by indication of reasonable progress toward completion of the Ph.D. program.

Bell Laboratories Scholarships will include a yearly stipend of $8,400 and cover actual costs of full tuition, books and recurring fees, and a summer research assignment at a Bell Laboratories location.

These scholarship awards will not be portable but will be associated with a specific department and university.

Document Delivery Service

Inaugurated by Mathematical Reviews and MATHFILE

Mathematical Reviews is inaugurating a new document delivery service: effective immediately, mathematicians may request copies of items covered in Mathematical Reviews or in Current Mathematical Publications. The service will be available either directly from Mathematical Reviews or in conjunction with MATHFILE, the on-line electronic database version of Mathematical Reviews.

In announcing the new service, J. L. Selfridge, Executive Editor of Mathematical Reviews,
pointed out that *Mathematical Reviews* receives in its Ann Arbor offices essentially every item of research mathematics published anywhere in the world. The new document delivery service will make that vast collection available to the mathematical community, providing copies of items needed in research to those without other access to such a broad collection. Users may make a request by mail to the Ann Arbor office of *Mathematical Reviews*, or through the document request services of the vendors of MATHFILE (currently BRS and DIALOG). In either case, the Ann Arbor office will mail (within two working days of receipt of the request) a copy of the article (if it is registered with the Copyright Clearance Center) along with an invoice for handling costs ($12 for the first ten pages or less plus $2 for each additional ten pages), any copyright royalties, and postage. If the item requested is not available at the *Mathematical Reviews* office or is not licensed to *Mathematical Reviews* for copyright purposes, the request will be forwarded to an appropriate library for possible inter-library loan, or an original of the item will be forwarded for use and return to *Mathematical Reviews*. (*Mathematical Reviews* has a long-standing cooperative understanding with the University of Michigan libraries; recently, the Mathematics Library at the University of Illinois has undertaken to expand its collection to include almost every monograph ever covered by *Mathematical Reviews*.)

Dr. Selfridge emphasized that this service is designed to assist those who need very rapid access to items or who need access to obscure items not generally available through regular library channels. It is hoped that the combination of direct mail request and on-line request through the MATHFILE vendors will put the service within easy reach of the entire mathematical community.

**New Service Offered by BRS**

BRS, one of the suppliers of MATHFILE, the *Mathematical Reviews* computer-readable database, has expanded its service for individual subscribers significantly. The BRS bibliographic retrieval system has been used by libraries for many years. Recently BRS introduced a new service intended to attract individual users by offering special low rates for subscribers who use the system in the evenings.

BRS AFTER DARK is described as a simple, user-friendly, system. It is available from 6 p.m. to midnight local time, and is designed for users of home computers or terminals.

The total cost of MATHFILE AFTER DARK is $13 per hour, including telephone charges. For information on subscribing to BRS AFTER DARK call BRS at 800-833-4707 or (in New York State) 518-783-1161.

**Center for Multivariate Analysis**

A Center for Multivariate Analysis (CMA) has been established at the University of Pittsburgh to stimulate research work on applied, theoretical and computational aspects of multivariate analysis and related areas. Besides its research mission, the Center will also sponsor symposia and short courses. The permanent members of the Center are P. R. Krishnaiah and C. R. Rao. Term members of the Center and the departments to which they are affiliated are: H. Block (Mathematics and Statistics), L. Bond (Psychology), A. Chakravarti (Biostatistics), W. W. Cooley (Learning Research and Development Center), P. D. Doreian (Sociology), C. Fang (Mathematics and Statistics), N. P. Hummon (Sociology), S. Iyengar (Mathematics and Statistics), T. Jacob (Psychology), C. C. Li (Electrical Engineering), A. Maeshiro (Economics), M. Mazumdar (Industrial Engineering), S. Mazumdar (Biostatistics), J. E. Mezich (Psychiatry), B. R. Rao (Biostatistics), P. S. Reddy (Cardiology), C. K. Redmond (Biostatistics), T. L. Saaty (Business), L. Sailer (Anthropology), A. R. Sampson (Mathematics and Statistics), T. H. Savits (Mathematics and Statistics), B. K. Sinha (Mathematics and Statistics), D. Stoffer (Mathematics and Statistics), K. Subramanyam (Mathematics and Statistics), and N. H. Timm (Educational Research). The Center invites visitors from time to time.

Further information about the CMA may be obtained by writing to: P. R. Krishnaiah, Director, Center for Multivariate Analysis, Ninth Floor, Schenley Hall, University of Pittsburgh, Pittsburgh, Pennsylvania 15260.

**Rollo Davidson Trust**

The Trustees of the Rollo Davidson Trust announce that they have awarded a Rollo Davidson Prize to EDWIN PERKINS of the Department of Mathematics, University of British Columbia, Vancouver, British Columbia, Canada, for his work on applications of non-standard analysis to the solution of problems of outstanding difficulty concerning 'local time' for brownian motion.

This is the eighth year in which awards have been made by the Trust, which is supported by royalties associated with the two books *Stochastic analysis* and *Stochastic geometry* published as a memorial tribute to Rollo Davidson in 1973 and 1974, and by donations to the Trust.

**P. S. Aleksandrov**

1896–1982

Pavel Sergeevich Aleksandrov of the University of Moscow died on November 16, 1982 at the age of 86.

Aleksandrov was born May 7, 1896 in Bogorodsk (Noginsk). He was educated
at the Smolensk grammar school and at Moscow University, which he entered in 1913 and at which he remained for nearly seventy years. He graduated in 1917 and was appointed a lecturer at Moscow in 1921. He was appointed to a professorship in 1928 and received the Doctor of Physical-Mathematical Sciences degree in 1934.

In the summers of 1923 and 1924 he visited Göttingen. He spent the year 1925-1926 in Holland working with Brouwer and, in the summers from 1925 to 1932, he lectured in Göttingen, where he also participated in Emmy Noether's seminar and where he and Hopf conducted a topological seminar. Aleksandrov and Hopf spent the academic year 1927-1928 in Princeton, where they laid the plans for their classic Topologie, a book they completed in 1935.

In 1929 Aleksandrov became a Corresponding Member of the Academy of Sciences of the USSR and, in 1953, a full Member. He was also a member of the Göttingen Academy of Sciences, the Austrian Academy of Sciences, the Leopoldina Academy in Halle, the Polish Academy of Sciences, the Academy of Sciences of the German Democratic Republic and the National Academy of Sciences of the U.S.A. The Soviet Government awarded him the title Hero of Socialist Work and the Council of Ministers of the USSR awarded him a State Prize for his paper Homological properties of the disposition of complexes and closed sets. He was awarded the International Lobachevski Prize for the whole body of his work on homological dimension theory.

He was widely regarded as the father of the Russian school of topology. He made substantial contributions to many parts of the subject—point-set topology, dimension theory, both geometric and algebraic, topology and geometry of complexes, algebraic topology, and so on.

I. M. Vinogradov
1891–1983

Ivan Matveevich Vinogradov, director of the Steklov Institute of Mathematics of the Soviet Academy of Sciences, died in Moscow on March 20, 1983.

Vinogradov was born September 14, 1891, in the village of Milolyub, Velikie Luki District. In 1914 he was graduated from Leningrad University and, in 1929, he was awarded the degree of Doctor of Physical-Mathematical Sciences and elected to the Academy of Sciences. In 1941 he became a Stalin Prize Laureate; in 1945 he was made a Hero of Socialist Labor. He was an honorary or corresponding member of the Armenian Academy of Sciences, the Royal Society of London, the Paris Academy of Sciences, the Danish Academy of Sciences, the German Academy of Sciences, the Hungarian Academy of Sciences, the Accademia Lincei, and the American Academy of Arts and Sciences. He was awarded an honorary Ph.D. by Oslo University in 1950.

He was a lecturer and professor at Perm University, 1918 to 1920, and professor at Leningrad University and Polytechnical Institute, 1920 to 1934.

He has long been well known for his important work in analytic number theory.

In recent years he was criticized for using his position and influence to obstruct the careers of Jewish mathematicians.

Addendum to the Report
in the April Notices
on the Assessment
of Research Doctorate Programs
in the United States

In the April 1983 issue of the Notices, the article Newest Ratings of Graduate Programs in Mathematics reproduced (pages 259 to 261) three reputational rankings of graduate programs in mathematics taken from the recent survey published by the National Academy Press. In these rankings New Mexico State University is at the end of the lists with the description NA. The article did not explain the characters NA (not available). As noted in the original publication, New Mexico State University was not ranked because of an error in the survey data. Thus no ranking was available for New Mexico State through no fault of the institution.

As author of the article in the Notices, I regret any confusion caused by the listing of New Mexico State (and a few other universities with an NA entry) at the end of the rankings. It does not mean that they were ranked last, only that for various reasons no ranking was available.

Donald C. Rung
NSF, State Department Award
NATO Postdoctoral Fellowships

The National Science Foundation (NSF) and the Department of State have announced the award of fifty North Atlantic Treaty Organization (NATO) Postdoctoral Fellowships in Science. These fellowships are awarded to young scientists for full-time postgraduate study at institutions and laboratories in NATO countries or in countries that cooperate with NATO.

The fellowship program was initiated by NATO in 1959 to advance science and technology and to promote closer collaboration among NATO members and associated countries. Each NATO country administers the program for its own nationals. At the request of the Department of State, NSF administers this NATO-funded program for U.S. citizens and nationals.

Of the fifty awards announced, two are in the mathematical sciences; others are in the life sciences, the physical sciences (including engineering) and the social and behavioral sciences. This year's Fellows will attend institutions in Austria (1), Belgium (2), Canada (5), Denmark (2), France (7), Federal Republic of Germany (5), Ireland (2), Italy (2), The Netherlands (3), Norway (1), Switzerland (1), and the United Kingdom (19).

The fifty who received the awards were selected by the National Science Foundation from 350 applicants on the basis of their proposed plans of study after initial review and evaluation by panels of experts who are experts in their specialized fields.

NATO fellows receive a stipend of $1,500 a month for up to twelve months. In addition, dependency allowances and limited allowances for round-trip travel are provided.

The two mathematical scientists, their fields of study and the institutions they will attend are as follows: RUSSELL D. LYONS (University of Michigan), Mathematical Analysis, Université de Paris-Sud, France; and BRUCE E. SAGAN (University of Michigan), Mathematical Sciences, University College of Wales, Wales, United Kingdom.

NSF Awards
Minority Graduate Fellowships

The National Science Foundation (NSF) announced in March the award of fifty fellowships to minority students of outstanding ability for graduate study in the sciences, mathematics and engineering. Four of the fifty awards are in the mathematical sciences.

Over 375 students who are American Indian, Black, Mexican American, Pacific Islander or Puerto Rican submitted applications in a nationwide competition for these fellowships, which were awarded on the basis of merit.

In response to the current shortage of advanced scientific personnel in fields critical to the health of the nation's scientific endeavors, added emphasis was given to making awards in engineering, mathematics, and biology related fields.

Panels of scientists, assembled by the National Research Council of the National Academy of Sciences, reviewed and evaluated applications, with final selections made by the Foundation. In addition to the fellowships awarded, NSF accorded honorable mention to 111 applicants.

Each fellowship provides a stipend of $6,900 per year for full-time graduate study. NSF Minority Graduate Fellows may attend any appropriate non-profit U.S. institution of higher education. An annual education allowance of $4,000 is provided to the institution by NSF in lieu of all tuition and fees. Three full years of graduate study are supported by each fellowship. The fellowships may be used over a five-year period, so students can incorporate teaching or research assistantships into their education during periods when they are not receiving fellowship support.

In addition to the awards announced this year, 147 individuals who previously received minority fellowships may continue their study during the 1982-1983 fellowship year.

The 1983 recipients in the mathematical sciences are listed below (the institutions in parentheses are those awarding bachelor degrees, those outside the parentheses are those at which graduate study is to be pursued): JOHN EDWARD ALCARAZ (University of California, San Diego), University of California, San Diego; ROBERT EDWARD CRUZ (U.S. Air Force Academy), Stanford University; RAUL ANTHONY DURAN (California State University, Chico), University of California, Los Angeles; and VICTOR JOHN ENG (Tufts University), University of Rochester.

--- NSF News Release

NSF Graduate Fellowships Awarded

Four hundred and fifty outstanding college students have been offered fellowships for graduate study in the natural and social sciences, mathematics and engineering, the National Science Foundation (NSF) announced in March. Forty-eight of the awards were made to students majoring in mathematics or computing.

More than 3,450 students submitted applications in the nationwide competition for the NSF
Graduate Fellowships, which are awarded on the basis of merit.

In response to the current shortage of advanced scientific personnel in certain fields critical to the continued health of science in the nation, added emphasis was given to making awards in computer science, engineering, the earth sciences and biology this year.

Panels of scientists, assembled by the National Research Council of the National Academy of Sciences, evaluated applications; final selections were made by the NSF. In addition to the fellowship awards offered, NSF awarded honorable mention to 1,186 applicants in recognition of their potential for scientific careers.

The fellowships provide a stipend of $6,900 per year for full-time graduate study. NSF Graduate Fellows may attend any appropriate non-profit U.S. or foreign institution of higher education. An annual cost-of-education allowance of $4,000 is provided by NSF in lieu of all tuition and fees to the institution selected by each Fellow. Each fellowship is awarded for three years of graduate study. The fellowships may be used over a five-year period to permit students to incorporate teaching or research assistantships into their education during periods in which they are not receiving their fellowship stipends.

In addition to the NSF Graduate Fellowship awards offered this year, 966 individuals who received fellowship awards in previous years are eligible to continue their study during the 1983-1984 fellowship year.

The 1983 recipients in the mathematical sciences are listed below (institutions in parentheses are those awarding bachelor degrees, those outside the parentheses are those at which graduate study is to be pursued): BENNETT BATTAILE (St. Olaf College), Cornell University; BRUCE JEREMY BAYLY (University of Cambridge), Massachusetts Institute of Technology; JAY PATRICK BELANGER (University of Michigan), Princeton University; CHRISTOPHER J. BISHOP (Michigan State University), University of Chicago; ANDREW F. Boucher (University of Oxford), University of Oxford; RANDOLPH CARL BROST (University of Denver), Stanford University; CLYDE W. CARPENTER (Swarthmore College), Carnegie-Mellon University; MARK ALAN DERTHICK (Washington University), Stanford University; DIANE ELIZABETH DUFFY (Boston College), Cornell University; PAUL NEIL FELDMAN (Yale University), Massachusetts Institute of Technology; LINDA THERESE FOSTER (University of California, San Diego), Carnegie-Mellon University; CARY GORDON GRAY (Abilene Christian University), Stanford University; RONALD IRWIN GREENBERG (Washington University), Stanford University; JOSEPH NEELY GREGG, Jr. (Texas A&M University), Princeton University; BENJAMIN NATHAN GROSOF (Harvard University), Stanford University; GREGORY DONALD HAGER (Luther College), Stanford University; ROBERT JOSEPH HALL (University of California, Berkeley), Massachusetts Institute of Technology; E. MICHAEL HANSEN (Bradley University), University of Illinois Urbana-Champaign; MONNETT HANVEY (Barnard College, Columbia University), Columbia University; EHUD U. HRUSHOVSKI (University of California, Berkeley), University of California, Berkeley; RONALD LLOYD KALIN (Princeton University), Carnegie-Mellon University; GAIL REBECCA LETZTER (Harvard University), University of Chicago; KIN YIN LI (University of Washington), University of California, Berkeley.

Also FRANKLIN MILLER MALEY (Amherst College), Massachusetts Institute of Technology; TIMOTHY PAUL MCBREEN (University of Arizona), Stanford University; PATRICK D. McSWIGGEN (University of California, Berkeley), University of California, Berkeley; ROGER MYRON OBA (Harvey Mudd College), Brown University; TIMOTHY WALTER PEIERLS (Yale University), Cornell University; LAURENCE ERIC PENN (Harvard University), Princeton University; CHARLES L. PERKINS (Harvard University), Stanford University; JAMES GARY PROPP (Harvard University), University of California, Berkeley; DAVID PETER ROBERTS (Princeton University), Harvard University; CECILIA B. RODRIGUEZ (California Institute of Technology), University of California, Berkeley; ALEJANDRO A. SCHAFFER (Carnegie-Mellon University), Stanford University; JEFFREY R. SCHAFFER (Amherst College), Massachusetts Institute of Technology; KAREN ELIZABETH SCHOLZ (Rice University), Stanford University; CARLOS TSCHUDI SIMPSON (Harvard University), University of California, Berkeley; ROBERT HAL SLOAN (Yale University), Massachusetts Institute of Technology; SCOTT FRASER SMITH (Purdue University), Stanford University; JOHN ROBERT SULLINS (Massachusetts Institute of Technology), Massachusetts Institute of Technology; BRADLEY VAN BANDEN (Ohio State University), Stanford University; LARRY EVAN VERSAW (North Texas State University), North Texas State University; WILLIAM CHARLES WAKE (University of Wisconsin, La Crosse), University of Illinois Urbana-Champaign; JANET ANN WALTER (Michigan State University), Stanford University; NIGEL GRAEME WARD (University of Michigan), Stanford University; JOE DAVID WARREN (Rice University), Stanford University; SAMUEL POLLARD WHITE (Carleton College), Princeton University; WILLIAM DAVID WILSON (Vanderbilt University), Stanford University.

- NSF News Release
Letters to the Editor

The Situation in Poland

In August 1982 I served as a member of the U.S. delegation to the IMU held in Warsaw (see Notices, October 1982, page 503). It was inevitable that I would feel a responsibility to keep informed about the situation of mathematics in Poland as it developed, the more so because of the debt I owed to the Polish school of mathematics, and in view of the scientific contacts I had maintained for many years.

During the period of the last few months I have continued to be in touch in one form or another with a number of Polish mathematicians, and these contacts have encouraged me to draw up a statement which summarizes the situation on mathematics as best as I can. Let me emphasize that while I take full responsibility for disseminating what follows, the views that are expressed are not primarily mine, but represent a compilation of the facts and a consensus of the opinions provided by these sources.

Political and economic situation. It may be worthwhile to begin by quoting what are the official statistics (for the period of December 13, 1981 to December 13, 1982).

Total number interned: 10,132
Number of killed during political disturbances: 15
Number of wounded: public 173; police and militia 800
Number tried for political activities: 3,616
Number received official warning concerning political activity: 150,000

At present the visible unrest and political demonstrations have died away. But great economic hardships, a deadening feeling of malaise, and anxiety about the future persist. I am informed that shortages of basic necessities are omnipresent. What would be striking for any visitor from abroad is the emptiness of stores, and the lack of even the most primitive "luxuries" which had hitherto been accessible to the average Pole. These shortages, which pervade every aspect of life, are highlighted and contrasted by the relative opulence available at a few hotels catering to the international clientele, and at hard-currency "dollar stores." As far as these special stores are concerned, one should keep in mind that there is a rampant black market for dollars, whose exchange rates are quoted weekly by a government newspaper. Incidentally, these rates are five times the official exchange rates and so the average Pole does not have the money to avail himself of the black market.

Polish mathematicians. Above thirty Polish mathematicians had been interned; one is still held in a psychiatric hospital following a decision of the court at his trial for taking part in a demonstration at the Gdansk shipyards in December of 1981. Several were in hiding for almost a year. I am told that one is still in hiding having escaped wounded from a hospital. Several are awaiting trial, while several other mathematicians have lost their jobs or have been removed from positions of authority for political reasons.

Despite all of this, most Polish mathematicians like the majority of other Polish scientists have survived the recent period relatively well. Obviously the nation's ordeal, and the loss of hopes that followed the breaking of the spirit that existed during the period of Solidarity, have weighted heavily. Yet the vast majority can continue their work: they are teaching, doing their research, and can keep up contacts with the outside world. Trips abroad for Polish mathematicians are by and large following their usual pattern, although in a few cases these have been disallowed for political reasons. Also, on a smaller scale, foreign mathematicians are taking part in activities in Poland. Dramatic cuts in availability of foreign currency for subscription of journals are compensated in part by the exchange of journals. Thanks to numerous personal contacts there is a constant inflow of preprints and reprints from abroad, but the situation regarding books is much worse.

International Congress. The International Congress to be held in Warsaw this August will convene under conditions quite different from those of previous Congresses. Polish mathematicians are aware that as hosts they will be dealing with delicate and difficult problems.

In facing these questions there seems to be a widespread wish to keep mathematics "above politics." Polish mathematicians are eager to

Warsaw Travel Funds

The following statement has been reviewed and approved by appropriate officials of the United States Government.

EDITOR

April 15, 1983

The U.S. Government policy barring the use of Federal funds to support travel to Poland to attend the International Congress of Mathematicians in Warsaw, August 16 to 24, 1983, is still in effect. Consequently, although no final decision has been made, it is not possible at this time for the National Science Foundation to authorize travel support for people planning to attend the ICM this summer.
maintain scholarly contacts with the rest of the world, to be able to send young people to study abroad, to participate in conferences all over the world and to organize them in Poland, and generally not to "drop-out" of the world-wide mathematical community. These desires argue strongly in favor of the Congress.

On the other hand — so I am told by the Polish colleagues I have been in contact with — there are many who feel other concerns. They see the Congress as more of a festival than as a conference, and very few would like attending a festival in Poland at this time. They also realize that in spite of the non-political character of mathematics, the Congress could be taken advantage of by the authorities in their wish to show that the situation has returned to normal. Finally, these doubters ask themselves if they would remain indifferent were the Congress to be held in another country with similar political repressions.

In closing I wish again to emphasize that the purpose of the above statement is not the expression of my views, since my personal opinions on the subject are of no great interest. Rather, I have felt the duty to present as best as I can the facts and opinions of those who have first-hand knowledge of the situation.

Elias M. Stein
Princeton University

As a Pole and as a mathematician I fully support and totally agree with the position of Peter Hilton, expressed in the February issue of the Notices (page 172), concerning the organization of the ICM in Warsaw in August 1983.

By holding the ICM in Warsaw we are bestowing legitimacy on a regime which is repressing the Polish people.

Jacek Bochnak
Vrije Universiteit,
Amsterdam

Blacks on the Council

The results of the 1981 and 1982 elections in the American Mathematical Society should lead to some soul-searching on the part of the electorate and even more of the leadership. The Council for 1983, like the Council for 1982, does not have even one Black member. The same is true of the Nominating Committee. In its recommendations for election to the 1983 Council, the Nominating Committee did not suggest any of our Black colleagues. One Black was included on the Council ballot eventually, as a result of a petition campaign. But he was not elected, nor was the one Black on the ballot for Nominating Committee elected.

Three Blacks have served on the Council: David Blackwell (member of the National Academy of Sciences), James A. Donaldson (Chair, Mathematics Department, Howard University), J. Ernest Wilkins, Jr. (member of the National Academy of Engineering Sciences). All three achieved membership by winning contested elections in which all had serious competition. More recently, Black candidates have been unsuccessful in such elections.

No Black has ever been nominated for an uncontested position on the Council, yet most (about two-thirds) the Council members get there via nomination for uncontested posts. One may well wonder why no Black has ever been offered this opportunity or, more precisely, why over the years the Council has failed to express confidence in the community of Black mathematicians by offering some of its members the same automatic path to membership on the AMS policy-making body as provided for most whites on the Council. Now the AMS has again an exclusively white Council. Black mathematicians may well regard their dues payments as "taxation without representation."

The contested offices are Vice-President and Member-at-Large. For these posts the ballot lists at least twice as many candidates as there are vacancies to be filled. For all other posts (the big majority) the ballot lists exactly the same number of candidates as there are vacancies. These uncontested posts include: President, Secretary, Associate Secretaries (4), Treasurer, Associate Treasurer and numerous members of editorial committees.

While I was on the Council, I urged vigorously several times that the Council nominate Black colleagues for some of the uncontested posts and proposed names of individuals eminently well qualified to discharge the requisite responsibilities. Their abilities were never challenged, but the Council nonetheless accepted without change the proposals put forward by the Nominating Committee and so it remains true to this day that

Policy on Letters to the Editor

Letters submitted for publication in the Notices are reviewed by the Editorial Committee, whose task is to determine which ones are suitable for publication. The publication schedule requires from two to four months between receipt of the letter in Providence and publication of the earliest issue of the Notices in which it could appear.

Publication decisions are ultimately made by majority vote of the Editorial Committee, with ample provision for prior discussion by committee members, by mail or at meetings. Because of this discussion period, some letters may require as much as seven months before a final decision is made.

The committee reserves the right to edit letters.

The Notices does not ordinarily publish complaints about reviews of books or articles, although rebuttals and correspondence concerning reviews in the Bulletin of the American Mathematical Society will be considered for publication.

Letters should be mailed to the Editor of the Notices, American Mathematical Society, Post Office Box 6248, Providence, Rhode Island 02940, and will be acknowledged on receipt.
the slate for automatic election never has included any Black colleague.

On two separate occasions I suggested that the choice of Southeast regional Associate Secretary be one of our Black colleagues. This is a region where many, probably most, U.S. Black mathematicians are employed, in the traditionally Black institutions which are most numerous there. Following one such discussion which I initiated last year, the Council approved R. G. Ayoub's motion to memorialize the Nominating Committee to keep in mind the possibility of assuring Black representation on the Council via nomination for a non-contested office. If the Committee and Council finally take heed of the need for them to stop excluding Black colleagues from selection for non-contested office, then some progress will have been made, hopefully of a non-token variety.

This situation will have to be followed closely to end the era of "taxation without representation," an era which our Black colleagues and their supporters find increasingly intolerable. Up until now, the record shows that Blacks must achieve the same level of distinction to fight their way on to the Council via seriously contested elections as is required of whites to coast in without any contest at all. Not a pretty picture.

Lee Lorch
York University
Birzeit University

Yesterday I called Julia Robinson to find out if the Council of the AMS had considered, at its Denver meeting, the letters of Lipman Bers, Shaul Foguel, myself and others. Each of us had protested the Council's refusal to act on the Human Rights Committee recommendation on the Israeli closing of Birzeit University. Julia told me that a motion not to discuss the letters or the issue was passed by the Council.

It is interesting that on the same day I received the Manchester Guardian Weekly of January 8, which contains a long letter protesting the measures of the Israeli military against the West Bank universities. The list of distinguished signers of the letter begins with Michael Atiyah and ends with the Very Reverend Victor de Waal, Dean of Canterbury.

The Council has, in the past, approved a number of motions concerning the welfare and academic freedom of mathematicians and mathematical programs in various countries. I think these have been, by and large, admirable—useful and important. Now the Council refuses for the second time to apply its previous standards to the Israeli treatment of Birzeit.

I am at a loss to explain the Council action. I do not believe that the majority of the Council is unaware of the facts of the Israeli occupation— these are generally well known and are easily obtainable by any literate person with access to a decent library. I do remember, with queasy horror, that in the very early 1940s, there were people who wanted to "avoid controversy" and others who wanted not to know the facts about the occupied territories.

The Council's action in Denver can and will be taken as a validation of the righteousness of the actions of the Israeli military against the universities on the West Bank.

I resign from the American Mathematical Society, effective now. I ask that you, the Secretary, publish this letter in the Notices of the Society, together with your own summary of the motions concerning Birzeit that were placed before the Council, the letters received, and the Council's actions.

I am sorrowful at ending a membership that began 44 years ago.

J. L. Kelley
University of California, Berkeley

EDITORS' NOTE. The Secretary provides the following summary of Council action. The bare facts are brief. The Council of 22 August 1982 considered the following resolution:

The Council of the AMS regrets the closing of Arab West Bank universities in what appears from a distance to be "collective punishment" for acts of individual students. If individuals are committing illegal acts, they and they alone should be punished. The stopping of educational processes for an entire student body is a severe action that we cannot approve of.

This was a revised version, written by the Committee on Human Rights, of a stronger resolution which had been considered briefly at the meeting of 16 March 1982 and referred to the Committee. The resolution failed. Reconsideration was proposed at the meeting of 4 January 1983. A motion to "object to consideration" was immediately passed.

The Secretary has been unsuccessful in attempts to write a summary of the arguments presented which is regarded as fair and accurate by all parties to whom he has shown drafts. Accordingly such a statement is not offered.
Queries

**Edited by Hans Samelson**

QUESTIONS ARE WELCOMED from AMS members regarding mathematical matters such as details of, or references to, vaguely remembered theorems, sources of exposition of folk theorems, or the state of current knowledge concerning published or unpublished conjectures.

REPLIES from readers will, when appropriate, be edited into a composite answer and published in a subsequent column. All answers received will be forwarded to the questioner.

QUERIES and RESPONSES should be typewritten if at all possible and sent to Professor Hans Samelson, American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940.

**Queries**

278. M. S. Brandly (Route 3, Liberty, Indiana 47353). Consider the \((v,b,r,k,\lambda)\) block designs, my block design has specifications as follows: \(v\) equals \(N\) (\(N\) congruent to 0 (mod 4)), \(b\) equal to \(N(N-1)\) divided by 4, \(r\), equal to \(N-1, k\) equal to 4 and \(\lambda\) equal to 3. According to H. Hanani, Ann. Math. Statist. 32 (1961), there does exist such a block design for any \(N\) congruent to 0 (mod 4) with these specifications. Within the blocks of size four, I desire to match two of the members together versus the other two. For the total number of blocks, I also desire that each member be matched against each other member exactly twice. I have the arrangement for \(N\) equal to 4 (\(3\times4\)) and 8. I want to know if there exists a method to manufacture such designs for \(N\) equal to 12, 16, 20, 24,... How many designs exist for a given \(N\)? Must a design exist for any \(N\) congruent to 0 (mod 4)?

279. John P. Nolan (UNZA, Department of Mathematics, P. O. Box 32379, Lusaka, Zambia). Let \(p > 0, 0 < \beta < p\) and define the "density" \(\Delta(\lambda) = \min(1,|\lambda|-(N+\beta))\) on \(L^p(R^N, \Delta)\). If \(1 \leq p \leq \infty\), then \(\inf ||1-\sum b_j e^{i\langle t_j, \lambda \rangle}\|_{p,\Delta} > 0\) where the inf is over all sums \(\sum b_j e^{i\langle t_j, \lambda \rangle}\) with \(|t_j| \geq 1\) for all \(j\). Is the same true for \(0 < p < 1\)? This is related to a problem in prediction theory.

**Responses**

The editor would like to thank all those who sent in replies.

245. (vol. 28, p. 512, October 1981, Kjeld Bagger Laursen) If \(P\) is a prime ideal in the algebra \(C^\infty([0,1])\) of \(n\) \((n \geq 0)\) times continuously differentiable complex-valued functions on the unit interval, then it is known that the set of primes containing \(P\) is totally ordered by inclusion (J. Funct. Anal. 38 (1980), 16-24). Is the same true in \(C^\infty([0,1])\)? **Reply:** No. Let \(F\) be a prime \(\mathbb{Z}\)-filter, let its accumulation point be 0 (w.l.o.g.), let \(p = \{f | Z(f^{(n)}) \in F, \forall n\}\) and \(q = \{f | Z(f) \in F\}\). Clearly \(p\) and \(q\) are prime ideals and \(p \subseteq q\). Let \(k(x) = x - h(x)\) be a diffeomorphism with \(h\) nonnegative, vanishing only at the origin, where all its derivatives vanish. Let \(K(F) = \{k(A) | A \in F\}\). Let \(r - \{f | \{x||f(x)|| \leq \delta|k^{-1}(x)|^{2n}\} \in K(F), \forall n \in N, \delta > 0\). One can show (i) \(r\) is a prime ideal, (ii) \(p \subset r\), (iii) \(q \not\subset r, r \not\subset q\). (Contributed by James Moloney)


267. (vol. 30, p. 11, January 1983, Niels Jacob) Does there exist an explicit formula for \(f(a) = \int_{-\infty}^{a} e^{-x^2} \cos ax\ dx\)? **Reply:** Integrals of the form \(\int_{0}^{a} x^{n} \exp(-ax^p - bx^q)\ dx\), where at least one of \(p\) or \(q\) is a positive integer, are expressible as generalized hypergeometric functions. In the case at hand we find

\[
\int_{-\infty}^{\infty} \cos(xy)e^{-x^{2n}}\ dx = \frac{1}{n} \sum_{i=0}^{n-1} \frac{(-1)^i}{(2i)!} \left(\frac{2l+1}{n}\right)y^{2i}.
\]

where \(I\) denotes that this term in the progression of parameters is missing. One can of course get an explicit power series expansion; however, that is not the intent of the query. (Contributed by M. L. Glasser, Michael Rolenz and Lawrence Turyn)
**1983 AMS Elections**

**Council Nominations for Vice-President and Member-at-Large**

Two vice-presidents and five members-at-large of the Council will be elected by the Society in the fall of 1983.

The vice-president will serve for a term of two years effective January 1, 1984. The Council has nominated four candidates for the two positions. They are:

- Paul J. Cohen
- E. R. Kolchin
- Jacob T. Schwartz
- Stephen Smale

Nominations by petition are acceptable. Refer to the two previous issues of the *Notices* (February 1983, pages 178-179; April 1983, pages 308-309) for the rules and the form of the petition.

The five members-at-large will serve for a term of three years. The Council nominated seven candidates. They are:

- Michael G. Crandall
- David Eisenbud
- Carlos E. Kenig
- Dusa McDuff
- Jean E. Taylor
- William P. Thurston
- Floyd L. Williams

Nominations by petition are acceptable. If the total number of nominees is less than ten, it will be brought to ten by the Council before the ballot is circulated.

**President’s Candidates for the Nominating Committee 1984 and 1985**

Four members of the Nominating Committee are to be elected in the fall of 1983. President Julia B. Robinson has named the following six candidates:

- A. T. Bharucha-Reid
- Heini Halberstam
- Alistair H. Lachlan
- Tsit-Yuen Lam
- Robert P. Langlands
- Harold M. Stark

Nominations by petition are acceptable. Refer to the two previous issues of the *Notices* (February 1983, pages 178-179; April 1983, pages 308-309) for the rules and form of the petition. If the total number of candidates is less than eight, the number will be brought up to eight by the president.
Albany Meetings, August 8–11, 1983

Second Announcement

The August 1983 Joint Mathematics Meetings, including the 87th summer meeting of the American Mathematical Society, the 63rd summer meeting of the Mathematical Association of America, and the 1983 annual meeting of Pi Mu Epsilon, will be held August 8–11, 1983 (Monday–Thursday), at the State University of New York, Center at Albany. The meetings will be preceded by the AMS Short Course on August 6 and 7 (Saturday and Sunday). Sessions will take place on the campus of the State University of New York, Center at Albany.

The members of the Local Arrangements Committee are Lindsay N. Childs (publicity director), William W. Fairchild, Richard Z. Goldstein (chairman), Timothy L. Lance, Violet Larney, William J. LeVeque (ex officio), David P. Roselle (ex officio), Hugo Rossi (ex officio), B. David Saunders, Edward S. Thomas, Edward C. Turner, and Nura D. Turner.

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AMS Abstracts, For consideration for special sessions Exired
Of contributed papers Exired
MAA Abstracts
Of contributed papers Exired
Summer List of Applicants July 1
Preregistration and Housing
Housing cancellations (full refund) July 15
Housing cancellations (partial refund) After July 15
Motions for AMS Business Meeting July 10
Preregistration cancellations (50% refund) August 5
Dues credit for nonmembers/students September 11

87th Summer Meeting of the AMS
August 8–11, 1983

Colloquium Lectures
A series of four Colloquium Lectures will be presented by Bertram Kostant of the Massachusetts Institute of Technology at 1:00 p.m., Monday through Thursday, August 8–11. The title of this lecture series is On the Coxeter element and the structure of the exceptional Lie groups.

Steele Prizes
The 1983 Leroy P. Steele Prizes will be awarded at a session at 4:45 p.m. on Wednesday, August 10.

Invited Addresses
By invitation of the AMS Program Committee, there will be eight invited one-hour addresses. The list of speakers, their affiliations, the dates and times of the talks, and some of the titles follow:

Selden Akbulut, Michigan State University, title to be announced, 2:15 p.m. Wednesday; James Eells, University of Warwick, England, Harmonic maps of Riemann surfaces, 8:30 a.m. Monday; Robert C. Gunning, Princeton University, Riemann surfaces and their Wirtinger varieties, 5:00 p.m. Monday; Leo A. Harrington, University of California, Berkeley, Reverse mathematics, 8:30 a.m. Wednesday; Ira Herbst, University of Virginia, The Schrödinger equation, 9:45 a.m. Wednesday; Hervé Jacquet, Columbia University, The residual spectrum of the linear group, 2:15 p.m. Tuesday; Johan H. B. Kemperman, University of Rochester, Functional equations over groups, and the mean value property, 3:30 p.m. Wednesday; and Wen-Ch'ing Winnie Li, Pennsylvania State University, University Park, Fourier transform: Representation of general linear groups, 11:00 a.m. Monday.

Special Sessions
By invitation of the same committee, there will be eleven special sessions of selected twenty-minute talks.

The Albany meetings will repeat an experiment tried for the first time at the Toronto meetings in August of 1982, in that the program will be “joint” in a stronger sense than before. AMS and MAA sessions will run concurrently and simultaneously, and the meetings have been shortened from five days to four. In order to evaluate the effects of this new type of program, a questionnaire will be distributed to all registrants at the Albany meetings requesting opinions and comments. A central location will be established for the collection of these questionnaires at the meeting registration desk. It is hoped that all participants will find time to respond, since this information will be a valuable guide in future planning of summer meetings.
Preregistration

Preregistration. Preregistration for these meetings must be completed by July 1, 1983. All those wishing to preregister must complete the form which appears at the back of this issue and submit it along with the appropriate preregistration fee(s) to the Mathematics Meetings Housing Bureau in Providence by July 1.

Preregistration for the meeting and full payment of room/board charges is a requirement in order to obtain confirmed residence hall accommodations at SUNYA through the Mathematics Meetings Housing Bureau as outlined in the facing page.

Checks for preregistration fee(s), housing payments and fees for social events should be made payable to the AMS. Canadian checks must be marked for payment in U.S. funds. Those who preregister for the AMS Short Course and/or Joint Mathematics Meetings pay fees which are 30 percent lower than those who register at the meetings. The preregistration fees are as follows:

**AMS Short Course**
- Student/Unemployed: $5
- All Others: $25

**Joint Mathematics Meetings**
- Member of AMS, MAA, IIME: $38
- Emeritus Member of AMS, MAA: $9
- Nonmember: $58
- Student/Unemployed: $9

**MAA Minicourses #1 through #6**: $20 each

Do not submit minicourse fee(s) with preregistration form.

There is no extra charge for members of the families of registered participants, except that all professional mathematicians who wish to attend sessions must register independently.

All full-time students currently working toward a degree or diploma qualify for the student registration fees, regardless of income.

The unemployed status refers to any person who has been a member of the AMS or MAA for twenty years or more, and is retired on account of age from his or her latest position.

A $4 charge will be imposed for all invoices prepared when preregistration forms are submitted without accompanying check(s) for the preregistration fee(s) or are accompanied by an amount insufficient to cover the total payments due. Preregistration forms received well before the deadline of July 1 which are not accompanied by correct payment will be returned to the participant with a request for resubmission with full payment.

A 50 percent refund of the preregistration fee(s) will be made for all cancellations received in Providence no later than August 5, 1983. No refunds will be granted for cancellations received after that date, or to persons who do not attend the meetings.

The only exception to this rule is someone who preregisters for the Joint Mathematics Meetings only in order to attend an MAA Minicourse, and is too late to obtain a slot in the Minicourse. In this case, full refund will be made of the Joint Mathematics Meetings preregistration fee, provided the preregistrant has checked the box on the preregistration form that this was his or her intent. Individuals who preregister for both the Joint Meetings and a Minicourse and who intend to attend the Joint Meetings, even if the Minicourse is not available, should, of course, not check the box on the preregistration form. In this case, the Joint Meetings Preregistration will be processed.

Those who preregister for the AMS Short Course will be able to pick up their badges and other material in Albany after 11:00 a.m. on Saturday, August 6, during the hours the AMS Short Course registration desk is open.

Those who preregister for either the Joint Mathematics Meetings or the MAA Minicourses or both will be able to pick up their badges and other material in Albany after 4:00 p.m. on Sunday, August 7, during the hours the Joint Mathematics Meetings registration desk is open.

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N.B.: Place your AMS or MAA mailing label on the preregistration/housing form where indicated. If you do not have a label readily available, please supply complete name, address, and AMS or MAA member code.
Housing

Mathematics Meetings Housing Bureau. The form for requesting university residence hall accommodations will be found at the back of this issue. The use of the services offered by the Mathematics Meetings Housing Bureau requires preregistration for the meetings. Persons desiring confirmed residence hall accommodations should complete the form, or a reasonable facsimile, and send it to the Mathematics Meetings Housing Bureau, Post Office Box 6887, Providence, Rhode Island 02940, so that it will arrive no later than July 1, 1983.

Please read carefully the section on University Housing before completing the form. Forms sent to the wrong address and thus incurring delay in delivery to the Housing Bureau until after the deadline cannot be accepted. All residence halls reservations with full prepayment for room/board will be confirmed by the housing bureau. All reservation requests must be received in writing and be processed through the Housing Bureau in Providence. Please do not contact the university directly. Telephone requests will not be accepted.

Housing assignments are made on a first-come, first-served basis, so participants desiring specific types of accommodations are urged to get their housing requests in as early as possible. Housing requests received after the deadline of July 1 most surely cannot be honored.

Participants who are able to do so are urged to share a room whenever possible. This procedure can be economically beneficial. The housing form should be fully completed to ensure proper assignment of rooms. Participants planning to share accommodations should provide the name(s) of the person(s) with whom they plan to occupy a room. Each participant should, however, complete a separate preregistration form. Parties planning to share rooms should send their forms together in the same envelope if possible.

Changes/Cancellations

Please make all changes to or cancellations of residence hall reservations with the Housing Bureau in Providence before July 15, 1983 in order to receive full refund of housing payment. After that date, cancellations should be made with the Housing Bureau in Providence up until August 5, 1983, at which time a partial refund (amount paid minus one night’s room/board) will be made. No cancellations can be made between 5:00 p.m. on Friday, August 5, and 4:00 p.m. on Sunday, August 7, after which changes or cancellations may be called in to Mary Coccoli at the Telephone Message Center number in Albany. Changes in reservations may be made at any time by notifying the Housing Bureau.

N.B.: Place your AMS or MAA mailing label on the preregistration/housing form where indicated. If you do not have a label readily available, please supply complete name, address, and AMS or MAA member code.
The American Mathematical Society, in conjunction with its eighty-seventh summer meeting, will present a one and one-half day short course titled *Population Biology* on Saturday and Sunday, August 6 and 7, 1983, at the State University of New York, Center at Albany. The program is under the direction of Simon A. Levin of Cornell University.

Population biology is probably the oldest area in mathematical biology, but remains a constant source of new mathematical problems and the area of biology best integrated with mathematical theory. The need for mathematical approaches has never been greater, as evolutionary theory is challenged by new interpretations of the paleontological record and new discoveries at the molecular level, as world resources for feeding populations become limiting, as the problems of pollution increase, and as both animal and plant epidemiological problems receive closer scrutiny.

The purpose of this course is to acquaint the participant with the mathematical ideas that pervade almost every level of thinking in population biology. The mathematical methods to be discussed include dynamical systems theory, partial differential equations, stochastic processes, matrix algebra, control theory and optimization, game theory, and differential geometry.

Synopses of the talks and accompanying reading lists appeared in the April issue of the *Notices*, pages 350 and 351. A basic knowledge of ordinary and partial differential equations, linear algebra, and probability theory will be assumed. Other mathematical methods to be discussed will be drawn from stochastic processes, control theory and optimization, game theory, and differential geometry. Background reading may be found in *Studies in mathematical biology*, Part II: *Populations and communities*, Simon A. Levin, editor, Volume 16 in *Studies in Mathematical Biology*, MAA, 1978. The reading lists also give a variety of sources for study prior to the course.

The course will consist of six 60-minute lectures and interpolatory material by Simon A. Levin. Ethan Akin (City College, CUNY) will speak about evolution, game theory and differential geometry, James C. Frauenthal (Bell Laboratories, Holmdel) about population dynamics and demography, Wayne M. Getz (University of California, Berkeley) about optimal control theory in population biology, Thomas Nagylaki (University of Chicago) about mathematical population genetics, George Sugihara (Oak Ridge National Laboratory) about graph theory and food webs, and James A. Yorke (University of Maryland) about epidemiology. Simon A. Levin will supplement with material on models of population dispersal, and on the theory of evolution of interacting populations.

The short course is open to all who wish to participate upon payment of the registration fee. There are reduced fees for students and unemployed individuals. Please refer to the sections titled **Preregistration, Housing and Registration at the Meetings** for details.

The short course was recommended by the Society’s Committee on Employment and Educational Policy, whose members are Lida K. Barrett, Lisl Novak Gaal, Irwin Kra, Robert W. McKelvey, Donald C. Rung (chairman), and Barnet M. Weinstock. The short course series is under the direction of the CEEP Short Course Subcommittee, whose members are Stefan A. Burr (chairman), Robert W. McKelvey, Cathleen S. Morawetz, Barbara L. Osofsky, and Philip D. Straffin, Jr.
papers. The topics of these special sessions, the tentative days they will meet, the names and affiliations of the mathematicians arranging them, and tentative lists of speakers, are as follows:


Ergodic theory concerning point transformations with finite invariant measure, NATHANIEL A. FRIEDMAN, SUNY, Center at Albany, 8:00 a.m. Tuesday, and 8:30 a.m. Thursday. J. Auslander, A. Bellow, A. Fieldsteel, N. Markley, N. Martin, K. Petersen, V. S. Prasad and W. Reddy. Tensor products and s-summing operators in harmonic analysis, COLIN C. GRAHAM, Northwestern University, and BERT M. SCHREIBER, Wayne State University, 2:15 p.m. Monday, 8:00 a.m. and 2:15 p.m. Tuesday. J. Fournier, C. Graham, M. B. Marcus, O. C. McGehee, C. Sadowski, B. M. Schreiber, and B. P. Smith. Applications of algebraic topology, TIMOTHY L. LANCE, SUNY, Center at Albany, 1:00 p.m. Wednesday, 8:30 a.m. and 1:00 p.m. Thursday. D. Anderson, M. Chisholm, D. Hondel, N. Levitt and J. Segal. Automorphic functions and automorphic representations, WEN-CH'ING WINNIE LI, Pennsylvania State University, University Park, 2:15 p.m. Monday, 8:00 a.m. Tuesday. S. Friedberg, P. Henniart, P. Kutzko, W.-C. W. Li, C. Moreno, I. Piatetskii-Shapiro, A. Pizer, S. Rallis, and S. Ullom. Several complex variables, R. MICHAEL RANGE, SUNY, Center at Albany, 2:15 p.m. Tuesday, 1:00 p.m. Wednesday, and 8:30 a.m. Thursday. H. Alexander, S. Bell, D. Burns, J. D'Angelo, J. J. Kohn, N. Mok, H. Rossi, W. Rudin, B. Schiffman, Y. T. Siu, D. S. Tartakoff, S. M. Webster, J. Wemer, P. C. Yang, and W. Zame. Summability methods, BILLY E. RHOADES, Indiana University, Bloomington, 8:30 a.m. and 1:00 p.m. Thursday. Solutions of operator equations and fixed points, V. M. SEHGAL, University of Wyoming, and S. P. SINGH, Memorial University, Newfoundland, 2:15 p.m. Tuesday, 1:00 p.m. Wednesday, and 1:00 p.m. Thursday. M. Altman, H. Amann, D. G. Bourgin, F. E. Browder, E. Dubinsky, W. Kirk, A. T. Lau, T. C. Lim, M. Z. Nashed, M. Martelli, W. Petryshyn, L. B. Rall, S. Reich, V. M. Sehgal, K. L. Singh, S. Thomeier, J. Whitfield, and A. T. Bharucha-Reid. Differential analysis in infinite dimensional spaces, SRINIVASA SWAMINATHAN, Dalhousie University, 2:15 p.m. Monday, 2:15 p.m. Tuesday, and 1:00 p.m. Wednesday. M. S. Berger, M. P. Heble, I. E. Leonard, B. Mityagin, C.C.A. Sasdri, T. Subramanian, K. Sundaresan, and K. K. Tan. Topological methods in combinatorial group theory, EDWARD C. TURNER, SUNY, Center at Albany, 2:15 p.m. Monday, 8:00 a.m. and 2:15 p.m. Tuesday. G. Huck, R. Kramer, D. McCullough, A. Sieradski, C. Squier, J. Stallings, M. Tretkoff, and T. Tucker. April 26 was the deadline for submission of abstracts for consideration for inclusion in these special sessions.

Contributed Papers

There will be sessions for contributed papers on Monday afternoon from 2:15 p.m. to 6:00 p.m., Tuesday morning from 8:00 a.m. to 10:45 a.m., Tuesday afternoon from 2:15 p.m. to 4:15 p.m., Wednesday afternoon from 1:00 p.m. to 4:30 p.m., and Thursday morning from 8:30 a.m. to 10:45 a.m. The deadline for submission of abstracts of contributed papers was May 17. Late papers will not be accepted.

Council Meeting

The Council of the Society will meet at 5:00 p.m. on Sunday, August 7, in the Squire Room of the Ramada Inn.

Business Meeting

The Business Meeting of the Society will take place immediately following the Steele Prize Session on Wednesday, August 10. The secretary notes the following resolution of the Council: Each person who
attends a Business Meeting of the Society shall be willing and able to identify himself as a member of the Society. In further explanation, it is noted that each person who is to vote at a meeting is thereby identifying himself as and claiming to be a member of the American Mathematical Society. For additional information on the Business Meeting, please refer to the announcement titled Committee on the Agenda for Business Meetings.

63rd Summer Meeting of the MAA
August 8–11, 1983

Business Meeting

The Business Meeting of the MAA will take place at 4:30 p.m. on Tuesday, August 9, at which the Carl B. Allendoerfer, Lester R. Ford, and George Pólya awards will be presented.

Board of Governors

The MAA Board of Governors will meet at 9:00 a.m. on Sunday, August 7, in the Squire Room of the Ramada Inn.

Hedrick Lectures

The 32nd Earle Raymond Hedrick Lectures will be given by ELIAS M. STEIN of Princeton University. The title of this series of three lectures is Some ideas in the development of Fourier analysis. These lectures will be given at 11:00 a.m. on Tuesday, Wednesday, and Thursday, August 9-11.

Invited Addresses

There will be nine invited fifty-minute addresses. The list of speakers, their affiliations, the dates and times of the talks, and titles follow:

- HAROLD M. EDWARDS, New York University, Courant Institute of Mathematical Sciences, Galois version of Galois theory, 2:00 p.m. Thursday;
- BRANKO GRÜNBAUM, University of Washington, Have you ever met a polyhedron you did not like? 9:50 a.m. Tuesday; ROBERT HERMANN, University of Texas at Austin, Theoretical and experimental contributions to the development of a science of vehicular traffic, 1:00 p.m. Wednesday;
- KATHERINE P. LAYTON, Beverly Hills High School, Progress report of the Commission on Precollege Education in Mathematics, Science, and Technology, 8:40 a.m. Thursday; RICHARD LEWONTIN, Harvard University, Analysis of complex genetic systems, 2:15 p.m. Tuesday;
- THOMAS H. MACGREGOR, State University of New York, Center at Albany, Convexity ideas in geometric function theory, 9:40 a.m. Thursday;
- BARBARA L. OSOFSKY, Rutgers University, Some connections between algebra and set theory, 8:40 a.m. Thursday; CARL POMERANCE, University of Georgia, Primality testing, 1:00 p.m. Thursday; and ALAN SCHOENFELD, University of Rochester, Understanding and teaching problem-solving skills, 8:40 a.m. Tuesday.

Other MAA Sessions

The MAA Committee on Exchange of Information in Mathematics will sponsor an evening session at 8:00 p.m. on Tuesday, August 9, on The MAA newsletters: A dialogue among editors featuring Focus editor, MARCIA P. SWARD. Also participating in the session will be various section newsletter editors and public information officers.

Minicourses

The MAA is planning six Minicourses, as follows:

Minicourse #1: PASCAL for Mathematicians, organized by HARLEY FLANDERS, Florida Atlantic University. Given from 7:30 p.m. to 9:30 p.m. on Monday, August 8, and on Tuesday, August 9. The course is aimed at mathematicians who do not presently (or can barely) program in PASCAL, but who have access to PASCAL on a microcomputer or larger system. No previous knowledge of PASCAL or programming will be assumed. The talks will cover the whole PASCAL programming language with emphasis on solving mathematical programming problems. There will be special emphasis on recursion, linked memory allocation, and scientific uses of the unique data structure flexibility of PASCAL. A wide range of applications will be demonstrated, including matrix manipulations, integration, differentiation, differential equations, invariant factors of integer matrices, set theory, series inversion, etc. The Minicourse will be conducted in a lecture-demonstration mode. The block structured nature of PASCAL makes it particularly flexible for programming intricate mathematical computations, and easier to read than most other popular programming languages. It is becoming the first programming language taught in many colleges and universities, but the emphasis in almost all current courses is on data processing applications. Probably mathematics departments should offer PASCAL courses for mathematics, sciences, and engineering students.

Minicourse #2: Problems from industry for use in the undergraduate classroom, is being organized by JEANNE L. AGNEW and MARVIN S. KEENER, and will be given from 8:30 a.m. to 10:30 a.m. on Monday, August 8, and Wednesday, August 10. This Minicourse is based on problems obtained under the direction of the organizers from representatives of industries who were willing to share their expertise in order to help provide the undergraduate student an opportunity to deal with a real-world problem in its raw form. These problems have arisen in the work of the industry presenting them, and can be solved, at least in part, using only undergraduate mathematics. They have been written up by the organizers in the format suitable for classroom use. A catalog of these industrial problems will be available to the participants. The Minicourse will focus on a discussion of selected problems already developed, and on the identification and development of a new problem with the help of an industrial representative. The cooperating representative will be Dr. Jerry Cline from McDonnell Douglas Astronautics in St.
Louis. The first part of the first session will be devoted to a brief description of the creation of the problem collection, and a discussion of several of the problems, their solution, and the ways in which they can be used in the classroom. Each participant will receive in advance one of the problems to be discussed in detail. Following these discussions, Dr. Cline will present a possible new problem for development, giving its background and the reasons why it is important to McDonnell Douglas. Between sessions the participants will have an opportunity to work on the solution of Dr. Cline’s problem. He will be available during this time to discuss it informally with interested participants. If necessary, computing facilities will be available. During the second session Dr. Cline will present his solution of the problem. Any alternate approaches suggested by the participants will be discussed. Dr. Cline will describe generalizations of this particular problem, and he will also be available to discuss the place of the mathematically trained individual in industry, and the curricular needs implied by employment in industry.

Minicourse #3: An introduction to the mathematical techniques and applications of computer graphics is being organized by JOAN WYZKOSKI of Bradley University, and will be given from 8:30 a.m. to 10:30 a.m. on Monday, August 8, and Wednesday, August 10. Graphs and illustrations of geometrical objects are useful tools in the teaching of mathematics. Computer graphics simplifies the production of these teaching aids. This Minicourse will present some of the mathematical techniques used to produce realistic pictures on graphics terminals. Emphasis will be on the use of these techniques to complement mathematics instruction. Some of the topics to be discussed are curve and surface sketching, 2D and 3D transformations, perspective drawing and hidden line removal. Since personal computers will be available for demonstrations and in-class implementations, programming experience is necessary.

Minicourse #4: COMAP microcomputer software in mathematics instruction is being organized by DAVID A. SMITH of Duke University, and is being held from 7:30 p.m. to 9:30 p.m. on Monday, August 8, and Tuesday, August 9. It is a Minicourse intended for college teachers. Uses of existing microcomputer software to enhance instruction in full courses in the undergraduate curriculum will be demonstrated. Included will be software for use in single- and multi-variable calculus, differential equations, and topics at the lower division college level. Presentations will be given by mathematicians who have developed the software and have had extensive experience with its use in their courses. It is planned for participants to have the opportunity to work with the software themselves on microcomputers.

Minicourse #5: Commercial microcomputer software in mathematics instruction. This Minicourse is also being organized by DAVID A. SMITH, and will be held from 8:30 a.m. to 10:30 a.m. and 2:00 p.m. to 4:00 p.m. on Tuesday, August 9 and will be identical to Minicourse #4 with the exception that only materials produced by individuals and organizations other than CONDUIT will be demonstrated.

Minicourse #6: Coloring problems. This Minicourse is being organized by DAVID M. BERMAN of the University of New Orleans, and has been scheduled for 8:30 a.m. to 10:30 a.m. on Monday, August 8, and Wednesday, August 10. Further information will be available later.

The Minicourses are open only to persons who have registered for the Joint Mathematics Meetings and paid the Joint Meetings registration fee.

Please note that participants registering for one or more of the Minicourses should **not** include the registration fee(s) with their preregistration. A reservation will be made for participants who preregister for the Minicourses and a confirmation will be sent once the preregistration has been processed. The Minicourses have separate registration fees of $20 each, and are limited to thirty participants each, except for Minicourse #1, which is limited to fifty. Payment of the fee(s) must be made at the meeting registration desk in Albany two hours prior to the beginning of the Minicourse or the reservation will be relinquished to someone on the waiting list. When making payment, the participant should present the confirmation to the cashier. “Standby” reservation confirmations will be issued to participants whose preregistration was received after the Minicourse was filled. These individuals should check with the meeting cashier one hour prior to the Minicourse to see if any openings have occurred.

**If the only reason for registering for the Joint Meetings is to gain admission to a Minicourse, this should be indicated by checking the appropriate box on the preregistration form. Then, if the Minicourse is full, full refunds can be made of the Joint Mathematics Meetings preregistration fee. Otherwise, the Joint Meetings preregistration will be processed, and then be subject to the 50 percent refund rule.**

**Contributed Papers**

Papers are being accepted on three topics in collegiate mathematics for presentation in contributed paper sessions at the MAA Summer Meeting in Albany. The topics are:

- The undergraduate mathematics curriculum
- The use of computers in undergraduate mathematics instruction
- Classroom notes

Presentations are normally limited to ten minutes, although selected contributors may be given up to twenty minutes.

Individuals wishing to submit papers for any of these sessions at Albany should have sent the following information to the MAA Washington office (1529 Eighteenth Street, NW, Washington, DC 20036) **before May 16**.
with vinaigrette dressing, brioche and crescent rolls
with butter, minted chocolate mousse with Chantilly

twenty-five years or more. The banquet will take
must be
will be operated from
ticket purchasers to indicate their seating preference,
roast prime rib of beef au jus, rosette potatoes, fresh
native green beans with mushrooms, romaine salad
Chilled wedge of Saratoga melon, iced relishes,

Please note that all tickets for this banquet must be purchased through preregistration, since a guarantee must be given to the caterer much earlier than usual. Tickets are $16.05 each and interested participants should complete the appropriate section of the preregistration form. Also, spaces are provided on the preregistration form for ticket purchasers to indicate their seating preference, if desired.

Activities of Other Organizations

Pi Mu Epsilon (TIME) will hold its annual meeting on Wednesday and Thursday, August 10 and 11. The J. Sutherland Frame Lecture will be given by HENRY L. ALDER of the University of California, Davis, at 8:30 p.m. on Wednesday, August 10. The title of his talk is *How to discover and prove theorems: A demonstration with partitions.*

The *Association for Women in Mathematics* (AWM) will hold a panel discussion on *Grants: Getting them and keeping them,* at 9:10 a.m. on Wednesday, August 10. The AWM membership meeting will follow the panel discussion at 10:10 a.m. on the same day. At 9:00 p.m. on Tuesday, August 9, the AWM will sponsor a party at the Ramada Inn, where desserts and after-dinner drinks will be served.

Other Events of Interest

Book Sales

Books published by the AMS and the MAA will be sold for cash prices somewhat below the usual prices when these same books are sold by mail. These discounts will be available only to registered participants wearing the official meeting badge. VISA and MASTERCARD credit cards will be accepted for book sale purchases at the meeting. The book sales are open the same days and hours as the Joint Mathematics Meetings registration desk, and are located in the meeting registration area.

Exhibits

The book and educational media exhibits will be located in the Lecture Center Vestibule and are open from 1:00 p.m. to 5:00 p.m. on Monday, August 8, and from 8:30 a.m. to 4:30 p.m. on Tuesday and Wednesday, August 9–10. All participants are encouraged to visit the exhibits during the meeting.

**MATHFILE**

MATHFILE, the computerized version of *Mathematical Reviews,* will be demonstrated in the exhibit area during regular exhibit hours. Sample searches will be performed on two terminals connected to computers of the vendors who offer MATHFILE: BRS (800-833-4707, in New York 518-783-1161) and DIALOG (800-227-1960, in California 800-982-3810).

MATHFILE is also available during evening hours at greatly reduced rates on “BRS After Dark.” This system uses a simplified command language and is especially designed for the end-user with a home computer or a terminal.

**Summer List of Applicants**

At the direction of the AMS-MAA-SIAM Committee on Employment Opportunities, which is charged with operation of the Employment Register and with the publication Employment Information in the Mathematical Sciences, the Society will publish a Summer List of mathematical scientists seeking employment for distribution at the Albany meeting in August 1983.

Copies of the 1983 summer list will be available at the Transparencies section of the registration desk for $2. Following the meeting, they may be purchased from the AMS office in Providence for $3. This list should prove useful to employers who have last minute openings in the latter part of the summer or in the fall.

The deadline for receipt of applicant forms to appear in this summer list is July 1, 1983.

Instead of an Employment Register at the Summer Meeting in Albany, there will be an opportunity for posting of both applicant résumé forms and employers’ announcements of open positions in or near the main meeting registration area. There will be no special room set aside for interviews. No provisions will be made by the Society for interviews: arrangements will be the responsibility of each employer and applicant. Messages may be left in the message box located in the registration area.

Special applicant and employer forms will be available at the Transparencies section of the registration desk both for applicants to post résumés and for employers to post forms announcing positions.
Applicants who submit an applicant form, but do not plan to attend the meeting will appear on the printed list only. There is no provision made for posting résumés for participants who do not attend the meeting.

Information for Participants

Information which appears below in the sections on University Housing and Food Services was furnished by SUNYA. Although firm information was requested, because of the uncertainty of the State of New York budget, many of the statements in these two sections may be subject to change between now and the time of the meetings. Every attempt will be made to provide updated information in future announcements.

University Housing

Participants requesting housing on campus during the meeting will be assigned to Indian Quadrangle, (located in the southeast corner of the uptown campus). Colonial Quadrangle will be used as an overflow dormitory, if necessary. The check-in desk for Indian Quad is located in the lobby of Mohawk Tower, which can be identified by a weather station on its roof. The check-in desk for Colonial Quad is located in the lobby of Livingston Tower (located diagonally across the campus from Mohawk Tower on the northwest side). Those participants who are arriving via Western Avenue (NY Route 20) will enter the campus from the south entrance and follow signs leading them to Indian Quad. Those arriving on Washington Avenue, bear left after entering one of the north entrances and proceed along the perimeter of the campus to Indian Quad. The entrance to the lobby faces the inside of the quadrangle. The check-in desk will be in operation daily from 9 a.m. until 11 p.m. with the exception of August 7 and 8, when the hours are 9 a.m. until 3 a.m. the following morning. Temporary parking will be allowed during check-in. (See section on Parking.)

Participants desiring confirmed reservations for on-campus housing must preregister and send required payment(s) to the Mathematics Meetings Housing Bureau prior to the July 1, 1983 deadline. (Please refer to sections below titled Room Rates Including Meal Plans and Meal Plans Only.)

Dormitories at SUNYA are not air-conditioned. Each quad consists of a high-rise tower and eight low-rise units. In addition to the usual dormitory room setup with communal bathrooms, there are a number of suites available containing one single and either one or two double-bededded rooms and bath. There are no cots available in the dormitories.

Children aged ten and over will be charged the same rates as adults. Children nine and under will be charged a reduced rate for room and board (meal Plan C or D).

Parents will be allowed to bring portacritbs or small cribs for infants and toddlers. These children may stay in the same room with parents at no charge. It is not a requirement that food plans be purchased for children four years of age and under. For additional information regarding families, please write to the Mathematics Meetings Housing Bureau, P. O. Box 6887, Providence, Rhode Island 02940, or call 401-272-9500, extension 239.

Beds will be made up in advance for preregistered participants. In addition to bed linen, two towels are provided. A small bar of soap and plastic glass will be provided upon request. Since this may prove to be inadequate, it is advised that participants bring an additional bar of soap as well as a face cloth, if necessary. Each room is equipped with floor lamp, desk and dresser. No clothes hangers are provided, and it is suggested that participants bring their own supply. Bathrooms will cleaned periodically.

There will be a limited number of rooms available for those without confirmed reservations; however, beds in these rooms will not be made up in advance. Participants arriving without prior reservations will be given a set of bed linens, pillow, and blanket in order to make up their own beds as well as two towels, and upon request a plastic cup and soap. Again, it is recommended that additional soap, a face cloth and clothes hangers be brought by the individual.

Keys will be issued to each participant staying in the residence halls. These keys open the outside door of the residence hall, the door to the suite (if applicable), and the door to the individual room. There is no deposit requirement for keys; however, there will be a penalty of $20 payable to the SUNYA Key Account by the individual participant should keys be lost to cover cost of replacement of both locks and keys.

There are heat detectors in hallways and lounges. There are smoke detectors in individual bedrooms. There are three elevators in the dormitories, one of which stops at every floor. All will be appropriately marked. Stairways are unlocked.

There is one kitchen unit in the basement of Mohawk Tower as well as in most of the low-rise buildings on Indian Quad containing a small refrigerator, range-top and oven. No utensils are provided. It is suggested that participants who wish to avail themselves of this convenience bring their own kitchen articles.

There are coin-operated laundry facilities in the tower basement as well as one in the basement of each low-rise building. There is a 35 cent charge for the use of washers; dryers are free. Participants are requested to bring their own laundry materials.

Vending machines dispensing soft drinks, candy, etc., are located in the tower.

No pets are allowed in the residence halls. Alcoholic beverages are not prohibited; however, residents are required to exercise moderation.

There is no telephone service in any of the residence hall rooms. Public telephones are located in the lobby of the towers.
Check-in Locations and Times

The check-in desk will be in operation in the lobby of Mohawk Tower, Indian Quad, daily from 9 a.m. to 11 p.m. with the exception of the nights of August 7 and 8 when the desk will remain open to accommodate latecomers until 3 a.m. As indicated in the text above, there is a possibility that Livingston Tower (Colonial Quad) may be used as an overflow dormitory. This tower is situated on the northwest corner of the campus diagonally across the quadrangle from Mohawk Tower.

Room Rates Including Meal Plans

Note: The State University of New York central administration has now approved the rates listed below.

Note: Rooms on campus are not available without a meal plan.

The following adult package plans offered by SUNYA include 7 percent state and local sales tax.

Plan A: Single room with breakfast and lunch $27.60 per day

Plan A: Double room with breakfast and lunch $22.60 per day per person

Plan B: Single room with breakfast, lunch and dinner $34.40 per day

Plan B: Double room with breakfast, lunch and dinner $29.40 per day per person

Children 10 years of age or older must occupy a bed and pay adult rates for lodging and food. Plans C and D below apply to children up to and including the age of 9.

Plan C: Breakfast and lunch $14.90

Plan D: Breakfast, lunch, and dinner $20.25

The above options are available by prepayment only. The following payments must accompany the preregistration/housing form and must be received in Providence by the deadline of July 1, 1983.

1.) Preregistration fee(s)
2.) Full payment for room/board
3.) Fee(s) for tickets (if applicable)

Any form received without an amount sufficient to cover the above items will be returned, which will delay processing of the housing request. Any form received with an amount which is more than required will be processed and an appropriate refund will be issued.

Meal Plans Only

For preregistered participants not staying in residence halls, commuters, or those staying in hotels, there is a modified plan whereby meals only can be purchased. Meal tickets must be purchased through preregistration, and the daily rate per person is given below:

Adults and Children 10 years of age and over:

Plan E: Breakfast and lunch $ 6.60
Plan F: Breakfast, lunch, and dinner $13.40

Children 9 years of age and under:

Plan G: Breakfast and lunch $ 3.90
Plan H: Breakfast, lunch, and dinner $ 9.25

Note: Meals on a cash-as-you-go basis are not available in the cafeterias; however, the Campus Center Snack Bar offers a limited menu for cash between the hours of 7:30 a.m. and 1:00 p.m.

Lake George Cruise

A cruise on Lake George aboard the Ticonderoga has been arranged for Sunday, August 7. Buses will depart from the Indian Quadrangle at 4:45 p.m. and return to Indian Quadrangle at 10:15 p.m. The buses will be marked “Lake George Cruise.” This cruise sails the beautiful island-dotted narrows of Lake George, with live music on board. The cost is $15 per person for those not on any meal plan, or those on either meal Plans A, C, E, or G. For those on meal Plan B or F, the ticket price is $8.20. For children up to and including 9 years of age on meal Plan D or H, tickets are $9.65. (Since children under 10 are offered meals at a reduced rate, the cost of their tickets for the cruise is higher.) This box dinner replaces the regularly scheduled meal for that night for those taking the cruise. Individuals who do not wish to participate in the cruise may still obtain their evening meal in the cafeteria.

Since the Lake George Steamboat Company has set a deadline for reservations, this cruise will be offered through preregistration only. If a sufficient number of preregistrations is not received by July 1, interested participants will be notified of cancellation and appropriate refunds will be made.

The above prices include the cost of the bus, the cruise, all taxes and gratuities, and a boxed dinner consisting of fried chicken, potato salad, fruit, brownie, soft drink, and relishes.

Picnic

At 6:15 p.m. on Monday, August 8, there will be a picnic at the Indian Quad South Outdoor Area. This meal replaces the regularly scheduled dinner for that night for all participants on meal Plans B, D, F, and H. There is no additional charge for participants on either of these plans for the picnic. For those not on any meal plan as well as those on meal Plans A, C, E, or G, the cost of the picnic ticket is $7. Because the guarantee must be given to the caterer in advance of the meeting, the picnic will be offered through preregistration only. The menu will feature barbecued chicken, hot dogs, hamburgers, assorted salads, corn, baked beans, watermelon, brownies, soda, coffee, tea, and milk. In case of rain, this event will be moved to the cafeteria.

Beer Party

A beer party will be held at 7:00 p.m. on Tuesday, August 9 at the Indian Quad Outdoor Area.
Albany Meetings Travel SuperPhone 800-556-6882

INSTANT... PERSONALIZED... IMMEDIATE CONFIRMATION OF
TRAVEL AND HOTEL RESERVATIONS FOR THE JOINT MATHEMATICS MEETINGS IN
ALBANY, NEW YORK

One free call does it all! No forms to mail and no waiting when you use your major credit card (VISA, MASTERCARD, American Express or air travel card.)

TRAVEL SUPERSERVICE:

- Fly to Albany with US AIR, the official carrier for the Joint Mathematics Meetings and get 30 percent or more off! No restrictions on reservations purchased at least 14 days in advance. This special offer is available ONLY through Mathematics SuperPhone! Call SuperPhone toll-free today at 800-556-6882 and SAVE!

  - Unbiased advice on the most direct, economical air routes.
  - Fast, computerized reservation, ticketing, invoicing, itinerary.
  - Guaranteed lowest possible air fares for your city.
  - Automatic "Fare Check" at regular intervals before your departure to assure the most economical rate. If lower fares develop, your ticket will be automatically rewritten at savings to you.

HOTEL CONFIRMATION:
Along with your travel arrangements, ask for immediate confirmation of your hotel accommodations. All hotels for this meeting must be confirmed through this number.

N.B.: University accommodations must be obtained through the Mathematics Meetings Housing Bureau.

CALL NOW: 800-556-6882 (In Rhode Island and outside the Continental U.S. call 401-884-9500.)

Hours of Operation: 9:00 a.m. to 7:00 p.m. EST, Monday through Thursday, Fridays until 6:00 p.m.

are $5.35 per person and must be purchased through preregistration. In addition to beer, white and red wines, soft drinks, potato chips, pretzels and peanuts will be served. In case of rain, this event will be moved to the cafeteria.

MAA Banquet

For those individuals not on any meal plan, as well as those on meal Plan A and E, the cost of the ticket for the MAA 25-year banquet on Wednesday is $16.05. There is an additional charge of $9.25 for participants on Plan B and F who plan to attend the banquet.

N.B.: These additional amounts must be included when completing the preregistration/housing form. As stated elsewhere in the meeting announcement, tickets for the MAA banquet, picnic, beer party, and cruise are available only through preregistration due to deadlines set by SUNYA.

Food Services

Food service in the Indian Quad cafeteria will begin with breakfast on Saturday, August 6, and will end with lunch on Thursday, August 11. No food service will be available after lunch on Thursday.

Only prepaid meals will be served in the cafeteria in the basement of Indian Quad. Since dinner will not be available on Thursday, August 11, be sure to include rate for Plans A, C, E, and/or G for the night of August 10 only. (Plans B, D, F, and H do not apply for that night.) Cafeteria hours of operation are:

Breakfast 7:00 a.m. to 8:30 a.m.
Lunch 11:30 a.m. to 1:00 p.m.
Dinner 5:00 p.m. to 6:30 p.m.

A sample breakfast served in the dining room would be various fruits and juices, eggs (two styles), sausages, pancakes with syrup, sweet rolls, and assorted jams and jellies. A typical lunch would be soup, hamburger steak with creole sauce, French fried potatoes, salad variations, assorted breads, whipped frosted jello and hot dogs, hamburgers and grilled cheese sandwiches. Dinner menus include cream of mushroom soup, browned roast chicken with peach half or ham and roast beef cold platter, baked potato, buttered peas, rye bread, ice cream, lemon cake and fresh apples. Second helpings will be allowed for all meals.

Hotel Accommodations

Blocks of rooms have been set aside for use by participants at the hotels listed below. Participants should make their own reservations early with the Albany Meetings Travel SuperPhone. (See box above.) Reservations at these hotels will not be available by calling the hotel directly. The rates listed below are subject to change, and to an 8 percent sales tax.

In all cases, a one night's deposit including the 8 percent tax is required to guarantee a room. This can be charged to a credit card when booking through the Albany Meetings Travel SuperPhone. If an emergency occurs and you find you must cancel your reservation, this must be done prior to 6:00 p.m. on the day of your arrival, or you will be charged for that day. The cut-off date for reservations at all hotels is July 25, 1983. After this date none of the hotels are obligated to provide a room at these special rates.
**TIMETABLE**

The purpose of this timetable is to provide assistance to registrants in the selection of arrival and departure dates. The program, as outlined below, is based on information available at press time. Locations will be listed in the final program distributed at the Albany meeting.

### AMERICAN MATHEMATICAL SOCIETY SHORT COURSE SERIES

**SATURDAY, August 6**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00 a.m. - 4:00 p.m.</td>
<td>REGISTRATION</td>
</tr>
</tbody>
</table>
| 2:00 p.m. - 2:20 p.m. | Introduction to mathematical population biology  
Simon A. Levin |
| 2:20 p.m. - 3:20 p.m. | Population dynamics and demography  
James Frauenthal |
| 3:30 p.m. - 4:30 p.m. | Epidemiology  
James York |
| 4:40 p.m. - 5:00 p.m. | Summary  
Simon A. Levin |

**SUNDAY, August 7**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 a.m. - 2:00 p.m.</td>
<td>REGISTRATION</td>
</tr>
</tbody>
</table>
| 9:00 a.m. - 10:00 a.m. | Population genetics  
Thomas Nagylaki |
| 10:10 a.m. - 11:10 a.m. | Evolution, game theory, and differential geometry  
Ethan Akin |
| 11:20 a.m. - 11:45 a.m. | Coevolution  
Simon A. Levin |
| 1:30 p.m. - 2:30 p.m. | Optimal control in population biology  
Wayne Getz |
| 2:40 p.m. - 3:40 p.m. | Graph theory and food webs  
George Sugihara |
| 3:50 p.m. - 4:00 p.m. | Summary  
Simon A. Levin |
| 4:00 p.m. - 4:45 p.m. | General discussion |

### JOINT MATHEMATICS MEETINGS

**SUNDAY, August 7**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
</table>
| 9:00 a.m. - 4:00 p.m. | American Mathematical Society  
Mathematical Association of America  
BOARD OF GOVERNORS MEETING |
| 4:00 p.m. - 8:00 p.m. | REGISTRATION                                                        |
| 4:00 p.m. - 8:00 p.m. | AMS BOOK SALE  
MAA BOOK SALE |
| 5:00 p.m. - 10:00 p.m. | COUNCIL MEETING |

**MONDAY, August 8**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
</table>
| 8:00 a.m. - 4:30 p.m. | AMS  
MAA  
REGISTRATION |
| 8:00 a.m. - 4:30 p.m. | AMS BOOK SALE  
MAA BOOK SALE |
| 8:15 a.m. - 8:25 a.m. | INVITED ADDRESS  
Harmonic maps of Riemann surfaces  
James Eells |
| 8:30 a.m. - 9:30 a.m. | MINICOURSE #2  
Problems from industry for use in the undergraduate classroom  
Jeanne L. Agnew  
Marvin S. Keener |
| 8:30 a.m. - 10:30 a.m. | MINICOURSE #3  
An introduction to the mathematical techniques and applications of computer graphics  
Joan Wyrzkoski |
| 8:30 a.m. - 10:30 a.m. | MINICOURSE #6  
Coloring problems  
David M. Berman |
| 8:40 a.m. - noon | CONTRIBUTED PAPER SESSION  
The use of computers in undergraduate mathematics instruction |
The estimated walking distance from the hotel to the meetings is given in parentheses following the telephone number. The number after the name of the hotel is the number it carries on the map.

The following codes apply: AC = Air Conditioned; CL = Cocktail Lounge; FP = Free Parking; GR = Game Room; RT = Restaurant; SP = Swimming Pool; SU = Sauna; TV = Television.

In all cases, children 17 years of age and under can stay in a parent's room at no charge. The rates for cots are noted below for each hotel, as they vary.

Ramada Inn (#1 on the campus map)
1228 Western Avenue
Albany, New York 12203
Telephone: 518-489-2981 (10 minutes)
Single: $34 Double: $39
Twin $46 Rollaway cot $5
Extra person in room: No charge
Code: AC, CL, FP, GR, RT, SP, SU, TV,
Free transportation is provided to and from the airport, bus station, and AMTRAK station. Upon arrival, contact the hotel and request transportation.

Thruway House (#2 on campus map)
1375 Washington Avenue
Albany, New York 12206
Telephone: 518-459-3100 (10 minutes)
Single: $34 Double: $40
Twin $40 Rollaway cot $6
Extra person in room: $6 (18 and over)
Code: AC, CL, FP, RT, SP, TV,
Free van service is provided. Contact the hotel upon arrival at the airport.

TraveLodge (#3 on campus map)
1230 Western Avenue
Albany, New York 12203
Telephone: 518-489-4423 (10 minutes)
Single: $29 Double $35
Twin $38 Rollaway cot $4
Extra person in room: No charge
Code: AC, FP, SP, TV,

Registration at the Meetings

Meeting preregistration and registration fees only partially cover expenses of holding meetings. All mathematicians who wish to attend sessions are expected to register, and should be prepared to show their meeting badge, if so requested. The fees for registration at the meetings, which are 30 percent more than the preregistration fees, are listed below.

AMS Short Course
Student/Unemployed $10
All Other Participants $30
One-day Fee (Second Day Only) $15

Joint Mathematics Meetings
Member of AMS, MAA, IIME $49
Emeritus Member of AMS, MAA $12
Nonmember $75
Student/Unemployed $12

MAA Minicourses #1 through #6
All Participants $20 each
Do not submit Minicourse fee(s)
with preregistration form.

Registration fees may be paid at the meetings in cash, by personal or travelers' checks, or by VISA or MASTERCARD credit cards. Canadian checks must be marked for payment in U.S. funds.

There will be no extra charge for members of the families of registered participants, except that all professional mathematicians who wish to attend sessions must register independently.

All full-time students currently working toward a degree or diploma qualify for the student registration fees, regardless of income.

The unemployed status refers to any person currently unemployed, actively seeking employment, and who is not a student. It is not intended to include any person who has voluntarily resigned or retired from his or her latest position.

Persons who qualify for emeritus membership in either the Society or the Association may register at the emeritus member rate. The emeritus status refers to any person who has been a member of the AMS or MAA for twenty years or more, and is retired on account of age from his or her latest position.

Nonmembers who register at the meetings and pay the $75 nonmember registration fee are entitled to a discount of the difference between the member registration fee of $49 and the nonmember registration fee of $75 as a $26 credit against dues in either the AMS or MAA, or both, provided they apply for membership before September 11, 1983.

Nonmember students who register at the meetings and pay the $12 registration fee are entitled to a discount of the difference between the student preregistration fee of $9 and the registration fee of $12 as a $3 credit against dues in either the AMS or MAA, or both, provided they apply for membership before September 11, 1983.

Nonmembers and nonmember students who thus qualify may apply for membership at the meetings, or by mail afterwards up to the deadline.

Registration Dates and Times

AMS Short Course
Lecture Center Vestibule (Outside Lecture Center 1)
Saturday, August 6 11:00 a.m. to 4:00 p.m.
Sunday, August 7 8:00 a.m. to 2:00 p.m.

Joint Mathematics Meetings
[and MAA Minicourses (until filled)]
Lecture Center Vestibule
Sunday, August 7 4:00 p.m. to 8:00 p.m.
Monday, August 8 8:00 a.m. to 4:30 p.m.
Tuesday, August 9, and
Wednesday, August 10 8:30 a.m. to 4:30 p.m.
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
</table>
| 8:40 a.m. - noon | INVITED ADDRESS  
Fourier transform: Representation of general linear groups  
Wen-Ch’ing Winnie Li |
| 11:00 a.m. - noon | COLLOQUIUM LECTURE I  
On the Coxeter element and the structure of the exceptional Lie groups  
Bertram Kostant |
| 1:00 p.m. - 2:00 p.m. | EXHIBITS |
| 2:15 p.m. - 5:00 p.m. | Picnic |
| 5:00 p.m. - 6:00 p.m. | INVITED ADDRESS  
Riemann surfaces and their Wirtinger varieties  
Robert C. Gunning |
| 6:15 p.m. | MAA and Other Organizations  
REGISTRATION |
| 7:30 p.m. - 9:30 p.m. | MINICOURSE #1  
Pascal for mathematicians  
Harley Flanders |
| 7:30 p.m. - 9:30 p.m. | MINICOURSE #4  
COMAP microcomputer software  
in mathematics instruction  
David A. Smith |
| 8:00 a.m. - 10:45 a.m. | Special Sessions  
Sessions for Contributed Papers |
| 8:30 a.m. - 4:30 p.m. | AMS BOOK SALE  
MAA BOOK SALE |
| 8:30 a.m. - 10:30 a.m. | EXHIBITS  
MAA - MINICOURSE #5  
Commercial microcomputer software  
in mathematics instruction  
David A. Smith |
| 8:40 a.m. - 9:30 a.m. | MAA - INVITED ADDRESS  
Understanding and teaching problem-solving skills  
Alan Schoenfeld |
| 9:50 a.m. - 10:40 a.m. | MAA - INVITED ADDRESS  
Have you ever met a polyhedron you did not like?  
Branko Grünbaum |
| 11:00 a.m. - noon | MAA - THE EARLE RAYMOND HEDRICK LECTURES: Lecture I  
Some ideas in the development of Fourier analysis  
Elias M. Stein |
| 1:00 p.m. - 2:00 p.m. | COLLOQUIUM LECTURE II  
On the Coxeter element and the structure of the exceptional Lie groups  
Bertram Kostant |
| 2:00 p.m. - 4:00 p.m. | MAA - MINICOURSE #5  
Commercial microcomputer software  
in mathematics instruction  
David A. Smith |
| 2:15 p.m. - 3:15 p.m. | INVITED ADDRESS  
The residual spectrum of the linear group  
Hervé Jacquet |
| 2:15 p.m. - 3:05 p.m. | MAA - INVITED ADDRESS  
Analysis of complex genetic systems  
Richard Lewontin |
| 2:15 p.m. - 4:15 p.m. | Special Sessions  
Sessions for Contributed Papers |
Assistance and Information Desk
Lecture Center Vestibule (Outside Lecture Center 7)
Thursday, August 11     8:30 a.m. to 1:30 p.m.

Please note that the Joint Mathematics Meetings registration desk will not be open on Thursday, August 11, and that the telephone message center will not be in operation that day. Other services provided during the meeting at the registration desk will also no longer be available (see section below on Registration Desk Services). There will, however, be a small desk set up in the Lecture Center Vestibule, where local information will be available and where a staff member will provide limited assistance to participants. No registration or cash transactions will be possible at this desk.

Registration Desk Services

AMS/MAA Information
Information on the publications and activities of both organizations may be obtained at this section of the registration desk.

Assistance, Comments and Complaints
A log for registering participants’ comments or complaints about the meeting is kept at the Transparencies section of the registration desk. All participants are encouraged to use this method of helping to improve future meetings. Comments on all phases of the meeting are welcome. If a written reply is desired, participants should furnish their name and address.

Participants with problems of an immediate nature requiring action at the meeting should see the director of meetings, who will try to assist them.

Audio-Visual Equipment
Rooms where special sessions and contributed paper sessions will be held will be equipped with an overhead projector, screen, and blackboard.

Presenters of ten- or twenty-minute papers are strongly urged to use the overhead projector rather than the blackboard for their presentation in order to obtain maximum visibility by all members of the audience of the material being presented.

Members of the AMS/MAA staff will be available to advise or consult with speakers on their audio-visual requirements.

Baggage and Coat Check
Provision will be made for participants checking out of the residence halls early to leave baggage in the registration area until leaving the campus.

Check Cashing
The meeting cashier will cash personal or travelers’ checks up to $50, upon presentation of the official meeting registration badge, provided there is enough cash on hand. Canadian checks must be marked for payment in U.S. funds.

Local Information
This section of the desk will be staffed by members of the Local Arrangements Committee and other volunteers from the Albany mathematical community.

Lost and Found
See the meeting cashier.

Mail
All mail and telegrams for persons attending the meetings should be addressed to the participant, c/o Joint Mathematics Meetings, Department of Mathematics, SUNY, Center at Albany, Albany, New York 12222, Mail and telegrams so addressed may be picked up at the mailbox in the registration area during the hours the registration desk is open. First class mail not picked up will be forwarded after the meeting to the mailing address given on the participant’s registration record.

Personal Messages
Participants wishing to exchange messages during the meetings should use the mailbox mentioned above. Message pads and pencils are provided. It is regretted that such messages left in the box cannot be forwarded to participants after the meeting is over.

Telephone Messages
A telephone message center will be located in the registration area to receive incoming calls for participants. The center will be open from August 7–10 only, during the same hours as the Joint Mathematics Meetings registration desk. Messages will be taken and the name of any individual for whom a message has been received will be posted until the message has been picked up at the message center. The telephone number of the message center will be announced later.

Transparencies
Speakers wishing to prepare transparencies in advance of their talk will find the necessary materials and copying machines at this section of the registration desk. A member of the staff will assist and advise speakers on the best procedures and methods for preparation of their material. There is a modest charge for these materials. Please note that this service will not be available on Thursday, August 11.

Visual Index
An alphabetical list of registered participants, including local addresses, arrival and departure dates, is maintained in the registration area.

Miscellaneous Information

Athletic Facilities
At this time, it is not known whether the gym will be open during the meetings. If it is, participants may use the swimming pool and squash courts free of charge. Tennis courts are free to participants upon presentation of the meeting badge; they remain lit
<table>
<thead>
<tr>
<th>TUESDAY, August 9</th>
<th>American Mathematical Society</th>
<th>MAA and Other Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:30 p.m. - 4:30 p.m.</td>
<td>MAA - SECTION OFFICERS MEETING</td>
<td></td>
</tr>
<tr>
<td>4:30 p.m. - 5:30 p.m.</td>
<td>MAA - BUSINESS MEETING</td>
<td></td>
</tr>
<tr>
<td>7:00 p.m. - 10:00 p.m.</td>
<td>Pi Mu Epsilon - RECEPTION</td>
<td></td>
</tr>
<tr>
<td>7:00 p.m.</td>
<td>BEER PARTY</td>
<td></td>
</tr>
<tr>
<td>7:30 p.m. - 9:30 p.m.</td>
<td>MAA - MINICOURSE #1</td>
<td></td>
</tr>
<tr>
<td>7:30 p.m. - 9:30 p.m.</td>
<td>Pascal for mathematicians</td>
<td></td>
</tr>
<tr>
<td>8:00 p.m. - 9:00 p.m.</td>
<td>MAA - EVENING SESSION</td>
<td></td>
</tr>
<tr>
<td>8:00 p.m. - 9:00 p.m.</td>
<td>The MAA newsletters: A dialogue among editors</td>
<td></td>
</tr>
<tr>
<td>9:00 p.m.</td>
<td>Marcia P. Sward</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEDNESDAY, August 10</th>
<th>AMS</th>
<th>MAA and Other Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30 a.m. - 9:30 a.m.</td>
<td>INVITED ADDRESS</td>
<td>REGISTRATION</td>
</tr>
<tr>
<td>8:30 a.m. - 9:30 a.m.</td>
<td>Reverse mathematics</td>
<td>MAA BOOK SALE</td>
</tr>
<tr>
<td>8:30 a.m. - 9:30 a.m.</td>
<td>Leo A. Harrington</td>
<td>EXHIBITS</td>
</tr>
<tr>
<td>8:30 a.m. - 4:30 p.m.</td>
<td>MAA - MINICOURSE #2</td>
<td></td>
</tr>
<tr>
<td>8:30 a.m. - 4:30 p.m.</td>
<td>Problems from industry for use in the undergraduate classroom</td>
<td></td>
</tr>
<tr>
<td>8:30 a.m. - 4:30 p.m.</td>
<td>Jeanne L. Agnew</td>
<td></td>
</tr>
<tr>
<td>8:30 a.m. - 4:30 p.m.</td>
<td>Marvin S. Keener</td>
<td></td>
</tr>
<tr>
<td>8:30 a.m. - 10:30 a.m.</td>
<td>MAA - MINICOURSE #3</td>
<td></td>
</tr>
<tr>
<td>8:30 a.m. - 10:30 a.m.</td>
<td>An introduction to the mathematical techniques and applications of computer graphics</td>
<td></td>
</tr>
<tr>
<td>8:30 a.m. - 10:30 a.m.</td>
<td>Joan Wyzkoski</td>
<td></td>
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<tr>
<td>8:30 a.m. - 10:30 a.m.</td>
<td>MAA - MINICOURSE #6</td>
<td></td>
</tr>
<tr>
<td>8:30 a.m. - 10:30 a.m.</td>
<td>Coloring problems</td>
<td></td>
</tr>
<tr>
<td>8:40 a.m. - 10:50 a.m.</td>
<td>MAA - CONTRIBUTED PAPER SESSION</td>
<td></td>
</tr>
<tr>
<td>8:40 a.m. - 10:50 a.m.</td>
<td>The undergraduate mathematics curriculum</td>
<td></td>
</tr>
<tr>
<td>9:00 a.m. - 11:00 a.m.</td>
<td>IIME - CONTRIBUTED PAPER SESSION</td>
<td></td>
</tr>
<tr>
<td>9:10 a.m. - 10:10 a.m.</td>
<td>AWM - PANEL DISCUSSION</td>
<td></td>
</tr>
<tr>
<td>9:45 a.m. - 10:45 a.m.</td>
<td>INVITED ADDRESS</td>
<td></td>
</tr>
<tr>
<td>9:45 a.m. - 10:45 a.m.</td>
<td>The Schrödinger equation</td>
<td></td>
</tr>
<tr>
<td>9:45 a.m. - 10:45 a.m.</td>
<td>Ira Herbst</td>
<td></td>
</tr>
<tr>
<td>10:10 a.m. - 10:40 a.m.</td>
<td>AWM - MEMBERSHIP MEETING</td>
<td></td>
</tr>
<tr>
<td>11:00 a.m. - noon</td>
<td>MAA - THE EARLE RAYMOND HEDRICK LECTURES: Lecture II</td>
<td></td>
</tr>
<tr>
<td>noon - 1:00 p.m.</td>
<td>Some ideas in the development of Fourier analysis</td>
<td></td>
</tr>
<tr>
<td>noon - 1:00 p.m.</td>
<td>Elias M. Stein</td>
<td></td>
</tr>
<tr>
<td>12:00 p.m. - 2:00 p.m.</td>
<td>IIME - COUNCIL LUNCHEON</td>
<td></td>
</tr>
<tr>
<td>1:00 p.m. - 2:00 p.m.</td>
<td>MAA - INVITED ADDRESS</td>
<td></td>
</tr>
<tr>
<td>1:00 p.m. - 2:00 p.m.</td>
<td>Theoretical and experimental contributions to the development of a science of vehicular traffic</td>
<td></td>
</tr>
</tbody>
</table>

| noon - 1:00 p.m. | Robert Hermann | |
| 1:00 p.m. - 1:50 p.m. | MAA - CONTRIBUTED PAPER SESSION | |
| 1:00 p.m. - 1:50 p.m. | Sessions for Contributed Papers | |
| 1:00 p.m. - 4:30 p.m. | INVITED ADDRESS | |
| 1:00 p.m. - 4:30 p.m. | Title to be announced | |
| 1:00 p.m. - 4:30 p.m. | Selman Akbulut | |
until approximately 11:30 p.m. There is an off-road running course around the perimeter of the university which is approximately three miles long.

Book Store
The University Book Store is open Monday through Friday from 9:00 a.m. to 4:00 p.m.

Camping
There are no camping sites within 15 miles of the university. The closest camping sites are:
- Thompson's Lake State Park (20 miles)
- Moreau Lake State Park (45 miles)

Child Care
The Local Arrangements Committee will have a list of babysitters available at the Local Information section of the registration desk during the meeting.

Crib Rental
The supply of rental cribs available is very limited. Portacribs are available for $10 a week and full-size cribs for $15 (not including delivery). Interested participants are advised to contact the following as soon as possible:

Handicapped
There is a ramp located at the rear of Mohawk Tower, Indian Quad, at lobby level which will facilitate entry into the building. The elevators provide easy access to all floors. Bathrooms, however, are not equipped for handicapped persons.

Libraries
At present, the campus library plans to be open from 8:00 a.m. to 6:00 p.m. Monday through Friday. Participants may use the library facilities at no charge.

Local Information
Albany, the state capital of New York, is steeped in upper Hudson Valley lore, surrounded by fields and farmlands. The city was originally settled by the Dutch in 1609, as the trading post of Fort Orange.

Some of the attractions in the area are Fort Crailo, a Dutch home and fort built about 1704, and where the song Yankee Doodle was composed; Schuyler Mansion, built in 1761-1762, and housing a beautiful collection of 18th and early 19th century furnishings; Historic Cherry Hill, built in 1787, and now a museum; and Ten Broeck Mansion, built in 1797-1798. Also within driving distance is the Saratoga racetrack, and a visit to the Empire State Plaza in downtown Albany is recommended.

Medical Services
The University Health Service is open for emergency care and doctor referrals from 8:00 a.m. to midnight, Monday through Friday. The on-campus ambulance can be summoned by calling 457-8633.

Nearby hospitals providing emergency medical care are:
- St. Peters Hospital, New Scotland Avenue & Manning Boulevard, 454-1318
- Albany Medical Center Hospital, New Scotland Avenue (Near South Lake Avenue), 445-3131

The emergency number on campus which should be used to report medical emergencies is 457-7616.

Parking
There is adequate parking for all participants in the lot east of Indian Quad. Temporary parking at the front entrance will be permitted for 10–15 minutes for check-in purposes. There are no parking fees or sticker requirements.

Social Events
See the section on Meal Plans Only which appears earlier in this announcement for full details on the Lake George cruise, picnic, and beer party.

Travel

| USAIR, the official carrier for the Albany meetings, has agreed to offer a 30 percent minimum discount to any participant purchasing tickets on its airline at least 14 day in advance through the Albany Meetings Travel SuperPhone. Other fares will, of course, still be available after the 14 day limitation. All participants are urged to consider this organization for their airline and hotel reservations. This service (which has an 800 number) is described in a box contained elsewhere in this announcement. |

In August, Albany is on Eastern Daylight Saving Time. There is regular airline service to Albany County Airport by several major airline carriers.

The airport in Albany is approximately five miles from campus. The Ramada Inn provides free transportation to and from the airport, bus station and AMTRAK station. Call the hotel upon arrival.

Pine Hills Yellow Cab Company, whose airport number is 869-2258, provides both taxis and limousines in its service to the city of Albany and Albany County Airport. The one-way rate from the airport to the campus is $9.90 for a single passenger, and $6.40 per person for two or more persons in a taxi. Preregistrants are being asked to supply airline flight arrival dates and times on the preregistration form. If indications are that arrivals will be heavy on a particular flight, Pine Hills Yellow Cab Company will provide limousines at a $4.90 per person rate. It is approximately a fifteen-minute ride by taxi from the airport to Indian Quad at SUNYA.

All participants using public transportation to reach the campus should instruct the driver to drop them off at the Indian Quad.

Albany is one-half mile from the intersection of I-90 (New York Thruway-Mass Pike) and I-87 (New York Thruway and Adirondack Northway). Follow I-90 East and take Exit 2 marked “Washington Avenue, SUNY.”

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<table>
<thead>
<tr>
<th>Time</th>
<th>American Mathematical Society</th>
<th>MAA and Other Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:30 p.m. - 4:30 p.m.</td>
<td>INVITED ADDRESS</td>
<td>MAA - CONTRIBUTED PAPER SESSION</td>
</tr>
<tr>
<td>3:30 p.m. - 4:30 p.m.</td>
<td>Functional equations over groups, and the mean value property Johan H. B. Kemperman</td>
<td>MAA - BANQUET FOR 25-YEAR MEMBERS</td>
</tr>
<tr>
<td>4:45 p.m. - 6:15 p.m.</td>
<td>STEELE PRIZE SESSION AND BUSINESS MEETING</td>
<td>IME - BANQUET</td>
</tr>
<tr>
<td>6:00 p.m. - 8:30 p.m.</td>
<td>MAA - FILM PROGRAM</td>
<td>IME - J. SUTHERLAND FRAME LECTURE</td>
</tr>
<tr>
<td>6:30 p.m. - 8:15 p.m.</td>
<td>Points of view: Perspective and projection</td>
<td>How to discover and prove theorems:</td>
</tr>
<tr>
<td>7:00 p.m. - 9:30 p.m.</td>
<td>Dragon fold... and other ways to fill space</td>
<td>A demonstration with partitions</td>
</tr>
<tr>
<td>7:00 p.m. - 10:45 a.m.</td>
<td>Linear programming</td>
<td>Henry L. Alder</td>
</tr>
<tr>
<td>8:00 a.m. - 10:45 a.m.</td>
<td>MAA - INVITED ADDRESS</td>
<td></td>
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<tr>
<td>9:00 a.m. - 10:45 a.m.</td>
<td>Some connections between algebra and set theory</td>
<td></td>
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<tr>
<td>11:00 a.m. - 1:30 p.m.</td>
<td>MAA - INVITED ADDRESS</td>
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<tr>
<td>11:00 a.m. - 1:30 p.m.</td>
<td>Progress report of the Commission on Precollege Education in Mathematics, Science, and Technology</td>
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<tr>
<td>1:00 p.m. - 2:00 p.m.</td>
<td>COLOQUIUM LECTURE IV</td>
<td></td>
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<tr>
<td>1:00 p.m. - 2:00 p.m.</td>
<td>On the Coxeter element and the structure of the exceptional Lie groups Bertram Kostant</td>
<td></td>
</tr>
<tr>
<td>1:00 p.m. - 1:50 p.m.</td>
<td>MAA - INVITED ADDRESS</td>
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<tr>
<td>2:00 p.m. - 2:50 p.m.</td>
<td>Primality testing</td>
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<tr>
<td>1:00 p.m. - 6:00 p.m.</td>
<td>Special Sessions</td>
<td></td>
</tr>
<tr>
<td>1:00 p.m. - 6:00 p.m.</td>
<td>MAA - INVITED ADDRESS</td>
<td></td>
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<tr>
<td>1:00 p.m. - 5:00 p.m.</td>
<td>Galois version of Galois theory Harold M. Edwards</td>
<td></td>
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<tr>
<td>1:00 p.m. - 5:00 p.m.</td>
<td>Special Sessions</td>
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<tr>
<td>3:30 p.m. - 5:00 p.m.</td>
<td>MAA - INVITED ADDRESS</td>
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<td>Galois version of Galois theory Harold M. Edwards</td>
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</table>
AMTRAK has a station in Rensselaer, 6 miles from campus. There are connections to Boston, New York City, Montreal, Buffalo, and Chicago. The cost of a cab from the AMTRAK station to the university is $8 plus $1 per person extra.

Greyhound and Trailways provide bus service from Boston, New York City, and Buffalo. The cost of the cab from the bus station to the university is $7 plus 50 cents per person extra.

Salt Lake City, Utah

Current Trends in Algebraic Topology
Richard M. Kane, Stanley O. Kochman, Paul S. Selick, and Victor P. Snaith, Editors

Current trends in algebraic topology is the proceedings of a conference by the same name held at the University of Western Ontario, London, Ontario from June 29 to July 10, 1981. It contains papers which were presented at the conference and some related papers.

The book contains research papers in topology and so potential readers should be at least at the level of graduate students in topology. Since the book is a collection of research papers from different areas, papers of interest to any individual will vary according to his or her research interests. Anyone doing research in topology is likely to find some papers of interest.

Contents of Part 1
ALGEBRAIC K-THEORY, with papers by R. Charney, M. Karoubi, E. Lluis-Puebla and V. Snaith, V. Snaith (two papers), C. Soulé, J. Stienstra, R. Thomason, and F. Waldhausen
GENERALIZED HOMOLOGY AND COHOMOLOGY, with papers by J. Boardman, P. Landweber and Z. Yosimura, H. Miller and V. Snaith, D. Ravenel, and R. Seymour
HOMOTOPY THEORY, with papers by R. Bruner, F. Cohen, D. Davis and M. Mahowald, J. Neisendorfer and P. Selick, and P. Selick
H-SPACES, with papers by J. Harper and R. Kane
ORDINARY HOMOLOGY AND COHOMOLOGY, with papers by A. Bahri, A. Baker, S. Kochman, D. Kraines and T. Lada, J. McCleary, S. Papastavridis, and D. Pengelley

Prepayment is required for all AMS publications. Order from AMS, P. O. Box 1571, Annex Station, Providence, RI 02901, or call toll free 800-556-7774 to charge with Visa or MasterCard.

August Weather

<table>
<thead>
<tr>
<th></th>
<th>Normal high</th>
<th>Normal low</th>
<th>Record high</th>
<th>Record low</th>
<th>Average August rain</th>
<th>Probability of rain</th>
<th>Average humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>81°F</td>
<td>59°F</td>
<td>99°F</td>
<td>37°F</td>
<td>2-8 inches</td>
<td>35%</td>
<td>73%</td>
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</table>

Hugo Rossi
Associate Secretary
The eight hundred and sixth meeting of the American Mathematical Society will be held at Fairfield University in Fairfield, Connecticut, on Friday and Saturday, October 28 and 29, 1983.

Invited Addresses

By invitation of the Committee to Select Hour Speakers for Eastern Sectional Meetings, there will be three invited one-hour addresses. The speakers, their affiliations, and the titles of their talks, are as follows:

JOHN L. HARER, Columbia University and the University of Maryland, *Homology of the moduli space of curves*.

JOHN HUBBARD, Cornell University and Harvard University, *Dynamics of rational maps*.

DANIEL J. KLEITMAN, Massachusetts Institute of Technology, *Dependent intervals*.

Special Sessions

By invitation of the same committee, there will be four special sessions of selected twenty-minute papers. The topics of these special sessions, and the names and affiliations of the mathematicians arranging them, are:

*Theory of infinite groups*, BEN FINE, Fairfield University.

*Surfaces and three-manifolds*, WILLIAM GOLDMAN, Massachusetts Institute of Technology and the University of Maryland, and JOHN L. HARER.

*Combinatorics*, DANIEL J. KLEITMAN.

*Topics in complex analysis*, DOROTHY B. SHAFFER, Fairfield University.

Most of the papers to be presented at these special sessions will be by invitation. However, anyone submitting an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these special sessions should indicate this clearly on the abstract form, and submit it by August 2, three weeks before the deadline for contributed papers, in order that it may be considered for inclusion.

Contributed Papers

There will also be sessions for contributed ten-minute papers. Abstracts should be prepared on the standard AMS form available from the AMS office in Providence or in departments of mathematics. Abstracts should be sent to the American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940, so as to arrive prior to the deadline of August 23. Members are reminded that a charge of $12 is imposed for retyping abstracts that are not in camera-ready form.

It appears unlikely that late papers can be accommodated.

Registration

The meeting registration desk will be located in the Lobby of Gonzaga Hall, and will be open from 12:30 p.m. to 5:30 p.m. on Friday, and from 8:30 a.m. to 1:30 p.m. on Saturday. The registration fees are $10 for members, $16 for nonmembers, and $5 for students or unemployed mathematicians.

Accommodations

Rooms have been blocked at the Fairfield Motor Inn, which is approximately two miles from the campus. Individuals should make their own reservations, and identify themselves as participants in the American Mathematical Society’s meeting at Fairfield University. The cut-off date for reservations is August 15. The rates listed below are subject to possible change and do not include applicable taxes.

**Fairfield Motor Inn**
417 Post Road, Fairfield 06430
Telephone: 203-255-0491

- Single $50.50
- Double $60.50

Although rooms have not been blocked at the following motels (which are approximately five or more miles from campus), they are included here for information purposes.

**Merritt Parkway Motor Inn**
Black Rock Turnpike, Fairfield 06430
Telephone: 203-259-5264

- Single or Double $43

**Pequot Motor Inn**
3471 Post Road, Fairfield 06430
Telephone: 203-259-7885

- Single or Double $48

(The Pequot Motor Inn has a few large rooms at $65 per night, which can accommodate groups of four.)

**Westport New Englander Inn**
1595 Post Road East, Westport 06880
Telephone: 203-259-5236

- Single or Double $75

Parking

Ample free parking will be available at several lots scattered about the campus.

Travel

The Metropolitan Transit Authority provides frequent commuter service between Grand Central Station in New York City and New Haven, Connecticut, with Fairfield as an intermediate stop. The train station in Fairfield is approximately 1.5 miles from campus, and economical taxi service is available. Many trains on Amtrak’s Northeast corridor service (operating between Boston and Washington) stop at Bridgeport, which is about five miles from the Fairfield University campus. Taxi service is available.
from the station. Amtrak tickets to Bridgeport are sold only from locations south of New York or east of New Haven.

For those driving to the meeting, Fairfield University is very close to Exit 22 of the Connecticut Turnpike, and is about 10 minutes from Exit 44 of the Merritt Parkway.

Since there is no scheduled airline service to Fairfield, participants are advised to obtain flights into LaGuardia or Kennedy Airports in New York. From there, the Connecticut Limousine service is a reliable company whose cars and buses depart from both these airports at intervals not exceeding one hour. The ride to Fairfield takes approximately 90 minutes. The cost is $18 one way or $35 round trip. Upon request, passengers are delivered to the Fairfield Motor Inn or to the Westport New Englander Inn.

W. Wistar Comfort
Associate Secretary
Middletown, Connecticut

The Mathematics of Networks
Stefan A. Burr, Editor

This volume represents a considerable expansion of the lecture notes prepared for the Short Course on the Mathematics of Networks at the Summer Meeting in Pittsburgh in August 1981.

The theory of networks is a lively one, both in terms of developments in the theory itself and in terms of the variety of its applications. This volume introduces most of the basic ideas of network theory and develops some of these ideas to a considerable extent. In addition, a number of more specialized topics were introduced, including a number of areas of active research and a wide variety of applications, in order to indicate the breadth and depth of the field.

The first chapter, Introduction to Basic Network Problems, sets the stage. Frank Boesch gives the basic definitions in the mathematics of networks, and in the closely-related topic of graph theory. He discusses two fundamental network problems, the shortest path problem and the minimum spanning tree problem, and some of their variants. He also discusses network reliability. In the second chapter, Maximum Flows in Networks, Frances Yao considers the problem many consider the most fundamental of all in the field. The history of this topic is one of steady improvement in the performance of the algorithms to solve it, and this chapter gives an account of several of the steps in this history.

One of the most significant recent developments in discrete mathematics is the recognition that many natural problems in areas such as network theory appear to be inherently intractable. In the third chapter, The Computational Complexity of Network Problems, Richard Karp gives an account of this theory, with an emphasis on network problems. In the fourth chapter, Effective Use of Heuristic Algorithms in Network Design, Shen Lin demonstrates by means of a case study some of the ways it is possible to get plausible solutions to problems for which exact solutions are out of the question.

In the fifth chapter, Some Practical Network Problems, Daniel Kleitman discusses four applications of the mathematics of networks. These consist of the design of irrigation systems, the theory of electrical networks (the first area of network theory to be developed systematically), the scheduling of delivery trucks, and the physics of ice. In the sixth chapter, Telephone Switching Networks, Nicholas Pippenger presents an area of network theory that leads to difficult mathematics drawn from such apparently unrelated field as harmonic analysis. In the final chapter, Concluding Remarks, the editor makes some general comments, presents a chronology of events relating to the theory of networks, and gives a short bibliography.

1980 Mathematics Subject Classification: 90B99

Proceedings of Symposia in Applied Mathematics
Volume 26, viii + 142 pages (hard cover and soft cover) Soft cover prices: List $16, institutional member $12, individual member $8 Hard cover prices: List $22, institutional member $17, individual member $11 ISBN 0-8218-0311-0; LC 82-18469 Publication date: December 1982
To order, please specify PSAPM/26N (hard cover) PSAPMS/26N (soft cover)

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San Luis Obispo, November 11–12, 1983,
California Polytechnic State University

First announcement of the 807th meeting

The eight hundred and seventh meeting of the American Mathematical Society will be held at California Polytechnic State University in San Luis Obispo, California, on Friday and Saturday, November 11 and 12, 1983. This meeting will be held in conjunction with a meeting of the Mathematical Association of America (MAA).

Invited Addresses

By invitation of the Committee to Select Hour Speakers for Far Western Sectional Meetings, there will be two invited one-hour addresses. The speakers, their affiliations, and the titles of their talks, are as follows:

Peter B. Gilkey, University of Oregon, Applications of analysis to topology.

T. S. Lam, University of California, Berkeley, The arithmetic of fields.

Special Sessions

By invitation of the same committee, there will be six special sessions of selected twenty-minute papers. The topics of these special sessions and the names and affiliations of the mathematicians arranging them, are:


Singular perturbations, E. Coutsias and J. Mueller, University of New Mexico.

The lower division curriculum in mathematics, including calculus, Martin Flashman, Humboldt State University.

Numerical partial differential equations, Wlodek Proskurowski, University of Southern California.

Automorphic forms, Audrey A. Terras, University of California, San Diego.

Partial differential equations, theory and application, Ahmed I. Zayed, California Polytechnic State University.

Most of the papers to be presented at these special sessions will be by invitation. However, anyone submitting an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these special sessions should indicate this clearly on the abstract form and submit it by August 4, three weeks before the deadline for contributed papers, in order that it may be considered for inclusion.

Contributed Papers

There will also be sessions for contributed ten-minute papers. Abstracts should be prepared on the standard AMS form available from the AMS office in Providence or in departments of mathematics. Abstracts should be sent to the American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940, so as to arrive prior to the abstract deadline of August 25. Members are reminded that a charge of $12 is imposed for retyping abstracts that are not in camera-ready form.

MAA Program

No information is available regarding MAA sessions at this time. Details will be announced later.

Registration

Registration will take place on Friday and Saturday. The location of the registration desk and hours it will be open will be announced in the August issue of the Notices. The registration fees are $6 for members of the AMS or MAA, $8 for nonmembers, and $2 for students or unemployed mathematicians.

Social Events

A banquet will be held on Friday evening at the Madonna Inn. Preceding the banquet, there will also be a no-host cash bar at the Madonna Inn, starting at 6:00 p.m. The featured speaker at the banquet will be announced later. There will be a luncheon on campus at noon on Saturday. Information concerning reservations for these events should be available in time for publiction in the August Notices. The local organizer is Euel Kennedy of California State Polytechnic Institute. Any questions regarding these functions should be directed to him at 805-546-2245.

Local Information

San Luis Obispo is approximately half-way between Los Angeles and San Francisco on the coast (about 300 kilometers from either city). The area is served daily by bus, Amtrak, and Wings West Airline from either San Francisco or Los Angeles. The train ride along the coast is very scenic and popular and those interested in coming to San Luis Obispo via Amtrak are advised to make reservations early. The weather in November along the California coast tends to be mild, if somewhat damp.

Information regarding local attractions, hotels and motels, will be available in the next announcement.

Salt Lake City, Utah

Hugo Rossi
Associate Secretary
The eight hundred and eighth meeting of the American Mathematical Society will be held at Northwestern University, Evanston, Illinois, on Friday and Saturday, November 11 and 12, 1983. The sessions on Friday will be held in the Norris University Center, while the sessions on Saturday will be held in Leverone Hall.

**Invited Addresses**

By invitation of the 1982 Committee to Select Hour Speakers for Central Sectional Meetings, there will be four invited one-hour addresses. The speakers, their affiliations, their titles, and the scheduled times of presentation are as follows:

- **EIICHI BANNAI**, Ohio State University, Columbus, *Orthogonal polynomials and algebraic combinatorics*, 11:00 a.m. Friday.
- **BURGESS J. DAVIS**, Purdue University, *Brownian motion and analytic functions*, 1:45 p.m. Friday.
- **EUGENE B. FABES**, University of Minnesota, Minneapolis, *Harmonic analysis and properties of solutions of partial differential equations with nonsmooth coefficients*, 11:00 a.m. Saturday.
- **REINHARD E. SCHULTZ**, Purdue University, *Nonlinear analogues of linear group actions on spheres*, 1:45 p.m. Saturday.

**Special Sessions**

By invitation of the same committee, there will be nine special sessions of selected twenty-minute papers. The topics of these special sessions, and the names and affiliations of the mathematicians arranging them, are:

- **Local fields in number theory and algebraic geometry**, ALAN ADOLPHSON, Oklahoma State University.
- **Approximation theory**, STEPHEN D. FISHER, Northwestern University.
- **Harmonic analysis and its applications to partial differential equations**, CARLOS E. KENIG, University of Minnesota, Minneapolis.
- **Volterra integral and integro-differential equations**, JOHN A. NOHEL, University of Wisconsin, Madison.
- **Connections between codes and designs**, VERA S. PLESS, University of Illinois at Chicago.
- **Algebraic topology**, STEWART B. PRIDDY, Northwestern University.
- **Commutative algebra**, JUDITH D. SALLY, Northwestern University.

Most of the papers to be presented at these special sessions will be by invitation. However, anyone contributing an abstract for the meeting who feels that his or her paper would be particularly appropriate for one of these special sessions should indicate this clearly on the abstract, and submit it by **August 8**, three weeks before the deadline for contributed papers, in order that it may be considered for inclusion.

**Contributed Papers**

There will also be sessions for contributed ten-minute papers. Abstracts should be prepared on the standard AMS form available from the AMS office in Providence, or in departments of mathematics. Abstracts should be sent to the American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940, so as to arrive prior to the abstract deadline of **August 29**. Members are reminded that a charge of $12 is imposed for retyping abstracts that are not in camera-ready form.

**Travel and Accommodations**

Information concerning travel and accommodations will be included in the next announcement.

**Paul T. Bateman**

Associate Secretary
Suggestions are invited from mathematicians, either singly or in groups, for topics of the various conferences that will be sponsored by the Society in 1985. The deadline for receipt of these suggestions, and the name and address of the person to whom the information should be sent, as well as some relevant information about each of the conferences are outlined below. The accompanying form (or a facsimile thereof) is to be used when submitting suggested topic(s) for any of these conferences. Individuals willing to serve as organizers should be aware that the professional meeting staff in the Society’s Providence office will provide full support and assistance, before, during, and after each of these conferences. Organizers should also note that a member of the Organizing Committee must be willing to serve as editor of the proceedings volume that will be published by the Society.

All suggestions must include (1) the names and affiliations of proposed members and chairman of the Organizing Committee; (2) a two- or three-page detailed outline of the subject(s) to be covered, including the importance and timeliness of the topic; (3) a list of the recent conferences in the same or closely related areas; (4) the names and affiliations of the proposed principal speakers; (5) a list of likely candidates who would be invited to participate and their current affiliations; and (6) any other observations which may affect the size of the conference and the amount of support required. Any suggestions as to sites and dates should be made as early as possible in order to allow adequate time for planning. By action of the AMS Board of Trustees, the Meetings Department of the Society is responsible for the final selection of the site for each conference, and for all negotiations with the host institution. Individuals submitting suggestions for the conferences listed below are requested to recommend sites or geographic areas which would assist the Meetings Department in their search for an appropriate site. In the case of Joint Summer Research Conferences in the Mathematical Sciences, a one-, two-, or three-week conference may be proposed.

1985 AMS-SIAM Symposium In Applied Mathematics

A two-day symposium in applied mathematics will henceforth take place in every odd-numbered year in conjunction with a spring Eastern Sectional Meeting. The 1983 symposium, whose topic is Inverse problems, will be held in New York City on April 12–13. The next such symposium will be held during the two days preceding the 1985 spring meeting at a site that has not yet been selected. Some topics in recent years have been Computational fluid dynamics (1977); Mathematical problems in fracture mechanics (1978); and Mathematical psychology and psychophysiology (1980). Proceedings are published by the Society as volumes in the series SIAM-AMS Proceedings.

Deadline For Suggestions: August 15, 1983

Submit to: Professor Alan C. Newell, Chairman, AMS-SIAM Committee on Applied Mathematics, Program in Applied Mathematics, University of Arizona, Tucson, Arizona 85721.

1985 AMS Summer Institute

Summer institutes are intended to provide an understandable presentation of the state of the art in an active field of research in pure mathematics, and usually extend over a three-week period. Dates for a summer institute must not overlap those of the Society’s summer meeting (not known at this printing, but sometime in August) and, in fact, there should be a period of at least one week between them. Recent topics have been Operator algebras and applications (1980); Singularities (1981); Recursion theory (1982); and Nonlinear functional analysis and its applications (1983). Proceedings are published by the Society as volumes in the series Proceedings of Symposia in Pure Mathematics.

Deadline For Suggestions: August 15, 1983

Submit to: Professor Robert Osserman, Chairman, AMS Committee on Summer Institutes, Department of Mathematics, Stanford University, Stanford, California 94305.

1985 AMS-SIAM Symposium Some Mathematical Questions in Biology

This one-day symposium is held in conjunction with the Annual Meeting of the AAAS in May. Some recent topics in these annual symposia have been Theoretical and experimental studies in cellular, developmental and population biology (1980), Biomechanics and mathematical models in developmental biology (1981), Neurobiology, the study of the nervous systems of organisms (1982). The 1983 Symposium will be on Muscle physiology. Papers from the symposium are published by the Society as volumes in the series Lectures on Mathematics in the Life Sciences.

Deadline For Suggestions: August 15, 1983

Submit to Dr. Robert M. Miura, Chairman, AMS-SIAM Committee on Mathematics in the Life Sciences, Department of Mathematics, University of British Columbia, 121-1984 Mathematics Road, Vancouver, B.C., Canada.

1985 AMS-SIAM Summer Seminar

The goal of the summer seminar is to provide an environment and program in applied mathematics
in which experts can exchange the latest ideas and newcomers can learn about the field. Recent topics are Algebraic and geometric methods in linear systems theory (1979), Mathematical aspects of physiology (1980), Fluid dynamical problems in astrophysics and geophysics (1981), Applications of group theory in physics and mathematical physics (1982), and Large-scale computations in fluid mechanics (1983). Proceedings are published by the Society as volumes in the series Lectures in Applied Mathematics.

**Deadline For Suggestions:** August 15, 1983

Submit to: Professor R. O. Wells, Jr., Chairman, Committee on Joint Summer Research Conferences in the Mathematical Sciences, Department of Mathematics, Rice University, Houston, Texas 77001.

**1985 Joint Summer Research Conferences in the Mathematical Sciences**

These conferences are similar in structure to those held at Oberwolfach, and represent diverse areas of mathematical activity, with emphasis on areas currently especially active. Careful attention is paid to subjects in which there is important interdisciplinary activity at present. Topics for the second series of one-week conferences, being held in 1983, are Combinatorics and algebra, Applications of algebraic K-theory to algebraic geometry and number theory, Axiomatic set theory, Group actions on manifolds, Ordered fields and real algebraic geometry, Microlocal analysis, Fluids and plasmas, geometry and dynamics, Probability theory, partial differential equations and applications, Geometrical analysis of singularities, and Kleinian groups. Proceedings are scheduled to be published by the Society as volumes in the series Contemporary Mathematics.

**Deadline For Suggestions:** August 15, 1983

Submit to: Professor Alan C. Newell, Chairman, AMS-SIAM Committee on Applied Mathematics, Program in Applied Mathematics, University of Arizona, Tucson, Arizona 85721.

**1985 Joint Summer Research Conferences in the Mathematical Sciences**

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Submit to: Professor R. O. Wells, Jr., Chairman, Committee on Joint Summer Research Conferences in the Mathematical Sciences, Department of Mathematics, Rice University, Houston, Texas 77001.

**1985 AMS Short Course Series**

The AMS Short Courses consist of a series of lectures and discussions ordinarily extending over a period of one and one-half days immediately prior to the Joint Mathematics Meetings held in January and August each year. Each of the courses is devoted to a specific area of applied mathematics or to areas of mathematics used in the study of a specific subject or collection of problems in one of the physical, biological, or social sciences. Topics in recent years have been Networks (August 1981), Tomography (January 1982), Statistical Data Analysis (August 1982), Computer Communications (January 1983), and Population Biology (August 1983). Proceedings are published by the Society as volumes in the series Proceedings of Symposia in Applied Mathematics.

**Deadline for Suggestions:** July 1, 1983 for January 1985 course and December 1, 1983 for August 1985 course

Submit to: Professor Stefan A. Burr, Chairman, AMS Short Course Subcommittee, Department of Computer Sciences, CUNY, City College, New York, New York 10031.

**Contents**

I. Embedding finite covers into bundles: Removing singularities of maps, Singularities of maps into bundles, Embedding covering spaces into bundles, The obstruction.

II. Embedding manifold-like continua up to shape: Applications of Part I to embedding continua up to shape, An n-manifold-like compactum which does not embed up to shape in $R^{2n}$, Singularities of coverings of immersions, Embedding up to shape manifold-like continua whose factors need not embed, Embedding double coverings, An example, $n$-manifold-like continua which do not embed up to shape in $R^{2n}$.

1980 Mathematics Subject Classifications. 57R40, 57Q35, 57N35

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American Mathematical Society Conferences

Suggested Topic For 1985 Conference (check one)

☐ AMS-SIAM Symposium in Applied Mathematics (Held in conjunction with an Eastern Sectional Meeting)
Submit this form before the August 15, 1983 deadline.

☐ AMS Summer Institute (In pure mathematics and usually held in July/August)
Submit this form before the August 15, 1983 deadline.

☐ AMS Symposium on Some Mathematical Questions in Biology (Held in conjunction with AAAS Annual Meeting)
Submit this form before the August 15, 1983 deadline.

☐ AMS-SIAM Summer Seminar (In applied mathematics and held in June/July)
Submit this form before the August 15, 1983 deadline.

☐ Joint Summer Research Conferences in the Mathematical Sciences (Series of six to ten week-long conferences held in June/July/August)
Submit this form before the August 15, 1983 deadline.

☐ AMS Short Course Series (Held in conjunction with Annual and Summer meetings)
Submit this form before the July 1, 1983 and December 1, 1983 deadlines.

Please print or type your responses. Return completed application to chairman of appropriate committee by deadline listed.

I propose organizing an AMS conference in 1985, as specified above, on the following topic:

I suggest the following members and chairman of the Organizing Committee. These individuals have ☐ / have not ☐ been requested to serve on that committee.

(Prospective committee members, chairman, and their current affiliations.)

Submitted by ___________________________ Date __________________________
Address ____________________________________________________________________________

N.B.: Please attach a two- or three-page detailed outline of the subject(s) to be covered, including the importance and timeliness of the topic, a list of the recent conferences in the same or closely related areas, the names and affiliations of the proposed principal speakers, and a list of appropriate candidates for invitations to participate and their current affiliations. Care and attention should be devoted to the size of the proposed conference and its relationship to limitations of funding support available. These limitations are very real at the present time, due to the general shortage of funds available for the support of research. Any extraordinary expenses should be supported by special justification.

4/83
Invited Speakers
and Special Sessions

Invited Speakers at AMS Meetings

The individuals listed below have accepted invitations to address the Society at the times and places indicated. For some meetings, the list of speakers is incomplete.

Albany, August 1983
Selman Akbulut  Hervé Jacquet
James Eells  J. H. B. Kemperman
Robert C. Gunning  Bertram Kostant
Leo A. Harrington  (Colloquium Lecturer)
Ira Herbst  Wen-Ch'ing Winnie Li

Fairfield, October 1983
John L. Harer  Daniel J. Kleitman
John Hubbard

San Luis Obispo, November 1983
Peter B. Gilkey  T. S. Lam

Evanston, November 1983
Eiichi Bannai  Eugene B. Fabes
Burgess J. Davis  Reinhard E. Schultz

Louisville, January 1984
Gunnar Carlsson  M. Susan Montgomery
Persi Diaconis  Herbert A. Simon
Simon Donaldson  (Gibbs Lecturer)
Andrew Majda  Leon Simon

Notre Dame, April 1984
Nigel J. Kalton  Karel L. Prikry
Paul G. Nevai  William Schelter

Organizers and Topics of Special Sessions

The list below contains all the information about Special Sessions at meetings of the Society available at the time this issue of the Notices went to the printer.

The section below entitled Information for Organizers describes the timetable for announcing the existence of Special Sessions.

August 1983 Meeting in Albany
Associate Secretary: Hugo Rossi
Deadline for consideration: Expired
Melvyn S. Berger and Alexander Eydeland, The calculus of variations in the large and its applications
Louis Block, Dynamical systems
Nathaniel A. Friedman, Ergodic theory concerning point transformations with finite invariant measure
Colin C. Graham and Bert M. Schreiber, Tensor products and p-summing operators in harmonic analysis
Timothy L. Lance, Applications of algebraic topology
Wen-Ch'ing Winnie Li, Automorphic functions and automorphic representations
R. Michael Range, Several complex variables
Billy E. Rhoades, Summability methods
V. M. Sehgal and S. P. Singh, Solutions of operator equations and fixed points
Srinivasa Swaminathan, Differential analysis in infinite dimensional spaces
Edward C. Turner, Topological methods in combinatorial group theory

October 1983 Meeting in Fairfield
Eastern Section
Deadline for organizers: Expired
Deadline for consideration: August 2, 1989
Ben Fine, Theory of infinite groups
William Goldman and John L. Harer, Surfaces and three-manifolds
Daniel J. Kleitman, Combinatorics
Dorothy B. Shaffer, Topics in complex analysis

November 1983 Meeting in San Luis Obispo
Far Western Section
Deadline for organizers: Expired
Deadline for consideration: August 4, 1989
Ian M. Anderson, Geometric methods for partial differential equations
E. Coulsias and J. Mueller, Singular perturbations
Martin Flashman, The lower division curriculum in mathematics, including calculus
Wlodek Proskurowski, Numerical partial differential equations
Audrey A. Terras, Automorphic forms
Ahmed I. Zayed, Partial differential equations, theory and applications

November 1983 Meeting in Evanston
Central Section
Deadline for organizers: Expired
Deadline for consideration: August 8, 1989
Alan Adolphson, Local fields in number theory and algebraic geometry
Earl R. Berkson, Operator theory in classical function spaces
Donald L. Burkholder, Probability and related parts of analysis
Stephen D. Fisher, Approximation theory
Carlos E. Kenig, Harmonic analysis and its applications to partial differential equations
John A. Nohel, Volterra integral and integro-differential equations
Vera S. Pless, Connections between codes and designs
Stewart B. Priddy, Algebraic topology
Judith D. Sally, Commutative algebra

January 1984 Meeting in Louisville
Associate Secretary: W. Wistar Comfort
Deadline for organizers: Expired
Deadline for consideration: October 12, 1983
J. T. Beale, Incompressible fluid flow
Persi Diaconis, Random walks on finite groups
M. Susan Montgomery and Lance Small, Ring theory
April 1984 Meeting in Notre Dame
Central Section
Deadline for organizers: July 15, 1989
Deadline for consideration: To be announced

Spring 1984 Meeting
Far Western Section
Deadline for organizers: July 15, 1989
Deadline for consideration: To be announced

Spring 1984 Meeting
Eastern Section
Deadline for organizers: July 15, 1989
Deadline for consideration: To be announced

Spring 1984 Meeting
Southeastern Section
Deadline for organizers: July 15, 1989
Deadline for consideration: To be announced

Information for Organizers

Special Sessions at Annual and Summer meetings are held under the general supervision of the Program Committee. They are administered by the Associate Secretary in charge of the meeting with staff assistance from the Society office in Providence.

Some Special Sessions arise from an invitation to a proposed organizer issued through the Associate Secretary. Others are spontaneously proposed by interested organizers or participants. Such proposals are welcomed by the Associate Secretaries.

The number of Special Sessions at a Summer or Annual Meeting is limited to twelve. Proposals, invited or offered, which are received at least nine months prior to the meeting are screened for suitability of the topic and of the proposed list of speakers, and for possible overlap or conflict with other proposals (specific deadlines for requesting approval for Special Sessions at national meetings are given above). If necessary, the numerical limitation is enforced.

Proposals for Special Sessions should be submitted directly to the Associate Secretary in charge of the meeting (at the address given in the accompanying box). If such proposals are sent to the Providence office, addressed to the Notices, or directed to anyone other than the Associate Secretary, they will have to be forwarded and may not be received before the quota is filled.

In accordance with an action of the Executive Committee of the Council, no Special Session may be arranged so late that it may not be announced in the Notices early enough to allow any member of the Society, who wishes to do so, to submit an abstract for consideration for presentation in the Special Session before the deadline for such consideration.

Special Sessions are effective at sectional meetings and can usually be accommodated. They are arranged by the Associate Secretary under the supervision of the Committee to Select Hour Speakers for the section. The limitation on the number of sessions depends on the space and time available. The same restriction as for national meetings applies to the deadline for announcing Special Sessions at sectional meetings: no Special Session may be approved too late for its announcement to appear in time to allow a reasonable interval for members to prepare and submit their abstracts prior to the special early deadline set for consideration of papers for Special Sessions.

Information for Speakers

A great many of the papers presented in Special Sessions at meetings of the Society are invited papers, but any member of the Society who wishes to do so may submit an abstract for consideration for presentation in a Special Session, provided it is received in Providence prior to the special early deadline announced above and in the announcements of the meeting at which the Special Session has been scheduled.

Abstracts of papers submitted for consideration for presentation at a Special Session must be received by the Providence office (Editorial Department, American Mathematical Society, Post Office Box 6248, Providence, RI 02940) by the special deadline for Special Sessions, which is usually three weeks earlier than the deadline for contributed papers for the same meeting. The Council has decreed that no paper, whether invited or contributed, may be listed in the program of a meeting of the Society unless an abstract of the paper has been received in Providence prior to the deadline.

Send Proposals for Special Sessions to the Associate Secretaries

The programs of sectional meetings are arranged by the Associate Secretary for the section in question:

Far Western Section (Pacific and Mountain)
Hugo Rossi, Associate Secretary
Department of Mathematics
University of Utah
Salt Lake City, UT 84112
(Telephone 801-581-8159)

Central Section
Paul T. Bateman, Associate Secretary
Department of Mathematics
University of Illinois
Urbana, IL 61801
(Telephone 217-333-4996)

Eastern Section
W. Wistar Comfort, Associate Secretary
Department of Mathematics
Wesleyan University
Middletown, CT 06457
(Telephone 203-347-9411)

Southeastern Section
Frank T. Birtel, Associate Secretary
Department of Mathematics
Tulane University
New Orleans, LA 70118
(Telephone 504-865-5646)

As a general rule, members who anticipate organizing Special Sessions at AMS meetings are advised to seek approval at least nine months prior to the scheduled date of the meeting. No Special Sessions can be approved too late to provide adequate advance notice to members who wish to participate.
Special Meetings

THIS SECTION contains announcements of meetings of interest to some segment of the mathematical public, including ad hoc, local, or regional meetings, and meetings or symposia devoted to specialized topics, as well as announcements of regularly scheduled meetings of national or international mathematical organizations. (Information on meetings of the Society, and on meetings sponsored by the Society, will be found inside the front cover.)

AN ANNOUNCEMENT will be published in the Notices if it contains a call for papers, and specifies the place, date, subject (when applicable), and the speakers; a second full announcement will be published only if there are changes or necessary additional information. Once an announcement has appeared, the event will be briefly noted in each issue until it has been held and a reference will be given in parentheses to the month, year and page of the issue in which the complete information appeared.

IN GENERAL, announcements of meetings held in North America carry only date, title of meeting, place of meeting, names of speakers (or sometimes a general statement on the program), deadlines for abstracts or contributed papers, and source of further information. Meetings held outside the North American area may carry more detailed information. All communications on special meetings should be sent to the Editor of the Notices, care of the American Mathematical Society in Providence.

DEADLINES for entries in this section are listed on the inside front cover of each issue. In order to allow participants to arrange their travel plans, organizers of meetings are urged to submit information for these listings early enough to allow them to appear in more than one issue of the Notices prior to the meeting in question. To achieve this, listings should be received in Providence SIX MONTHS prior to the scheduled date of the meeting.

1982–1983. Special Year in Lie Group Representations, University of Maryland, College Park, Maryland. (June 1982, p. 373)


MAY 1983


Information: AFIPS, 1815 North Lynn Street, Arlington, Virginia 22209.


20–21. Fifth Nestor M. Riviére Memorial Lecture, University of Minnesota, Minneapolis, Minnesota. (February 1983, p. 206)


24–June 12. First Southeast Asian Colloquium on Graph Theory, National University of Singapore. (November 1982, p. 700)


Information: 1776 Massachusetts Avenue, Washington, D.C. 20036.


JUNE 1983

4–9. Tenth International Conference on General Relativity and Gravitation, PADOVA, Italy.


Information: N. Reid, Department of Mathematics, University of British Columbia, 121-1984 Math. Road, Vancouver, British Columbia V6T 1Y4.


7–16. International Conference on Multifunctions and Integrands: Stochastic Analysis, Approximation and Optimization, University of Catania, Italy. (February 1983, p. 207)

7–July 5. Analyse de Régression: École d'Été du CIMPA, Nice, France.

Information: 1 sv. Edith Cavell, F-06000 Nice.


13–17. 1983 Mathematical Sciences Lecture Series, Department of Mathematical Sciences, Johns Hopkins University, Baltimore, Maryland. (February 1983, p. 207)


Information: B. di Bartolo, Department of Physics, Boston College, Boston, Massachusetts.

16–18. Short Course on Factoring and Primality Testing, Kent State University, Kent, Ohio. (January 1983, p. 79)


20–24. Linear Algebra & the Microcomputer, Salisbury State College, Salisbury, Maryland. (February 1983, p. 207)


Sponsor: UNCC Foundation.

Speakers: Richard Barlow, University of California, Berkeley; Henry Block, University of Pittsburgh; Erhan Çınlar, Northwestern University; Frank Proschan, Florida State University.

Information: Mohamed Abdel-Hameed, Department of Mathematics, University of North Carolina at Charlotte, Charlotte, North Carolina 28223.


27–July 1. NSF-CBMS Regional Conference in Mathematics: Intersection Theory in Algebraic Geometry, George Mason University, Fairfax, Virginia.

Principal Speaker: William Fulton.

Program: Professor Fulton will present a series of ten lectures introducing the recent and dramatic developments in intersection theory and algebraic geometry. There will also be talks by conference participants on topics related to the conference theme.

Support: The National Science Foundation will provide travel and living expenses for 25 participants. Some additional participants will be invited to attend at their own expense.

Instructions for Applicants: Applicants for support should include a short resume with emphasis on current research and publications. Those wishing to present a paper should submit a brief abstract. Applications should be sent to the address below.

Information: Robert Ephraim, Department of Mathematics, George Mason University, Fairfax, Virginia 22030.


27–July 15. Séminaire de Mathématiques Supérieures—NATO Advanced Study Institute on Topological Methods in Nonlinear Analysis, Université de Montréal, Montréal, Canada. (January 1983, p. 79)


JULY 1983

2–4. Regular and Chaotic Motions in Dynamical Systems, Erice, Italy.

Information: G. Velo, Ist. Fis., University of Bologna, Italy.


Information: D. W. Dubois, Department of Mathematics, University of New Mexico, Albuquerque, New Mexico.

4–22. Séminaires de Mathématiques Supérieures—NATO Advanced Study Institute on Topological Methods in Nonlinear Analysis, Université de Montréal, Montréal, Canada.

Principal Speakers: H. Brézis, Paris; K. C. Chang, Beijing; J. Dugundji, University of Southern California; K. Geha, Gdansk; A. Granas, Montréal; R. B. Guenther, Oregon State; M. König, München; K. Fan, Santa Barbara; J. Mawhin, Louvain-La Neuve; L. Nirenberg, Courant Institute of Mathematical Sciences; R. D. Nussbaum, Rutgers University; P. H. Rabinowits, Wisconsin.

Information: SMS-NATO ASI, Département de mathématiques et de statistique, Université de Montréal, C.P. 8128, Montréal H3C 3J7, Canada.


10–16. International Conference on Quasigroups and their Applications, Università Cattolica del Sacro Cuore, Milano, Italy. (February 1983, p. 208)


11–15. TeX Users Group Meeting and Introductory TeX82 Users Course, Stanford University, Palo Alto, California. (February 1983, p. 208)


11–22. Quadratic Forms and Hermitian K-theory, McMaster University, Hamilton, Canada. (January 1983, p. 79)


12–14. Third Scandinavian Conference on Image Analysis, Kopenhagen, Denmark.
Information: Peter Johansen, Inst. Comp. Sc., 41 Sigurdsgade, University of Kopenhagen, København, Denmark.


18–20. ORSA/TIMS Special Interest Meeting on Applied Probability in Biology & Engineering, University of Kentucky, Lexington, Kentucky.
Information: Professor J. Gani, Department of Statistics, University of Kentucky, Lexington, Kentucky 40506, 606-257-6901.


18–22. International Conference on Mathematics in Biology and Medicine, Bari, Italy. (October 1982, p. 590)


18–August 12. Workshop on Latin Squares: Their Construction and Application, Simon Fraser University, British Columbia, Canada. (February 1983, p. 208)

19–22. Sixth European Congress on Operational Research (EURO VI), Vienna, Austria. (February 1983, p. 208)

25–29. NSF-CBMS Regional Conference in Mathematics on Iterated Rational Mappings, University of Minnesota, Duluth, Minnesota.
Principal Lecturer: William P. Thurston (Princeton University).
Support: Some NSF support is available for a limited number of participants.
Information: Mark Luker, Department of Mathematical Sciences, University of Minnesota-Duluth, Duluth, Minnesota 55812, 218-726-8240.


Information: P. Thøft-Christensen, Aalborg, Denmark.

25–August 2. Seminar on the History of Mathematics, University of Toronto, Toronto, Canada. (February 1983, p. 208)

Speakers: J. L. Berggren (Simon Fraser University); Joseph Dauben (CUNY); Stillman Drake (University of Toronto); I. Grattan-Guinness (Middlesex Polytechnic); Barnabas Hughes (California State University); Charles V. Jones (University of Toronto); C. J. Scriba (Chairman, International Commission on History of Mathematics).


AUGUST 1983

**1–5. NSF-CBMS Regional Conference on Quasianularity and Analyticity in Operator Algebras, Texas Tech University, Lubbock, Texas. (April 1983, p. 363)** These dates have been changed from those originally announced.


1–10. Seventh International Congress on Mathematical Physics, University of Colorado, Boulder, Colorado. (February 1983, p. 209)

1–12. NATO Advanced Study Institute on Methods in Ring Theory, Antwerp, Belgium. (April 1983, p. 363)

1–12. Workshop and Conference in Algebraic Topology, Memorial University, Saint John's, Newfoundland. (November 1982, p. 701)


Information: Conference Secretary, Department of Mathematics and Statistics, Memorial University, St. John’s, Newfoundland, Canada, A1B 3X7.


15–17. Fourth International Conference on Mathematical Modelling, Zürich, Switzerland. (October 1982, p. 591)


Information: CRYPTO ’83, Computer Science Department, University of California, Santa Barbara, California 93106.


Invited Speakers: (Tentative.) Stephen A. Cook (Toronto), David Harel (Rehovot), Per Martin-Löf (Stockholm), Hendrik W. Lenstra, Jr. (Amsterdam), Gordon D. Plotkin (Cambridge, Mass.), Dana S. Scott (Pittsburgh).


30–September 2. The First International Tampere Seminar on Linear Statistical Models and their Applications, Department of Mathematical Sciences, Statistics, University of Tampere, Tampere, Finland. Program: There will be lectures by C. Radhakrishna Rao, University of Pittsburgh, U.S.A., and George P. H. Styan, McGill University, Canada.

Speakers: (Tentative.) J. K. Bakshalery, Academy of Agriculture, Poznan, Poland; J. Fellman, Swedish School of Economics, Helsinki, Finland; H. Niemi, University of Helsinki, Helsinki, Finland.


Information: The Seminar Secretary, The First Tampere Seminar on Linear Statistical Models and their Applications, Department of Mathematical Sciences, Statistics, Huone C123, University of Tampere, F-O. Box 697, SF-33101 Tampere 10, Finland.

30–September 2. Second International Conference on Databases, Cambridge, Great Britain. Information: S. M. Deen, Conference Chairman, Department of Computer Science, University of Aberdeen, Aberdeen, Scotland, AB9 2UB.


SEPTEMBER 1983


6–10. Second International Meeting on Bayesian Statistical Methods, Valencia, Spain.


25–October 2. International Conference on Operator Algebras, Ideals and their Applications in Theoretical Physics, Naturwissenschaftlich-Theoretischen Zentrum, Karl Marx University, Leipzig, German Democratic Republic. (January 1983, p. 80)


OCTOBER 1983


Sponsor: The US Army Operational Test and Evaluation Agency (USAOTEA).


**Inoted Speakers:** John Ball, Jerald Ericksen, Joseph Flaherty, Morton Gurtin, John Hutchinson, Richard James, James Knowles, James Langer, James Serrin, and Marshall Slemrod.

**Information:** Mrs. Gladys Moran, Conference Secretary, Mathematics Research Center, University of Wisconsin, 610 Walnut Street, Madison, Wisconsin 53705.


24-27. Seventh Symposium on Computer Applications in Medical Care, Baltimore, Maryland.

**Information:** George Washington University Medical Center, Washington, D.C. 20052.


**Topics:** Theory of optimization problems; numerical methods for solving optimization problems; applications and program packages.

**Deadline for Abstracts:** 1 page in camera ready form should be sent not later than June 1, 1983 to the address below.

**Information:** A. L. Dontchev, Institute of Mathematics, 1090 Sofia, P.O. Box 373, Bulgaria.

**NOVEMBER 1983**

1-9. Sixth International Summer School on Problems of Model Choice & Parameter Estimation in Regression Analysis, Sellin, German Democratic Republic.

**Information:** R. Bellach, Humboldt-University Sekt. Math., DDR-1086, Berlin, GFR 1297.


**Information:** R. W. Katz, Department of Atmospheric Sciences, Oregon State University, Corvallis, Oregon 97331.


**DECEMBER 1983**


5-16. Workshop on Pattern Recognition and Analysis of Seismicity, Miramare-Trieste, Italy.

**Information:** International Centre for Theoretical Physics, Workshop on Pattern Recognition, P. O. Box 98, I-34100, Trieste, Italy.

**JUNE 1984**


**Principal Speakers:** Lawrence Druffel (Department of Defense), Paul Erdös (Hungarian Academy of Sciences), Ronald L. Graham (Bell Laboratories), Frank Harary (University of Michigan), Stephen T. Hedetniemi (Clemson University), Richard M. Karp (University of California), Maria Klawe (IBM Research Laboratory), Eugene L. Lawler (University of California), Fred Roberts (Rutgers University), Robert E. Tarjan (Bell Laboratories), Carsten Thomassen (Technical University of Denmark), Herbert S. Wilf (University of Pennsylvania), Robin J. Wilson (Open University of England).

**Program:** There will be approximately 35 additional invited speakers. There is limited space for contributed talks.

**Information:** Directors, Graph Theory Conference, Department of Mathematics, Western Michigan University, Kalamazoo, Michigan 49008.

**AUGUST 1984**

August 1984. Fifth International Congress on Mathematics Education, University of Adelaide, Australia. (June 1982, pp. 331, 376)

**LATE ENTRY**

June 13-17. Short Course in Algorithms and Complexity, University of Maine at Orono.

**Speaker:** Herbert S. Wilf, University of Pennsylvania.

**Information:** Grattan Murphy, Department of Mathematics, University of Maine at Orono, Orono, Maine 04469.

**ADDITIONAL CLASSIFIED ADVERTISING**

(See also pages 464 and 465.)

**POSITIONS AVAILABLE**

ASSOCIATE EDITOR—MATHEMATICS—Springer-Verlag New York, Inc. is seeking an Associate Editor, Mathematics. Requirements include an undergraduate degree and some graduate work in mathematics and a solid foundation in research-oriented mathematics. Experience in publishing or teaching is desirable but not required. Send resume to Helen Salinger, Springer-Verlag New York, Inc., 175 Fifth Avenue, New York, N. Y. 10010. We are an affirmative action/equal opportunity employer.

**THE AUSTRALIAN NATIONAL UNIVERSITY** invites applications for POSTDOCTORAL FELLOWSHIP/RESEARCH FELLOWSHIP in the DEPARTMENT OF MATHEMATICS, RESEARCH SCHOOL OF PHYSICAL SCIENCES (Head: Professor D. W. Robinson, F.A.A.). Preference will be given to applicants in one of the following fields: Functional Analysis, Mathematical Physics, Partial Differential Equations, Differential Geometry and Lie Groups. Salary in accordance with qualifications and experience within the ranges: Research Fellow $22,430 - $29,640 p.a.; Postdoctoral Fellow Grade 1 $19,333 - $22,148 p.a. Current exchange rates: $A1 = $US 0.87 = UK £ 0.6. Appointment will be Research Fellow for up to 3 years in the first instance with the possibility of extension to 5 years; Postdoctoral Fellow for 2 years. Grants are provided towards travel and removal; assistance with housing; superannuation. The University reserves the right not to make an appointment or to make an appointment by invitation at any time. Applicants may obtain further particulars from The Registrar, The Australian National University, G. P. O. Box 4, Canberra, Australia, with whom applications close on 31 JULY 1983.
Reciprocity Agreements

The American Mathematical Society has "reciprocity agreements" with a number of mathematical organizations around the world. A current list appears below.

These Reciprocity Agreements provide for reduced dues for members of these organizations who choose to join the AMS and who reside outside of the U.S. and Canada. Reciprocally, members of the AMS who reside in the U.S. or Canada may join these organizations at a reduced rate. Summaries of the privileges available to AMS members who join under the terms of reciprocity agreements are given on the following pages. Members of these organizations who join the AMS as reciprocity members enjoy all the privileges available to ordinary members of the Society. AMS dues for reciprocity members are $20 for 1983. Each organization was asked to review and update its listing in the Spring of 1983. An asterisk (*) after the name of an organization indicates that no response to this request had been received when the June Notices went to press. A disc (*) before the name of an organization indicates that application forms for that organization may be obtained by writing the American Mathematical Society, P.O. Box 6248, Providence, Rhode Island 02940.

Africa

• Nigerian Mathematical Society
  Apply to: Christopher O. Imoru (Secretary), Nigerian Mathematical Society, Department of Mathematics, University of Ife, Ile-Ife, Nigeria.
  Dues: $10; payable to the Treasurer, Nigerian Mathematical Society, Department of Mathematics, University of Benin, Benin City, Nigeria.
  Privileges: Journal of the Nigerian Mathematical Society at the price normally charged to individual members.
  Officers: A. O. Olubummo (President), J. O. C. Ezeilo (Vice President), C. O. Nwachuku (Treasurer), C. O. M. Imoru (Secretary), S. A. Ilori (Assistant Secretary), H. O. Tejumola (Editor-in-Chief).

Asia

• Allahabad Mathematical Society*
  Apply to: S. R. Sinha, Secretary, Allahabad Mathematical Society, 5, C. Y. Chintamani Road, Allahabad-211002, India.
  Dues: US $12.50 (annual), US $125 (life); payable to K. K. Azad, Treasurer.
  Privileges: Indian Journal of Mathematics (three issues per year); back volumes available at 25% discount.
  Officers: U. N. Singh (President), Vachaspati, P. Srivastava (Vice Presidents), K. K. Azad (Treasurer), S. R. Sinha (Secretary), S. N. Bhatt (Editor), V. Singh (Librarian).

Calcutta Mathematical Society*
  Apply to: M. Dutta, Secretary, Calcutta Mathematical Society, 92, Acharya Prafulla Chandra Road, Calcutta 700 009, India.
  Dues: $2; admission fee $1; payable to M. Dutta, Secretary.
  Officers: P. C. Vaidya (President), F. Harary, N. D. Sengupta, Shih I. Pai, B. R. Broune, M. C. Chaki (Vice Presidents), S. K. Chatterjea (Treasurer), M. Dutta (Secretary).

• Indian Mathematical Society
  Apply to: T. Ramesan, Hon. Secretary, Indian Mathematical Society, John Armstrong Road, Richards Town, Bangalore 560005, India.
  Dues: $7 (Rupees 25/-); payable to K. M. Saxena, Hon. Treasurer, IMS, Department of Mathematics, Ranchi University, Ranchi, India.
  Privileges: Journal of Indian Mathematical Society or Mathematics Student.
  Officers: R. S. Mishra (President), T. Ramesan (Secretary), K. M. Saxena (Treasurer), S. R. Sinha (Academic Secretary), K. G. Ramanathan (Editor of Journal of Indian Mathematical Society), N. Sankaran (Editor of Mathematics Student).

• Korean Mathematical Society
  Apply to: Sa Ge Lee, Korean Mathematical Society, Department of Mathematics, College of Natural Sciences, Seoul National University, Seoul 151, Korea.
  Dues: W6,500 (US $10); payable to Korean Mathematical Society.
  Privileges: Free receipt of Bulletin (two issues per year) and Journal of the Korean Mathematical Society (two issues per year).
  Officers: Sehie Park (President), Tae Geun Cho (Vice President), Pyung-U Park (Treasurer), Sa Ge Lee (Secretary).

• Mathematical Society of Japan
  Apply to: Mathematical Society of Japan, 25-9-203, Hongo 3-chome, Bunkyo-ku, Tokyo 113, Japan.
  Dues: US $20 (for 1983); each member will be informed how to pay the dues after joining the Society.
  Privileges: Journal of the Mathematical Society of Japan; Sugaku (in Japanese) for $4 additional dues.
  Officers: Hiroshi Fujita (President).

• Mathematical Society of the Republic of China
  Apply to: Mathematical Society of the Republic of China, P.O. Box 23-3, Taipei, Taiwan, Republic of China.
  Dues: N.T. $200 (US $5.00); payable to Mathematical Society of the Republic of China.
  Privileges: Chinese Journal of Mathematics (two to four issues per year).
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In the last year or so there have been widespread rumors that group theory is finished, that there is nothing more to be done. It is not so.

While it is true that we are tantalizingly close to that pinnacle representing the classification of finite simple groups, one should remember that only by reaching the top can one properly look back and survey the neighboring territory. It was the task of the Santa Cruz conference not only to describe the tortuous route which brings us so close to the summit of classification, but also to chart out more accessible paths—ones which might someday be open to the general mathematical public.

A third concern was the elucidation of topics in related fields, and it is to one of these three areas that the papers in this volume are devoted.

Just a quick glance at the table of contents [too lengthy to be included here] will reveal a wide variety of topics with which the modern group theorist must contend. Some of these, for example the connections with the theory of modular functions, have very recent origins, but they leave us with the clear impression that, far from being dead, group theory has only just come of age. This conference was partially supported by a grant from the National Science Foundation.

—From the Preface by G. Mason

There are 90 papers in this book by almost as many authors. The major divisions of the book are:

1. Classification theory of finite simple groups,
2. General theory of groups,
3. Properties of the known groups,
4. Representation theory of groups of Lie-type,
5. Character theory of finite groups,
6. Combinatorics,
7. Computer applications,
8. Connections with number theory and other fields.
9. Connections with number theory and other fields.

The table of contents includes so many mathematicians well known and active in the field that it would be unfair to list a sample.

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MATHFILE is the Society’s new computer-searchable version of Mathematical Reviews (the cumulative index covering 1973 to 1979, as well as the contents of issues published in 1980 and since, including for the latter texts of the reviews themselves). For information on MATHFILE see the February 1982 Notices, page 169.

A user’s guide has been prepared by the Society to make searching MATHFILE easier, more effective and faster. The Guide includes:

Instructions. How to get started on the vendors’ systems, an explanation of the file and suggestions on search techniques.

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CONTEMPORARY MATHEMATICS

Nonlinear Partial Differential Equations
Joel A. Smoller, Editor

This is the proceedings of a conference which took place on June 20–26, 1982, at the University of New Hampshire in Durham, New Hampshire. The conference was sponsored by the American Mathematical Society, and was funded by the National Science Foundation.

The theme was time-dependent nonlinear partial differential equations; in particular, the majority of the speakers lectured either on shock waves or reaction-diffusion equations and related areas. The first day speakers were asked to give an overview of their field: to describe the main results, and the open problems.

Perhaps the most interesting feature of this conference was the constant interplay between analysis, topology and computational methods.

The following is a list of the authors of papers in this volume.

Amundson, N.
Bardos, C.
Barrow, D. and Bates, P.
Beale, J. T.
Belbach, S. and Lenhart, S.
Berestycki, H., Nicolaenko, B. and Scheurer, B.
Berger, M.
Cafflisch, R. and Nicolaenko, B.
Cheng, K. S.
Chipot, M. and Hale, J.
Conway, E.
DiPerna, R.
Fife, P. and Nicolaenko, B.
Gardner, R.
Glimm, J.
Greenberg, J.
Hastings, S. and Kazarinoff, N.
Hirsch, M.
Hoff, D.
Jones, C.
Keener, J.
Keyfitz, B. and Kranner, H.
Kheshgi, H. and Luskin, M.
Kopell, N.
Kurland, H.
Liu, T. P.
Matsumura, A. and Nishida, T.
Mimura, M.
Mora, X.
Nishida, T. and Smoller, J.
Osher, S. and Ralston, J.
Pego, R.
Rascle, M.
Rinzel, J. and Troy, W.
Strauss, W.
Temple, B.
Terman, D.
Wolfe, P.
Zabusky, N. J.

1980 Mathematics Subject Classifications: 35-02, 35Q20, 73005, 76C05

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Fixed Points and Nonexpansive Mappings
Robert C. Sine, Editor

A special session on Fixed Points and Nonexpansive Mappings was held in conjunction with the Annual Meeting of the American Mathematical Society in Cincinnati in January 1982. This volume represents the proceedings of that session. In several instances the papers here go beyond “extended versions” of the actual talks given. It was felt that the interest would be greater in scope and in time if the papers took on as much of the flavor of a survey as possible.

Contents
Ronald E. Bruck, Asymptotic behavior of nonexpansive mappings
Frank Deutsch, A survey of metric selections
David J. Downing, Some aspects of nonlinear mapping theory and equivalent renormings
J. Elton, Pei-Kee Lim, E. Odell and S. Szarek, Remarks on the fixed point problem for nonexpansive maps
W. A. Kirk, Fixed point theory for nonexpansive mappings, II
Teck-Cheong Lim, Asymptotic centers in C0, c and m
William O. Ray, Normally solvable nonlinear operators
Simeon Reich, Convergence, resolvent consistency, and the fixed point property for nonexpansive mappings
Robert Sine, Recurrence of nonexpansive mappings in Banach spaces
S. Swaminathan, *Normal structure in Banach spaces and its generalisations*

Ricardo Torrejon, *Some remarks on nonlinear functional equations*

T. E. Williamson, *A geometric approach to fixed points of non-self mappings T: D → X*

1980 *Mathematics Subject Classifications*: 47H10, 54E40; 47H05, 41A50

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**Selected Topics in Harmonic Maps**
*James Eells and Luc Lemaire*

The first part of this work is devoted to an account of various aspects of the theory of harmonic maps between Riemannian manifolds. In §1 the authors develop the formalism of Riemannian connections in vector bundles and the relevant calculus of vector bundle valued differential forms. That formalism is applied systematically in the sequel. §§2–7 give a rather full treatment of various topics. §§8 and 9 present certain aspects of the relationships between harmonic and holomorphic maps.

The primary aim of Part I is to present a coherent introduction to harmonic maps as a branch of geometric variational theory, and to illustrate their appearance as significant objects in Riemannian geometry.

In Part II the authors propose certain unsolved problems, together with comments and references. They range over the whole theory of harmonic maps, and are certainly of wide importance.

This book presents the first printed exposition of the qualitative aspects of harmonic maps.

**Contents**

Part I. Differential Geometric Aspects of Harmonic Maps


Part II. Problems Relating to Harmonic Maps


**Limiting Equations for Problems Involving Long Range Memory**
*Moshe Marcus and Victor Mizel*

Asymptotic solution behavior and relevant limit equations are studied for a broad class of nonautonomous hereditary equations. These problems are presented on a function space consisting of locally integrable functions defined on semi-axes of the reals, and the operators occurring in the equations map this function space into the space of continuous functions—in a ‘nonanticipative’ manner. The basic topological dynamic framework which is developed is then employed in the detailed analysis of three concrete classes of problems: nonlinear Volterra equations with autonomous kernel; a general family of nonlinear functional differential equations; and nonlinear Volterra equations with nonautonomous kernel.

1980 *Mathematics Subject Classifications*: 54H20, 45D05, 34K25, 45M05

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**Hodge Theory and the Local Torelli Problem**
*Loring W. Tu*

This monograph consists of two parts. The first part is an exposition of some developments in Hodge theory dating from the sixties and due largely to Phillip Griffiths and his coworkers. The topics include the period map, Hodge bundles, monodromy and variation of Hodge structure, mixed Hodge structures and the numerical invariants of a degeneration. This machinery is applied in the second part to the local Torelli problem in algebraic geometry. Several new proofs are given for the case of curves. In higher dimensions an affirmative answer is given for a smooth family of varieties of dimension at most four having a large number of holomorphic 1-forms. Throughout the book the presentation has been kept as down-to-earth and as elementary as possible.

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Algebraic $K$-theory and Localised Stable Homotopy Theory
Victor P. Snaith

Abstract

This paper continues the theme initiated in [Mem. Amer. Math. Soc. (1979), number 221]. There is a homomorphism from the stable homotopy of the classifying space of the group of units of a ring to its algebraic $K$-theory. When the ring has enough roots of unity a "Bott element" exists in these groups (taken with coefficients). We compute the groups obtained by inverting the Bott element. This computation, in successively more elaborate guises, is used, in conjunction with the homomorphism mentioned above, to construct algebraic $K$-theory classes and to give upper bounds on $K$-theory with the Bott element inverted.

1980 Mathematics Subject Classifications: 55N15, 18F25, 55P42

The Existence of Multi-dimensional Shock Fronts
Andrew Majda

Abstract

The short-time existence of discontinuous shock-front solutions of a system of conservation laws in several space variables is proved under suitable hypotheses. These shock-front solutions are nonlinear progressing wave solutions associated with the nonlinear wave fields. The results developed here apply to the equations of compressible fluid flow in two or three space variables with standard equations of state where the initial data can have shock discontinuities of arbitrary strength which lie on a given smooth initial surface with arbitrary geometry.

These shock-front solutions are constructed via a classical iteration scheme so that the shock fronts for the physical equations are extremely stable and do not exhibit a "loss of derivatives." Two of the main tools used in the proof of convergence are estimates from Friedrichs' theory of positive symmetric systems and the linearized stability theory for shock fronts developed recently by the author. The convergence proof for the iteration scheme utilizes exponentially weighted square-integrable norms in space-time together with a judicious choice of these weights as the time interval tends to zero.

Intersection Calculus on Surfaces with Applications to 3-manifolds
John Hempel

Abstract

If a group, $T$, acts on a surface, $S$, there is a pairing

$$H_1(S) \times H_1(S) \rightarrow \mathbb{Z}^T$$

called the Reidemeister pairing. We use properties of this pairing, in the case that $S/T$ is a Heegaard splitting surface for a 3-manifold, $M$, to prove a duality theorem for the fundamental group of $M$ and, in a relative form, for the fundamental group system. We also give criteria for the reducibility of the Heegaard splitting. In the process we review material about group and module presentations as related by the free differential calculus with emphasis on its geometric interpretation and give explicit formulae for computing the Reidemeister pairing.

The discrete spectrum

$$\lambda_1 \leq \ldots \leq \lambda_n \leq \lambda_{n+1} \leq \ldots \leq \lambda_{n+m}$$

is a closed interval with endpoints $\lambda_1$ and $\lambda_{n+m}$, where $\lambda_{n+m}$ tends to zero.

Spectral Theory of Automorphic Functions
A. B. Venkov

Contents

1. Notation and auxiliary theorems
2. Theorem on expansion in eigenfunctions of the operator $\mathfrak{H}(\Gamma; \chi)$
3. First refinement of the expansion theorem for $\mathfrak{H}(\Gamma; \chi)$. The continuous spectrum
4. The Selberg trace formula
5. Elements of the theory of the Selberg zeta-function. Spectral and geometric applications of the theory
6. Second refinement of the expansion theorem for $\mathfrak{H}(\Gamma; \chi)$. The discrete spectrum
7. The spectral theory of perturbations of the spectrum of the operator $\mathcal{H}(\Gamma; \chi)$. Some perspectives on the development of the spectral theory of automorphic functions.

1980 Mathematics Subject Classifications: 10D05, 10D20, 10D40, 10H10, 32N05, 32N15

Proceedings of the Steklov Institute of Mathematics Volume 153, ix + 164 pages (soft cover)
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TRANSLATIONS OF
MATHEMATICAL MONOGRAPHS
(ISSN 0065-9282)

Differential Forms Orthogonal to Holomorphic Functions or Forms, and Their Properties
L. A. Alzenberg and Sh. A. Dautov

The authors consider the problem of characterizing the exterior differential forms which are orthogonal to holomorphic functions (or forms) in a domain $D \subset \mathbb{C}^n$ with respect to integration over the boundary, and some related questions. They give a detailed account of the derivation of the Bochner-Martineilli-Koppelman integral representation of exterior differential forms, which was obtained recently (1967) but has already found many important applications. They study the properties of $\delta$-closed forms of type $(p, n-1)$, $0 \leq p \leq n-1$, which turn out to be the duals (with respect to the orthogonality mentioned above) to holomorphic functions (or forms) in several complex variables, and resemble holomorphic functions of one complex variable in their properties. The greater part of the results expended were obtained during the years 1970–1973.

In the six years that have elapsed since this book appeared in the USSR, many new results have been obtained in this field of multidimensional complex analysis. These results are presented in a supplement (Chapters V–VII), written by the authors especially for the American edition. The results of A. M. Kytmanov have made the greatest impact on the contents of the supplement.

This book will be useful to mathematicians and theoretical physicists interested in several complex variables.

1980 Mathematics Subject Classifications: 32A25, 32F15; 32A35, 32A45

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M. G. Krein and V. A. Jakubovič, Hamiltonian systems of linear differential equations with periodic coefficients

1980 Mathematics Subject Classifications: 34A30, 34B25, 34C35; 15A18, 34A25, 34F15

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CORRECTION: Volume 119 of AMS Translations, Series 2, was incorrectly described on page 212 of the February 1983 Notices as being issued in soft cover. It is in hard cover.

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**Personal Items**

**Pierre E. Conner, Jr.** of Baton Rouge, Louisiana will be visiting the University of Western Ontario from September to December 1983. His area of special interest is topology.

**Edward D. Davis** of SUNY, Center at Albany, will be visiting Queen's University from September to December 1983. His area of special interest is commutative algebra.

**Patrick Flinn** of Texas A&M University has been appointed to an assistant professorship at that institution.

**Evarist Giné** of Louisiana State University, Baton Rouge, has been appointed to a professorship at Texas A&M University.

**Paul R. Halmos** of Indiana University, Bloomington was a visiting professor at the University of Victoria in March 1983.

**Douglas Hensley** of Texas A&M University has been appointed to an associate professorship at that institution.

**David Johnson** of Texas A&M University has been appointed to an associate professorship at that institution.


**Catherine Meadows** of Texas A&M University has been appointed to an assistant professorship at that institution.

**Joseph Neisendorfer** of Ohio State University, Columbus, will be visiting the University of Western Ontario from September to December 1983. His area of special interest is algebraic topology.

**Michael Pilant** of Texas A&M University has been appointed to an assistant professorship at that institution.

**Paulo Ribenboim** of Queen's University will be visiting the University of Illinois, Urbana-Champaign, from September to December 1983. His area of special interest is number theory.

**Gordon L. Walker** has been designated an Honorary Fellow by the National Federation of Abstracting and Information Services in recognition of his outstanding contributions to the Federation.

**Deaths**

**Jacob Kofner**, of George Mason University, died on March 23, 1983 at the age of 35. He was a member of the Society for 6 years.

**Hugh S. Stanley** died on February 18, 1983. He was a member of the Society for 53 years.

**Valeriu I. Troie**, of the Courant Institute of Mathematical Sciences, New York University, died on March 27, 1983 at the age of 30. He was a member of the Society for 2 years.

**Erratum**

A supplementary list of Assistantships and Fellowships in the Mathematical Sciences in 1983-1984 was published in the February 1983 Notices. On page 226 the number of faculty published for UNIVERSITY OF CALIFORNIA, RIVERSIDE, Department of Mathematics, should have been 18 not 8.
Visiting Mathematicians

The list of visiting mathematicians includes both foreign mathematicians visiting in the United States and Canada, and Americans visiting abroad. Note that there are two separate lists.

### American Mathematicians Visiting Abroad

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<td>Imperial College, University of London</td>
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<td>Bixby, Robert E. (U.S.A.)</td>
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<td>Mathematical Programming, Matroid Theory, Graph Theory, Game Theory</td>
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<tr>
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<td>McKennon, Kelly (U.S.A.)</td>
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<td>Analysis on Homogeneous Spaces</td>
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### Visiting Foreign Mathematicians

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<td>Mathematical Relativity Theory</td>
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<td>Schaefer, H. (Germany)</td>
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<td>Schneider, Peter (West Germany)</td>
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<td>University of Denver</td>
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<td>4/83 - 11/83</td>
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Acknowledgement of Contributions

The officers and the staff of the Society acknowledge with gratitude gifts and contributions received during the past year. The inside cover of each issue of Mathematical Reviews carries the names of the sponsoring societies which support that publication. Contributing members of the Society paid dues of $78 or more. In addition to contributions to the AMS Research Fellowship Fund, there were a number of unrestricted general contributions. Some of the contributors have asked to remain anonymous. All of these gifts provide important support for the Society’s programs. The names listed below include those whose contributions were received during the year ending March 31, 1983.

CONTRIBUTING MEMBERS

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The Society also acknowledges with gratitude the support rendered by the following corporations, who held either Corporate Memberships or Institutional Associations in the Society during the past year.

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Current Mathematical Publications

This biweekly journal is a subject index of recent and forthcoming mathematical publications which have been classified by the editors of Mathematical Reviews. (The classification scheme used is the 1980 Mathematics Subject Classification, published in each annual index of Mathematical Reviews.) Each issue contains an author index and a key index; Numbers 13 and 26 contain semiannual cumulative author and key indexes. Each issue contains a list of the journals represented in the issue, as well as a section containing the tables of contents of certain journals. Occasionally, lists of lecture notes and new journals are included. Each volume is composed of twenty-six issues. Volume 15 is the 1983 volume.

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American Mathematical Society, P. O. Box 1571, Annex Station, Providence, Rhode Island, USA 02901
Report of the Treasurer

The Treasurer this year again presents to the membership an abridged statement of the financial position of the Society, in semi-informal narrative style. A copy of the Treasurer's Report, as submitted to the Trustees and the Council, will be sent from the Providence Office to any member who requests it from the Treasurer. The Treasurer will be happy to answer any questions members may wish to put to him concerning the financial affairs of the Society.

I. A DESCRIPTION OF THE FINANCIAL POSITION OF THE SOCIETY AS OF DECEMBER 31, 1982

The Society had investments in accounts in the Rhode Island Hospital Trust National Bank .......................................................... $ 1,559,073
There was owing to it by subscribers, and others (less allowance for doubtful accounts) ......................................................... 428,605
It had prepaid expenses and deposits .......................................................... 141,183
It had deferred prepublication costs .......................................................... 580,463
It had invested in the headquarters building, *Mathematical Reviews* editorial offices, computers, and other equipment ....................... 3,378,900
Making a total of current and fixed assets of ...................................... 6,088,224
The Society also held investment securities and uninvested principal cash valued at .......................................................... 2,209,105
(Approximate market value December 31, 1982: $2,296,657)

<table>
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<th>Total assets, therefore, were ..................................................</th>
<th>$ 8,297,329</th>
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Offsetting these assets, the Society had:

| Accounts payable .................................................. | $ 551,302 |
| Reserved unearned dues and subscriptions ....................... | 4,003,349 |
| Other miscellaneous liabilities ..................................... | 567,467 |
| Funds and grants received from various sources to support particular projects such as the summer institute, symposia, etc. ................................. $ 2,405 |
| A surplus in its publication funds .................................. 1,743,018 1,745,423 |
| Its general fund reflected a deficit balance of ................... (779,317) |

Thus, accounting for all the current funds ............................... 6,088,224

The invested funds represent the following:

| The Endowment Fund, largely the gifts of members .................. 100,000 |
| Robert Henderson Endowment Fund .................................... 548,223 |
| Joseph Fels Ritt Memorial Fund ....................................... 22,521 |
| The Library Proceeds Fund, derived from the sale of the Society's library in 1959 .......................................................... 66,000 |
| Future operations fund .................................................. 285,667 |
| The various prize funds .................................................. 164,880 |
| Dues and publication reserve fund ..................................... 126,641 |
| *Mathematical Reviews* subscription reserve fund .................. 80,000 |
| Undistributed net gains on investment transactions ................. 680,481 |
| Friends of Mathematics Fund .......................................... 29,584 |
| Other funds, derived mainly from bequests to the Society by members, which Trustees were either required to invest or which they have invested at their option, the income being used for the general purposes of the Society ......................... 105,128 2,209,105 |

| Total liabilities and fund reserves, therefore, were ................ | $ 8,297,329 |
II. AN ACCOUNT OF THE FINANCIAL TRANSACTIONS OF THE SOCIETY
DURING THE FISCAL YEAR ENDED DECEMBER 31, 1982

The Society has two types of receipts: funds for special purposes and projects; and general funds, from which are met the general operating expenses, including the publication of Abstracts, the Bulletin, the Proceedings, Mathematics of Computation, the Notices, Current Mathematical Publications, Mathematical Reviews, and the Transactions.

To meet its general obligations, the Society received from

Dues and contributions of individual members ......................... $ 501,465
Dues of institutional members ........................................... 248,571
Dues of corporate and associate members .............................. 5,973

Less amount allocated to Notices and Bulletin ....................... 685,087
Sales of Society journals .................................................. 4,614,474
Investments and trusts ..................................................... 260,344
Publication contributions .................................................. 61,464
Miscellaneous sources .................................................... 26,466

Total general receipts .................................................... 5,033,670

These funds were expended for

Publication of Society journals ......................................... 4,272,703
Net transfers to invested, special and publication funds, including support of membership services and costs of meetings ...... 1,223,677
Miscellaneous ............................................................... 367,757

Total general expenses and transfers .................................. 5,864,137
Net Deficit transferred to general funds ............................... $ (830,467)

Respectfully submitted,

Franklin P. Peterson
Treasurer
Recent Appointments

Committee members’ terms of office on standing committees expire on December 31 of the year given in parentheses following their names, unless otherwise specified.

Lee P. Neuwirth (1985) has been appointed to the Visiting Committee on Computer Operations and Facilities by the chairman of the Board of Trustees, P. Emery Thomas. Continuing members of the committee are Brian Kernighan, chairman (1984) and Robert Sedgewick (1983).


Reports of Past Meetings

The October Meeting in College Park

The seven hundred ninety-seventh meeting of the American Mathematical Society was held at the University of Maryland, College Park, on Saturday and Sunday, October 30–31, 1982. All sessions were held in the Mathematics Building and the adjacent Physics Building. There were 384 registrants, including 334 members of the Society.

Invited Addresses. By invitation of the Committee to Select Hour Speakers for Eastern Sectional Meetings, there were four invited one-hour addresses. The speakers and the titles of their lectures were:

- ROBERT FEFFERMAN, University of Chicago, Fourier analysis with several parameters.
- DORIS FISCHER-COLBRIE, Columbia University, Minimal submanifolds and their role in geometry.
- ALPHONSE VASQUEZ, Graduate School and University Center, City University of New York, Hilbert modular varieties.
- SCOTT WOLPERT, University of Maryland, College Park, and Harvard University, The Kähler geometry of Teichmüller space.

Special Sessions. By invitation of the same committee, there were thirteen special sessions of selected twenty-minute papers as follows:

- Riemannian geometry, A. ADEBOYE, Howard University, and ALFRED GRAY, University of Maryland, College Park. The speakers were Lance D. Drager, Alfred Gray, Leon Karp, and McKenzie Y. Wang.
- Differential equations, KATHY ALLIGOOD, University of Maryland, College Park. The speakers were Rita Iannacci, J. Mallet-Paret, Mario U. Martelli, S. E. Newhouse, Zbigniew Nitecki, Roger D. Nussbaum, Stephan E. Pelikan, Helena S. Winnielski, and James A. Yorke.
- Differential geometry and 3-manifolds, R. BROOKS, WALTER D. NEUMANN, and SCOTT WOLPERT, University of Maryland, College Park. The speakers were Mark D. Baker, Christopher B. Croke, Clifford J. Earle, David Gabai, William M. Goldman, Nancy Hingston, Irwin Kra, Francis D. Lonergerg, Bernard Maskit, Howard A. Masur, Walter D. Neumann, Don B. Zagier, and Wolfgang Ziller.
- Minimal submanifolds in differential geometry, DAVID HOFFMAN, University of Massachusetts, Amherst. The speakers were William K. Allard, F. J. Almgren, Jr., Michael T. Anderson, Antonio C. Asperti, Marcos Dajczer, James Eells, David Hoffman, H. Blaine Lawson, Jr., Tilla Klotz Milnor,
Frank Morgan, Brian Smyth, Chuu Lian Terng, and Brian White.

Complex analysis, JOHN R. QUINE, Florida State University. The speakers were Carlos A. Berenstein, B. A. Case, J. A. Cima, David Drasin, David H. Hamilton, Linda Keen, Albert E. Livingston, T. H. MacGregor, Peter A. McCoy, Sanford Miller, B. G. Osgood, Dorothy B. Shaffer, Herb Silverman, E. Silvia, and David E. Tepper.

Representation theory and automorphic forms, J. A. SHALIKA, Johns Hopkins University. The speakers were Avner Ash, Leslie Cohen, Y. Flicker, B. Brent Gordon, A. W. Knapp, I. Piatetski-Shapiro, Steve Rallis, Paul J. Sally, Jr., Freydoon Shahidi, J. A. Shalika, D. Shelstad, Birgit Speh, and Gregg J. Zuckerman.


Model theory, CAROL WOOD, Wesleyan University. The speakers were Steven A. Buechler, Zoe Chatzidakis, Kevin J. Compton, Lou van den Dries, Laurence Kirby, Julia F. Knight, L. Lipshitz, James Loeves, Angus Macintyre, Alan H. Mekler, Anand Pillay, Mike Prest, David Rosenthal, Dan Saracino, James Schmerl, and Rick L. Smith.

Contributed Papers. There were four sessions for contributed ten-minute papers. These were as follows: Session on Topology, session on Differential Equations, session on Analysis and a general session.

Other Organisations. The Association for Women in Mathematics held an informal session on Sunday from 8:30 to 9:30.

Raymond G. Ayoub
University Park, Pennsylvania Associate Secretary

The Annual Meeting in Denver

The January 1983 Joint Mathematics Meetings, including the 89th Annual Meeting of the American Mathematical Society, the 66th Annual Meeting of the Mathematical Association of America, and the 1982–1983 Annual Meeting of the Association for Symbolic Logic, were held January 5–9, 1983, in Denver, Colorado. There were 2,027 registrants, including 1,491 members of the Society.

Fifty-sixth Josiah Willard Gibbs Lecture. The 1983 Gibbs lecture was presented by SAMUEL KARLIN of Stanford University. Professor Karlin spoke on Mathematical models and controversies of evolutionary theory. He was introduced by Julia B. Robinson, president of the Society.

Colloquium Lectures. A series of four Colloquium Lectures was given by CHARLES L. FEFFERMAN of Princeton University. The title of this lecture series was The uncertainty principle. The titles of the individual lectures were The SAK principle, Schrödinger operators, Finer cutting, and Approximate diagonalization. The presiding officers at the four lectures were Julia B. Robinson, Elias M. Stein, Linda P. Rothschild, and Carlos E. Kenig.

Retiring Presidential Address. The retiring presidential address was delivered by ANDREW M. GLEASON of Harvard University, who retired as president of the Society on December 31, 1982. Professor Gleason’s title was Some remarks on the prime number theorem. He was introduced by President Robinson.

Birkhoff Prize. The 1983 George David Birkhoff Prize in Applied Mathematics was awarded to PAUL R. GARABEDIAN of the Courant Institute of Mathematical Sciences, New York University. Further details may be found on pages 138 and 139 of the February 1983 Notices.

Invited Addresses. By invitation of the Program Committee, there were seven invited one-hour addresses. The names of the speakers, their affiliations, and the titles of the talks were as follows.

MICHAEL AIZENMAN, Rutgers University, New Brunswick, Stochastic geometry in quantum field theory and classical statistical mechanics.

BRADLEY EFRON, Stanford University, Mathematics, statistics, and the modern computer.

MICHAEL H. FREEDMAN, University of California, San Diego, Four-dimensional manifolds.

DAVID GIESKER, University of California, Los Angeles, Geometric invariant theory and moduli problems in algebraic geometry.

BENEDICT H. GROSS, Brown University, Constructing rational points of infinite order on elliptic curves.

ROGER E. HOWE, Yale University, Aspects of harmonic analysis on the Heisenberg group: dual pairs, theta functions, classical invariant theory.

NEIL J. A. SLOANE, Bell Laboratories, Murray Hill, The Leech lattice.

The presiding officers at these seven lectures were R. O. Wells, Jr., Andrew M. Gleason, Linda Keen, Carlos E. Kenig, Carlos J. Moreno, Philip C. Kutako, and Andrew M. Odlyzko.

Special Sessions. By invitation of the same committee, there were twelve special sessions of selected twenty-minute papers. The topics of these special sessions, the names and affiliations of the mathematicians arranging them, and final lists of speakers are as follows.


**Automatic theorem proving,** WOODROW W. BLEDSOE, University of Texas, Austin. Peter B. Andrews, W. W. Bledsoe, Robert S. Boyer, D. Lankford, Douglas B. Lenat, Donald W. Loveland, John McCarthy, Derek Oppen, Hao Wang, and L. Wos. The Automatic Theorem Proving Prize (sponsored by the International Joint Conference on Artificial Intelligence) was awarded to Hao Wang and Lawrence Wos in an informal ceremony which was part of this session.


**Applied category theory,** JOHN W. GRAY, University of Illinois, Urbana-Champaign. Michael Barr, Andreas Blass, Marta Bunge, Peter Freyd, Andre Joyal, Anders Kock, J. Lambek, D. M. Latch, D. Lankford, Douglas G. Kartsatos, Allan M. Krall, Kurt Kreith, V. B. Andrews, W. W. Bledsoe, Robert Alexander Ramm, Dean Alvis, Richard Boyce, Leonard Chastkofsky, Lawrence Wos in an informal ceremony which was part of this session.


**Other Events.** A special address, The National Science Foundation: Policies and programs for research in the mathematical sciences, was given by EDWARD A. KNAPP, Director of the National Science Foundation. (See pages 140–144 of the February 1983 Notices).

A panel discussion, sponsored by the Society’s Committee on Employment and Educational Policy (CEEP) and the Mathematical Association of America (MAA), was held on Freshmen Mathematics: Are
there alternatives to calculus? (See pages 166–171 of the February 1983 Notices.)

Council and Business Meetings. The reports of the Council and Business Meetings held during the annual meeting were given on page 231 of the February 1983 Notices.

Paul T. Bateman
Associate Secretary

Urbana, Illinois

April Council Meeting

April Council Meeting. The Council met on 14 April 1983 at 5:00 p.m. in the Gold Ballroom of the New York Statler Hotel. There were nineteen members in attendance. President Julia B. Robinson was in the chair.

The Council approved the election of Melvin Hochster and Elias M. Stein to the Executive Committee of the Council.

The President announced the names of six candidates for four places on the Nominating Committee in the election of 1983. They are:

- A. T. Bharucha-Reid
- Tsit-Yuen Lam
- Heini Halberstam
- Robert P. Langlands
- Alistair H. Lachlan
- Harold M. Stark

(Nomination of candidates by petition is in order. Should these petitions not bring the number of candidates to at least eight, the President will name additional candidates.)

The Nominating Committee proposed and the Council approved the following candidates for office in the election of 1983:

- President Elect: Irving Kaplansky
- Vice President (two positions)
  - Paul J. Cohen
  - Jacob T. Schwartz
  - E. R. Kolchin
  - Stephen Smale
- Trustee (one position)
  - Theodore W. Gamelin
  - Paul J. Sally, Jr.
- Member-at-Large (five positions)
  - Michael G. Crandall
  - Jean E. Taylor
  - David Eisenbud
  - William P. Thurston
  - Carlos E. Kenig
  - Floyd L. Williams
  - Dusa McDuff

The Council received the report of the Treasurer with the minutes of the meeting. (An abbreviated version appears at the beginning of this section of AMS Reports and Communications.)

The Council changed the eligibility requirements for the AMS Postdoctoral Fellowships. The competition that closes in December 1983 will be open to persons in early mid-career, ordinarily interpreted as four to ten years past the Ph.D. degree. (Details will be announced in the August Notices.)

The petition table, which has been available at a few recent meetings, will ordinarily be available at meetings during the coming year. The intent is that it shall be possible for interested parties to collect signatures on petitions concerning the violation of human rights of individual mathematicians. All responsibility for petitions rests with the sponsors.

The Council adjourned at 7:20 p.m.

Everett Pitcher
Secretary

Bethlehem, Pennsylvania

Associate Secretary (two positions)
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Nominations by petition for the positions of Vice-President and Member-at-Large will be considered by the council.¹

¹See the column titled “1983 AMS Elections” in this issue of the Notices, and pages 178-179 of the February 1983 issue or 308-309 of the April 1983 issue.
The Department of Mathematical Sciences anticipates having several tenure-track positions at the level of Assistant Professor starting in August 1983. Candidates should possess Ph.D. degree in Mathematics. Duties include teaching at the undergraduate and beginning graduate level, research and service. Evidence of teaching ability and research potential is desirable. Preferred areas of specialization are in combinatorics, mathematical logic/recursion theory, numerical methods, probability or algebra. Qualified candidates in other areas will be considered. Salary is competitive. Applicants should send vita and three letters of reference to:

Albert R. Stralka, Chairman
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University of California, Riverside, CA 92521

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Tenure-track position effective August 29, 1983. Ph.D. in Mathematical Sciences and a strong background in Computer Science are required. Responsibilities will include teaching intermediate level computer science courses and junior-senior level mathematics courses. Rank and salary will be commensurate with qualifications and experience. Excellent facilities—B6800, Heath LS 1-11 and a number of micro-computers.

Fredonia, with an enrollment of 5,000 is located in scenic Chautauqua County, western-most in NYS. Please send résumé and three references to: Dr. Albert D. Polimeni, Chairman, Department of Mathematics and Computer Science, SUNY, College at Fredonia, NY 14063. AA/EOE.

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Natural Sciences and Mathematics Division
St. Mary's City, Maryland 20686

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Candidate should have a strong interest in undergraduate teaching and should be interested in participating in development of a strong mathematics major. Normal teaching load is 12 credit hours (three courses) per semester. Summer teaching is usually available. Send résumé and names of three referees to Rosemary R. Hein, Chairwoman, Science Division, St. Mary's College of Maryland, St. Mary's City, MD 20686. AA/EOE.

COLLEGE OF CHARLESTON
Department of Mathematics, Charleston, SC 29424

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POSITIONS AVAILABLE

LECTURER positions available starting Fall 1983 to teach undergraduate courses. Minimum qualification is Master's Degree in mathematics or related areas with preference in areas of statistics or computer science algebra. Pay is approximately $600 per credit hour taught. Ideal for someone on leave. Send vita to Arthur Sagle, Natural Science Division, University of Hawaii at Hilo, 1400 Kapiolani Street, Hilo, HI 96720.

LOYOLA UNIVERSITY of New Orleans invites applications for two tenure-track positions teaching mathematics. A Ph.D. or A.B.D. in Mathematics or Computer Science is required. New Orleans is a sunbelt city famous for Mardi Gras and cuisine. Loyola is a small, selective Liberal Arts University famous for quality education and personal interaction among students and faculty. Candidates should send résumés and references to:

W. S. Curran, Dept. of Mathematical Sciences
Loyola University, New Orleans, LA 70118
(504) 865-3340
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English is the basic language of instruction and candidates should have a Ph.D. or a Master's Degree. Starting annual salary for Ph.D. 4414 JDs., approximately $12,433, and for Masters Degree 2680 JDs., approximately $7,550. Higher salaries are offered depending on experience. Fringe benefits include air ticket and relocation allowance for new faculty members, accident and health insurance, cost of living coverage.

All applications should include résumé and be addressed to:

Dean of the Faculty of Science
Birzeit University
P. O. Box 14
Birzeit
West Bank
Via Israel

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Summer List of Applicants

Instructions for Applicant Form on facing page

The form. Forms submitted by job applicants who attend the August meetings in Albany will be posted. The first impression a prospective employer has of an applicant may be based on the appearance of this form.

The forms should be carefully typed using a fresh black ribbon. The best results are obtained with a carbon-coated polyethylene film ribbon, but satisfactory results may be obtained using a ribbon made of nylon or other woven fabric if suitable care is exercised. It is important that the keys be clean and make a sharp, clear impression. Use a correcting typewriter or correction tape or fluid if necessary. Submit the original typed version only. Hand lettered forms are acceptable if prepared carefully.

The summary strip. Information provided here will be used to prepare a printed list of applicants for distribution to employers. Please supply all information requested, and confine your characters to the boxes provided. Use the codes below. Circled letters identify corresponding items on the form and the strip.

Address forms to the Mathematics Meetings Housing Bureau, P.O. Box 6887, Providence, RI 02940. The deadline for receipt is July 1, 1983. See pages 406 and 412 for more information.

A Specialties

AL = Algebra AN = Analysis
BI = Biomathematics BS = Biostatistics
CB = Combinatorics CM = Communication
CN = Control CS = Computer Science
CT = Circuits DE = Differential Equations
EC = Economics ED = Mathematical Education
FA = Functional Analysis FI = Financial Mathematics
FL = Fluid Mechanics GE = Geometry
HM = History of Math LO = Logic
MB = Mathematical Biology ME = Mechanics
MO = Modelling MP = Mathematical Physics
MS = Management Science NA = Numerical Analysis
NT = Number Theory OR = Operations Research
PR = Probability SA = Systems Analysis
ST = Statistics TO = Topology

B Career Objectives

AR = Academic Research AT = Academic Teaching
NR = Nonacademic R&D NC = Nonacad. Consulting
NS = Nonacademic Supervision

B 1 Duties

T = Teaching U = Undergraduate
G = Graduate R = Research
C = Consulting A = Administration
S = Supervision IND = Industry
GOV = Government DP = Data Processing

Location

E = East S = South
C = Central M = Mountain
W = West O = Outside U.S.
I = Indifferent

U.S. Citizenship Status

C = U.S. Citizen P = Permanent Resident
T = Temporarily in U.S. N = Non-U.S. Citizen
# Summer List of Applicants

**Mathematical Sciences Employment Register**  
August 1983  
Albany, New York

(Please see instructions on facing page)

**APPLICANT:** Name_______________________________________________

Mailing address (include zip code)________________________________________

- A Specialties________________________________________________________

- B Career objectives and accomplishments

ACADEMIC: ☐ Research, ☐ Teaching

NON-ACADEMIC: ☐ Research and Development, ☐ Consulting, ☐ Supervision

Near-term career goals__________________________________________________

Significant achievements or projects, including role________________________

Honors and offices______________________________________________________

Other (e.g., paper to be presented at THIS meeting)________________________

Selected titles of papers, reports, books, patents__________________________

- C Degree  Year  Institution

- D No. of abstracts, internal reports__________________________

- E No. of papers accepted____________________________________

- F No. of books and patents_____________________________________

**EMPLOYMENT HISTORY:**

- G Employer________________________________________________________

Position____________________________________________________________

- H Duties____________________________________________________________

Years_________________________to_________________________to_________________________

**DESired POSITION:**

- I Duties____________________________________________________________

- J Available mo./yr. Location_________________________Salary_________________________

- K References (Name and Institution)

__________________________________________________________

__________________________________________________________

- L Citizenship_______________________________________________________

- M I plan to attend the Summer Meeting ☐ yes ☐ no

**SUMMARY STRIP**

<table>
<thead>
<tr>
<th>Family Name</th>
<th>First Name</th>
<th>Mailing Address</th>
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<tr>
<th>Address (cont’d.)</th>
<th>Address (cont’d.)</th>
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<th>A Specialties</th>
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<tr>
<th>B Career objectives</th>
<th>C Highest Degree</th>
<th>D Yr.</th>
<th>E Institution</th>
<th>D</th>
<th>B</th>
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<tr>
<th>H Present duties</th>
<th>I Desired duties</th>
<th>J Available mo./yr.</th>
<th>L</th>
</tr>
</thead>
</table>
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AMS Short Course                  Joint Mathematics Meetings                  MAA Minicourses
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MUST BE RECEIVED IN PROVIDENCE NO LATER THAN JULY 1, 1983

Please complete this form and return it with your payment to
Mathematics Meetings Housing Bureau
P. O. Box 6887, Providence, Rhode Island 02940, Telephone: (401) 272-9500, Ext. 239

DEADLINES: PREREGISTRATION: July 1, 1983 for preregistration fee(s)

RESIDENCE HALL ROOM PAYMENT: July 1, 1983 (partial refunds only after July 15.)

CANCELLATIONS: Preregistrations may be cancelled until August 5 by writing or calling the Mathematics Meetings Housing Bureau. (See above.) 50% of the preregistration fee(s) will be refunded if notification is received by this date. Confirmed residence hall reservations may be cancelled until July 15 and full payment will be refunded; however, after that date, only partial refunds will be allowed.

CHANGES: Changes in arrival and departure dates must be made with the Mathematics Meetings Housing Bureau by August 5. (See address and number above.) After this date, please call message center number at Albany meeting.

NOTE: All dues and meeting registration fees paid to AMS or MAA by professional mathematicians are tax deductible.

REGISTRATION FEES

<table>
<thead>
<tr>
<th>Preregistration (by mail prior to 7/1)</th>
<th>At Meeting</th>
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<tr>
<td><strong>AMS Short Course</strong></td>
<td><strong>MATT Minicourses</strong></td>
</tr>
<tr>
<td>Member of AMS, MAA, TIME</td>
<td>#1 [ ] #2 [ ] #3 [ ] #4 [ ] #5 [ ] #6 [ ]</td>
</tr>
<tr>
<td>*Student, Unemployed or Emeritus</td>
<td>#9 [ ] #12 [ ]</td>
</tr>
<tr>
<td>Nonmember</td>
<td>#58 [ ] #75 [ ]</td>
</tr>
<tr>
<td><strong>MAA MINICOURSES #1 through #6</strong></td>
<td>#20 [ ] #20 [ ]</td>
</tr>
</tbody>
</table>

*All full-time students currently working toward a degree or diploma qualify for the student registration fees, regardless of income. The unemployed status refers to any person currently unemployed, actively seeking employment, and who is not a student. It is not intended to include persons who have voluntarily resigned from their latest position. The emeritus status refers to any person who has been a member of the AMS or MAA for twenty years or more and is retired on account of age from his or her latest position.

PREREGISTRATION SECTION: Please check the function(s) for which you are preregistering:

Joint Mathematics Meetings [ ]

AMA Short Course [ ]

MAA Minicourses [ ] #1 [ ] #2 [ ] #3 [ ] #4 [ ] #5 [ ] #6 [ ]

1) Name (Please print) __________________________ Surname __________________________ First __________________________ Middle __________________________

2) Address Number and Street City State Zip Code __________________________

3) AMS member code __________________________ MAA member code __________________________

4) Address for confirmation of room reservation if other than above __________________________

5) Employing institution __________________________ Emeritus member [ ]

*Student, Unemployed or Emeritus [ ] Nonmember [ ]

6) I am a student at [ ] Full-time student [ ] Part-time student [ ] __________________________

7) Name of spouse __________________________

8) Number of Children __________________________

(Provide information only if accompanying meeting)

9) Member of AMS [ ] MAA [ ] TIME [ ] Nonmember [ ]

Member of other organizations: AWM [ ] NAM [ ]

10) Joint Meetings fee enclosed $ __________________________

11) Please reserve a place for me in Minicourse(s) __________________________

I will pay appropriate fee(s) at the meetings.

12) AMA Short Course fee enclosed $ __________________________

NOTE: I am preregistering for the Joint Meetings only in order to attend the MAA Minicourse(s).

13) FULL PAYMENT for residence hall accommodations enclosed $ __________________________ (partial refund applies after 7/15/83)

TICKETS

14) Cruise: @ $15 for those not on any meal plan as well as those on meal Plans A, C, E, or G. $ __________________________

@ $9.25 for those on any meal plan A, B, D, or H. $ __________________________

15) Picnic: @ $7 for those not on any meal plan as well as those on meal Plans A, E, or G. $ __________________________

@ $9.65 for children under 10 on meal Plans B or D. $ __________________________

(No charge if on Plans B, D, F, or H.)

16) Beer Party: __________________________

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17) MAA 25-year Banquet: __________________________

@ $15.05 for those not on any meal plan as well as those on meal Plans A or B. $ __________________________

@ $9.25 for those on meal Plan B or F. $ __________________________

I would like to be seated with __________________________

18) Total amount enclosed for 10 through 17 plus Meal Plans Only (if applicable [see reverse]) $ __________________________

NOTE: Make checks payable to AMS; Canadian checks must be marked "In U.S. Funds”. Do not include payment for MAA Minicourses.

NOTE: A $4 charge will be imposed for invoices prepared when preregistration/housing forms are submitted without an accompanying check for preregistration fee(s) and housing (if applicable), or are accompanied by an insufficient amount.

[ ] Check here if you will not require a room.

N.B. Please be sure to complete the section on next page if you will require housing or meal plans only.

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PREREGISTRATION AND HOUSING REQUEST FORM (continued)

UNIVERSITY HOUSING SECTION

Please read sections on housing and room rates in meeting announcements.

Please reserve the following residence hall accommodations and send confirmation to me at address indicated below.

SINGLE OCCUPANCY

[  ] PLAN A -- includes breakfast and lunch

[  ] PLAN B -- includes breakfast, lunch, and dinner

CHILDREN'S RATES

The adult rates as listed above apply for children 10 years of age and older. This group must occupy a bed.

The following rates in Plan C or D apply to children up to and including the age of 9.

PLAN C -- includes breakfast and lunch

PLAN D -- includes breakfast, lunch, and dinner

N. B.!! Since dinner will not be available on Thursday, August 11, be sure to include rate for Plans A, C, E, or G for the night of August 10 only. (Plans B, D, F, or H do not apply for that night.)

I will arrive on __________________________ at __________ a.m./p.m., and depart on __________________________ at __________ a.m./p.m.

I will share a double room with __________________________ who will arrive on __________________________ at __________ a.m./p.m., and depart on __________________________ at __________ a.m./p.m.

Please list age(s) and sex(es) of accompanying children ______________________________.

ADDRESS FOR CONFIRMATION OF ROOM RESERVATION:

------------------------------

MEAL PLANS ONLY

For adults and children 10 and over (not staying in residence halls, commuters, or those staying in hotels).

[  ] PLAN E -- includes breakfast and lunch @ $ 6.60 per day $__________

[  ] PLAN F -- includes breakfast, lunch, and dinner @ $13.40 per day $__________

For children 9 years of age and under (not staying in residence halls, etc.):

[  ] PLAN G -- includes breakfast and lunch @ $ 3.90 per day $__________

[  ] PLAN H -- includes breakfast, lunch, and dinner @ $ 9.25 per day $__________

N. B.!! Since dinner will not be available on Thursday, August 11, be sure to include rate for Plans A, C, E, or G for the night of August 10 only. (Plans B, D, F, or H do not apply for that night.)

****************************************************************************************************************************

TRAVEL INFORMATION

[  ] I plan to arrive by plane on __________________________ (Airline and Flight Number) scheduled to arrive at Albany airport

on __________________________ at __________ a.m./p.m.

[  ] I plan to drive to the meeting.

PHONE NUMBER: ________

(Area Code)
Nonparametric Statistical Inference, Vols. I and II

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COLLOQUIA MATHEMATICA SOCIETATIS JÁNOS BOLYAI, 32

The field of nonparametric statistics continues to play an increasingly successful role in statistical theory as well as in its applications. Nonparametric methods are not only mathematically elegant, they also provide a variety of applications in several fields such as engineering, economics, agriculture, meteorology and biometrics. To stimulate further research, a colloquium on the subject was held in Budapest, 23-27 June, 1980.

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The Theory and its Applications. Revised Edition

by GÜNTER PILZ

NORTH-HOLLAND MATHEMATICS STUDIES, 23

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Bulletin Mathematique de la Société des Sciences
"... The book is well organized and gives a quick and easy introduction into the field of near-rings. It will certainly contribute to the further development of the subject..."
Mededelingen van het Wiskundig Genootschap


Price: US $59.50/Dfl. 140.00

Differential Geometry

edited by GY. SOÓS and J. SZENTHE

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The scope of these lectures covers several branches of Differential Geometry with applications such as Riemannian and Finsler Geometry, theory of connections, fibre bundles, Lie groups, generalized spaces, applications in various fields of theoretical physics.

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