The Anosov flow on 2D lattices
(see page 34)
To make an animated tube plot,

1. Type an equation in four variables.
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A vast majority of researchers don’t have [federal) grants,” our reader pointed out that “the vast majority of researchers don’t have [federal) grants”, and went on to note that, in his view, the real problem we face in mobilizing the support of the mathematical community for increasing federal support for mathematics is that so few mathematicians receive support (or anticipate receiving support), there isn’t a critical mass of people who care much about federal funding. This is why, our reader claims, that “physics and chemistry can mobilize people and mathematics can’t.”

I have to admit these observations are a bit of a surprise. Of course the fraction of academic mathematicians who are regularly named investigators of federal research grants in their research specialties is unfortunately a small number. But many more mathematicians receive other kinds of federal support, perhaps most significantly support to attend, or organize, conferences. And one can hope that the constituency for federal support for mathematics is not limited to grant recipients, or prospective recipients.

Nonetheless, our reader may have a point, or rather two points. First, there is the alleged apathy of a large part of the American mathematical community, at least as far as agitation for federal funding of mathematics is concerned. Second, there is the assumption that this apathy is the product of the bleak prospects for receiving federal research funding. For the sake of argument, let’s grant the first point and consider what could be done if the majority of American mathematicians were eager to push for increased federal funding. The Division of Mathematical Sciences (DMS) budget of the National Science Foundation—which is the most popular source of federal funding of mathematics research—is about one ten thousandth of the total federal budget, which is the same order of magnitude as the fraction of mathematicians in the American population (I’m being generous with the definition of mathematician). Despite this fortuitous proportionality, the obvious conclusion is that as both a constituency and as a budget line research mathematics is too small to warrant direct political action. Indeed, this is our correspondent’s conclusion: he argues that mathematicians should be part of the science lobby, and make sure that the public understands that mathematics is science.

Again for the sake of argument, let’s grant the second point as well. Suppose we gave the entire mathematical community a stake in the federal funding process by funding everyone. For instance, if, as an experiment, the DMS budget were divided equally among all mathematicians (using my same generous definition) for, say, five years, each mathematician would receive US$20,000 annually to support their research. We can speculate whether this would cure the alleged apathy, and, with the apathy problem solved, whether the now committed mathematical community could have the desired impact on future federal funding. We can also speculate on whether the current federal funders (and fundees) would be willing to support such an experiment.

The Notices, of course, will continue to keep readers informed of developments and opportunities regarding federal support for mathematics research. In addition to news items about proposal deadlines and about AMS activities highlighting the need for, and successes of, funded mathematics research, scheduled Notices articles for 2007 include Allyn Jackson’s annual analysis of DMS budget prospects, an article in our series for graduate students about the process for applying for a federal grant, an interview with outgoing DMS Director William Rundell, and others.

And speaking of 2007, I note that with this issue I begin my second term as Notices editor. Notices readers are well aware of Allyn Jackson’s contributions as Notices Senior Writer; authors and others know of her major contributions as Deputy Editor as well. Our authors also know of the huge role Managing Editor Sandra Frost plays in the design and production of the Notices. The Notices is an important benefit to many AMS members, and we all (especially me) owe a large debt of gratitude to Sandy and Allyn for what they do to bring you the Notices each month. There are others I’d like to thank as well. Graphics Editor Bill Casselman continues to bring mathematically significant and esthetically pleasing images to Notices covers and articles. If you like the mathematical graphics in the Notices, and I do, you should know that Bill deserves the credit. The Notices is supported by a hard working production staff in the AMS offices, especially Production Assistant Muriel Toupin, all of whom deserve recognition and thanks. And finally, I’d like to recognize AMS Executive Director John Ewing, whose commitment to the editorial independence of the Notices is gratefully acknowledged.

—Andy Magid
Letters to the Editor

Visibility of Asian Americans in Mathematics

During the Madrid ICM-2006, there was considerable popular press coverage on a focal topic leading to it, namely the Poincaré Conjecture. Among the coverage is an August 28 article in the New Yorker by Nasar and Gruber. It was a much talked-about piece of publicity on mathematics at many dinner tables. Jackson’s “Conjectures No More?” in your September issue of the Notices followed.

After reading these two articles in parallel, it is then particularly gratifying to read Goel’s article on “An Invisible Minority” concerned with the need for Asian American mathematicians in the context of our social political environment. There are many reasons for it being gratifying.

A difference between Jackson’s piece and the Nasar-Gruber piece is in the latter adding the spice of S. T. Yau being “Chern’s successor” or “Chern’s heir”. While some mathematicians may interpret this plot in terms of Chern and Yau’s professional accomplishment, due to the political incarnation of “heir” and “successor” the New Yorker actually creates for its general readers the plot of a political power struggle. We find the addition of this plot being a way to stereotype Asian Americans in the shadow of a politburo. It is particularly ironic that when Yau has the courage to speak openly against corruption in China in the past year, he never got the usual kudos in the American popular press, and is instead portrayed as an aggressor. It brings us to Goel’s article concerned with the challenge facing all Asian mathematicians in the USA.

As people with South Asia origins are subjected to the stereotype of a terrorist, people of East Asia origins are subjected to the stereotype of a communist. Both are taboos in the American society.

Yau’s achievement in mathematics is well known within the mathematics community. It is equally well known that he has donated personal funds to establish scholarships for mathematics students, has donated tens of thousands of books to educational institutions, has helped raise tens of millions of dollars to promote mathematics education and research, and has raised funds to promote interaction among scientists across subject boundaries and national borders. For the Asian Americans below the glass ceiling, it is disheartening to see such a successful and dedicated academic being subjected to the smear of popular press. For the Asian American scientists and their children negotiating their ways through the minority situation in our political system but excluded outside the “under-represented” designation, especially in academic institutions, Goel’s piece provides a much needed, timely and refreshing perspective.

—Bun Wong and Yat Sun Poon
University of California at Riverside

(Received September 23, 2006)

Mathematical Community Should Police Itself

I would like to comment on recent events revolving about the awarding of the Fields Medal to Grigory Perelman, and the article in the New Yorker magazine about it.

I have always felt proud to be a member of a professional community that embraces talent, with all the human diversity that can accompany it. As mathematicians, we have an extraordinary tolerance of eccentricity, and I truly believe that many individuals who might do badly in a different social milieu find acceptance and thrive in the mathematics community. Sylvia Nasar’s book, A Beautiful Mind, describes this in rich detail. Reading it, I was proud of our decency as a community.

But there is another, and a darker, side to the same phenomenon, i.e. a tolerance for bad behavior, especially when the individuals whose actions might be questioned are highly talented. To put it plainly, we do not police ourselves very well.

I focus on one small part of the complex array of matters discussed in the Nasar-Gruber article, namely the manner in which the normal peer review process, essential to the integrity of the profession, was tossed out the window when the paper of Cao and Zhu was accepted for publication in the Asian Journal of Mathematics (AJM). The submitted paper appears to be mainly an exposition of Perelman’s work on the Geometrization Conjecture, however it asserted that there were gaps in Perelman’s proof, which the authors filled. That was a serious assertion. The decision to publish the Cao-Zhu paper was made by the two editors-in-chief of the AJM, without consultation with the journal’s twenty-six member editorial board, even though it was known that the authors had deep personal attachments to the editors-in-chief. The members of the editorial board of the AJM were notified of the pending publication a few days before the journal issue appeared, but were not shown the paper, an abstract, or reports by independent referees. Their names continue to appear on the journal cover, so one must assume that they approved that process. Thus those who were in a position to say “wait a minute, we will not let our names be used in this way” remained silent. This was just one of the many moments in this sad tale when there were no whistle-blowers. As a result the entire profession has received a very public and very bad black mark.

—Joan S. Birman
Professor Emeritus of Mathematics
Barnard College and Columbia University

(Received September 23, 2006)

Poincaré’s Vision

The recent proof by Hamilton and Perelman of the celebrated 3-d Poincaré conjecture has occasioned a dramatic upsurge of controversies concerning priorities and individual personalities.

We want to bring to the reader’s attention a specific aspect which has been neglected in this discussion. Namely, the connection of this proof with the vision of Poincaré. Up to now the unsuccessful attempts to prove
the conjecture had relied on methods of topology. The Hamilton-Perelman proof rests upon two essential ingredients:

1) The study of the deformation theory of these manifolds under a nonlinear evolution equation, namely the Ricci flow.

2) The careful control of Ricci flows based on a priori estimates for this PDE and Thurston's decomposition.

These two ingredients are closely linked to some of the earlier works of Poincaré. In particular Poincaré had a vivid insight of the role of PDEs within pure mathematics. This is illustrated very sharply in the introduction to Poincaré's paper in the Amer. J. Math., vol. 12 (1890), in which Poincaré sets forth the foundations of the modern theory of PDEs. We quote this section in our English translation.

After listing some outstanding examples of PDEs in mathematical physics (Laplace, heat and wave equations) he writes:

"All these problems have a family resemblance that one cannot disregard. One should therefore expect to find a large number of common properties. Unfortunately, the first common property is their extreme difficulty. Not only can one not resolve these equations in explicit form, but it is only at the price of great effort that one can prove their solvability rigorously.

"Is this demonstration necessary? Most physicists wouldn't care less. Experience does not permit one to doubt the possibility of electric equilibrium. One cannot doubt, it seems, the solvability of these equations which express this equilibrium.

"The differential equations which physical phenomena obey have often been established with lack of rigor. One can regard these only as approximations. [...] Thus absolute rigor has limited interest. It seems often that there is no place for such rigor if it involves too much effort.

"Nevertheless, each time I can, I aim at absolute rigor for two reasons. In the first place, it is always hard for a geometer to consider a problem without resolving it completely. In the second place, these equations that I will study are susceptible, not only to physical applications, but also to analytical applications. It is using the existence theory of the Dirichlet problem that Riemann founded his magnificent theory of Abelian functions. Since then, other geometers have made important applications of the same principle to the most fundamental parts of pure analysis. Is it still permitted to content oneself with a demi-rigor? And who will say that the other problems of mathematical physics will not, one day, be called to play in analysis a considerable role, as has been the case of the most elementary of them?"

-Haim Brezis, Paris VI and Rutgers University
-Felix E. Browder, Rutgers University
-Louis Nirenberg, Courant Institute

(Received October 3, 2006)

Correction

The October 2006 issue of the Notices, page 1007, carried a Letter to the Editor from William C. Waterhouse that mentioned the famous "taxicab number" 1729. Due to an editing error, the factorization of 1729 was given as 7-1-19 rather than 7-13-19. The Notices regrets the error.

-Allyn Jackson

Correction

In the diagram on the lower right of p. 1316 of the Brams, Jones, and Klamler article, "Better Ways To Cut a Cake" (December 2006), the c- should have been c- (see revised figure below), showing the movement of c rightward that is described in the text just above the diagram.

-Steven J. Brams, Michael A. Jones, and Christian Klamler
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Joint Mathematics Meetings, New Orleans
Organized by David Eisenbud, Mathematical Sciences Research Institute

1:00 PM
Robert Ghrist
Barcodes: The Persistent Topology of Data
Scientists everywhere are struggling with an explosion in the quantity of data they can gather. Ideas in topology give new ways to extract qualitative properties.

2:00 PM
Akshay Venkatesh
Flows on the Space of Lattices: work of Einsiedler, Katok and Lindenstrauss
A lattice is a grid (discrete subgroup of maximal rank) in $\mathbb{R}^n$. Dilations give a simple way of transforming one lattice into another. What are the orbits of these transformations like? Answers to this question have interesting connections with number theory.

3:00 PM
Izabella Laba
From Harmonic Analysis to Arithmetic Combinatorics
This talk will show some connections between an old question in Euclidean geometry, a variety of deep combinatorial problems, recent advances in analytic number theory, classical harmonic analysis and PDE regularity estimates.

4:00 PM
Barry Mazur
The Structure of Error Terms in Number Theory and an Introduction to the Sato-Tate Conjecture
Number theoretic quantities can often be well approximated by simple expressions. All the fun, at that point, is in the nature of the error term, i.e., the difference between the quantity being studied and our approximation of it. Some recent work has proven an old conjecture of Sato and Tate about the distribution of error terms in many important cases.
Homological Sensor Networks

Vin de Silva and Robert Ghrist

Sensors and Sense-ability
A sensor is a device that measures some feature of a domain or environment and returns a signal from which information may be extracted. Sensors vary in scope, resolution, and ability. The information they return can be as simple as a binary flag, as with a metal detector that beeps to indicate a detection threshold being crossed. A more complex sensor, such as a video camera, can return a signal requiring sophisticated analysis to extract relevant data.

An increasingly common application for sensors is to scan a region for a particular object or substance. For example, one might wish to determine the existence and location of an outbreak of fire in a national forest. Questions of more interest to national security involve detection of radiological or biological hazards, hidden mines and munitions, or specific individuals in a crowd. All of these scenarios pose difficult and challenging data management problems.

Numerous strategies exist, aided by the fact that sensor technology provides an expansive array of available hardware. A fundamental dichotomy exists in the approach to sensing an environment based on the number and complexity of sensors. For a fixed cost (monetary, or perhaps "total complexity"), one can deploy a small number of sophisticated "global" sensors with high signal complexity and precise readings. In contrast, one can deploy a large number of small, coarse, "local" devices that may have large uncertainties in their readings. Different strategies are appropriate for different tasks. The human body contains examples of sensor systems with a small multiplicity of highly complex devices (for sight) as well as vast networks of local sensors (for touch).

Technology promises to push the envelope on both sides of this spectrum, yielding new types of powerful, global sensors, as well as local sensors of surprisingly small size. The relevant question for the mathematician is which types of mathematics will be useful in analyzing sophisticated sensor networks.

It may be that the most exciting possibilities lie in the domain of the small. Swarms of local sensors at micro- or nanoscale have the potential to revolutionize the way that we think about security and surveillance problems [4]. However, this brings with it the difficulty of integration. How does one collect local information and collate it into global environmental data?

From Local to Global
Fortunately, mathematicians have spent centuries carefully contemplating local-to-global transitions. The very term we use to indicate the collection and collation of local data—integration—harks back to the well established means of relating local information about a function (pointwise derivatives) with a global quantity (the integral).

A more relevant example for our purposes is to be found in simple ideas about the topology of surfaces. What are the global features of a surface given "local data" in the form of a triangulation? The Classification Theorem for Surfaces implies that the Euler characteristic $\chi(\Sigma)$ suffices to determine the homeomorphism type of a closed orientable surface $\Sigma$. The computation is as simple as one could hope for:

$$\chi(\Sigma) = \#V - \#E + \#F,$$

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Robert Ghrist is associate professor of mathematics at the University of Illinois, Urbana-Champaign. His email address is ghrist@math.uiuc.edu.
The authors acknowledge the support of DARPA (Defense Advanced Research Projects Agency) and the National Science Foundation.
where the triangulated surface $\Sigma$ has $\#V$ vertices, $\#E$ edges, and $\#F$ faces.

The information contained in $\chi(\Sigma)$ is not restricted to topological classification. The Euler characteristic $\chi(\Sigma)$ can be used to infer geometric properties of $\Sigma$ (specifically, the Gauss curvature, via the Gauss-Bonnet Theorem) and dynamical characteristics of $\Sigma$ (specifically, the number and types of fixed points of a vector field, via the Hopf Index Theorem).

The efficacy of the Euler characteristic in this example is a consequence of the restricted nature of surfaces. For a more arbitrary space, the challenge of characterizing global features of the space becomes a more fundamental problem in topology. With surfaces, simple arithmetic suffices to determine global properties. For arbitrary complexes, more sophisticated algebraic topology is required. Roughly speaking, algebraic topology provides two ways in which to associate to a given space $X$ a collection of algebraic objects that gauge the global features of $X$.

The first such set of invariants are the homotopy groups, $\pi_k(X)$, for $k = 0, 1, \ldots$, the fundamental group $\pi_1(X)$ being very well known. These groups measure in how many and which ways one can map a $k$-dimensional sphere $S^k$ into $X$, two spheres in $X$ being deemed equivalent if they are homotopic relative to some fixed basepoint. Homotopy groups comprise very powerful data; however, they are in practice quite difficult to compute. The general computation of homotopy groups of spheres is unknown and indeed is the premier unsolved problem in algebraic topology at this time.

The second set of invariants provide a weaker but more computable option. These are the homology groups, $H_k(X)$, for $k = 0, 1, \ldots$. (Properly speaking, homology defers to its algebraic dual—the cohomology groups $H^k(X)$—as a finer invariant.) Instead of measuring $k$-spheres in a space up to homotopy, homology measures certain types of chains, or objects built from simple oriented pieces: simplices. These simplices are defined differently depending on the type of homology used. The simplest instantiation is that of a simplicial complex $X$, where the combinatorial simplices from which $X$ is built form a basis for simplicial chains. The elements of $H_k(X)$ are cycles, or chains with vanishing boundary, and two $k$-cycles are deemed homologous if there is an oriented $(k + 1)$-chain that has as its boundary the pair of cycles (with opposite orientation).

Like homotopy groups, the homology groups are an invariant of the homotopy type of the underlying space. This explains why the Euler characteristic $\chi$ of a surface is independent of both the triangulation and the homeomorphism type of the surface: $\chi$ is the alternating sum of the dimensions of the homology groups.

Unlike homotopy groups, homology groups can be computed via linear algebra. Recent advances in algorithms for the rapid computation of homology (see [7] and references therein) make this a feasible tool for realistic problems in science and engineering.

**Blanket Coverage**

Motivated by the potential of pervasive computing in sensor-rich environments [4], we consider a class of simple sensors that can solve global problems based on local communication.

For concreteness, we consider the case where nodes lie in a planar Euclidean domain with polygonal boundary. Each node can perform some sensing task within a certain radially symmetric neighborhood. Within this coverage disk, the sensor performs its unspecified task, whether it involves video surveillance, detection of radiological or biotohazard material, motion detection, etc. We do not model this sensing task at all: it is completely implicit except for the assumption that it is radially symmetric. For such a network, we consider the problem of blanket coverage.

Does the union of the coverage discs about the nodes cover the domain $D$?

We wish to solve this problem using small-scale (and therefore cheap) devices without GPS or other sophisticated positioning systems. The intended lesson is that topological methods permit sensors that are remarkably minimal, having no means of measuring distance, orientation, or location in their environment.

The coverage problem is of clear significance to security and surveillance. A similar coverage problem vexes anyone with a cell phone in an area of
A Simple Local Network

What minimal capabilities must the sensor nodes possess, for there to be a solution (or reasonable partial solution) to the blanket coverage problem? We focus on node-to-node communication. Assume that each node broadcasts its unique ID and listens to determine its neighbors. These unique IDs may take the form of RFID tags.

The one strong assumption we make concerns the boundary of the domain $D$ in which the nodes lie. We suppose (for now) that the vertices of the polygonal boundary $\partial D$ are defined by special fence nodes in a known cyclic configuration (although their coordinates remain unknown). Our precise assumptions are as follows:

A1: Nodes $X$ broadcast their unique ID numbers. Each node can detect the identity of any node within broadcast radius $r_b$.

A2: Nodes have radially symmetric covering domains of cover radius $r_c \geq r_b/\sqrt{3}$.

A3: Nodes $X$ lie in a compact connected domain $D \subset \mathbb{R}^2$ whose boundary $\partial D$ is connected and piecewise-linear with vertices marked fence nodes $X_f$.

A4: Each fence node $v \in X_f$ knows the identities of its neighbors on $\partial D$ and these neighbors both lie within distance $r_b$ of $v$.

To summarize, each node is aware of the identities of those nodes that are within broadcast range $r_b$. The orientations and distances of these neighboring nodes are unknown. The fence nodes have two additional pieces of data: (1) they know that they are on the boundary of the domain; and (2) each knows the identities of the two neighboring fence nodes.

Apart from the fence nodes (which are used to simplify the statements of theorems), the type of information that this network encodes is very similar to that encoded by a simplicial complex. Local cell phone tower density. This latter coverage problem is simpler because the network of cell phone towers is fixed and intentional. The company that built the towers knows exactly where they were built and is certain that the towers have not moved. One can thus compute the union of the coverage discs "by hand" with ease (assuming no hardware failure). Standard algorithms from computational geometry can check for holes quickly, even in cases with many nodes, so long as the node positions are known.

The scenario that we envision differs in that there is no means of determining relative position. This is not an insurmountable difficulty. Indeed, there is an extensive literature on probabilistic methods for coverage problems in networks of randomly distributed points. See, e.g., [8]. Unfortunately, these methods have very strong assumptions on the uniformity or density of the random distribution of points. We would like to solve coverage problems in more realistic settings where one "dumps a bucketful" of sensors in a field, forest, or ocean and then queries the network, perhaps after environmental influences have moved the sensors to unknown positions.
combinatorial data about how elementary pieces are assembled give rise to a global object whose large-scale topological features are revealing.

**Simplices for Sensors**

The obvious way to begin is to build the network graph of the system. This is a combinatorial graph, \( \Gamma \), in which vertices correspond to the labeled nodes and (undirected) edges correspond to pairs of nodes that are in mutual broadcast range (within distance \( r_b \)). In this graph, the boundary \( \partial \mathcal{D} \) is naturally identified with a particular cycle \( \mathcal{F} \subset \Gamma \) traversing the fence nodes, thanks to A4. The problem at hand is to determine whether the set \( \mathcal{U} \) given by the union of radius \( r_b \) balls at \( X \) contains the domain \( \mathcal{D} \). The input for this problem is the pair of graphs \( (\Gamma, \mathcal{F}) \).

Determining the topology of a union of balls is a classical problem and is easily solved using the notion of a Čech complex (also known as the nerve). Given a collection of sets \( \mathcal{U} = \{ U_a \} \), the Čech complex of \( \mathcal{U}, C(\mathcal{U}) \), is the abstract simplicial complex whose \( k \)-simplices correspond to nonempty intersections of \( k + 1 \) distinct elements of \( \mathcal{U} \). Thus, the vertices are in bijective correspondence with the cover sets \( U_a \), and edges of \( C(\mathcal{U}) \) are in bijective correspondence with nonempty intersections between two cover sets. Higher order intersections generate higher dimensional simplices: see Figure 2.

**Theorem 1**. [The Čech Theorem] If the sets \( \{ U_a \} \) and all nonempty finite intersections are contractible, then the union \( \bigcup_a U_a \) has the homotopy type of the Čech complex \( C \).

The equivalence in the Čech theorem is functorial, and in particular there is a relative version that gives us the following result.

**Corollary 2**. Under assumptions A1-A4 above, the coverage area \( \bigcup_a U_a \) contains the domain \( \mathcal{D} \) if and only if the fence 1-cycle \( \mathcal{F} \) is null-homologous in \( C(\mathcal{U}) \).

This would appear to be exactly what one wants for sensor networks. Unfortunately, it is not possible to compute the Čech complex from the network graph \( \Gamma \) alone. Precise distances between nodes are needed to determine the higher-dimensional simplices of \( C(\mathcal{U}) \). All we have are two radii: the broadcast radius \( r_b \) and the coverage radius \( r_c \). For no (physically realistic) choice of these radii can the radius \( r_c \) Čech complex be derived from the radius \( r_b \) network graph. It is not even possible to recover the homotopy type of \( C(\mathcal{U}) \). See Figure 3 for one example of the difficulty.

On the other hand, with the bound on coverage and broadcast radii in A2, it follows that for any triple of nodes that are in pairwise communication distance, the convex hull of these nodes in \( \mathbb{R}^2 \) is contained in the cover \( \mathcal{U} \). The extremal case, in which all three nodes are at pairwise distance \( r_b \), yields an equilateral triangle in \( \mathbb{R}^2 \) that is covered by balls at the nodes of radius \( r_b \) only if \( r_b \geq r_b \sqrt{3} \).

This motivates the following construction. We consider the network graph as the 1-dimensional skeleton of a larger simplicial complex. Denote by \( \mathcal{R} \) the largest simplicial complex whose 1-skeleton is the network graph. That is, for every collection of \( k \) nodes that are pairwise within distance \( r_b \), we assign an abstract \( k - 1 \) simplex. This is also known as the flag complex associated to the network graph.

A nearly identical construction was used by Vietoris in the 1930s in the beginnings of homology theory [9]. It was largely forgotten and later reformulated by Rips in his work on geometric groups. Given a set of points \( X = \{ x_a \} \subset \mathbb{R}^n \) in Euclidean \( n \)-space and a fixed radius \( \epsilon \), the Vietoris-Rips complex of \( X \) is the abstract simplicial complex whose \( k \)-simplices correspond to unordered \( (k + 1) \)-tuples of points in \( X \) that are pairwise within Euclidean distance \( \epsilon \) of each other.

For brevity, we refer to the complex \( \mathcal{R} \) constructed above as the **Rips complex** of the network, with the radius \( r_b \) understood implicitly. Unfortunately, the Rips complex does not necessarily capture the topology of the union of cover discs: we have traded accuracy for computability. In the remainder of this article, we will outline two methods for extracting coverage information from a Rips complex, the latter of which infers Čech data.

**The Homological Criterion**

The Rips complex does contain enough topological information about the cover to certify coverage, if the cover is sufficiently robust. One might guess that the right criterion measures \( H_1(\mathcal{R}) \), since \( H_1(\mathcal{U}) \) collates holes in the cover. For reasons to be seen, it is more natural to consider the second homology of \( \mathcal{R} \) relative to the fence \( \mathcal{F} \) that defines \( \partial \mathcal{D} \).

**Theorem 3**. [1] For a set of nodes \( X \) in a domain \( D \subset \mathbb{R}^2 \) satisfying Assumptions A1-A4, the sensor cover \( \mathcal{U} \) contains \( D \) if there exists \( [\alpha] \in H_2(\mathcal{R}, \mathcal{F}) \) such that \( \partial \alpha \neq 0 \).

The proof of this result is straightforward with an elementary knowledge of homology as in, say, Chapter 2 of [6]. We present an abbreviated proof.

**Proof sketch.** Define a simplicial realization map \( \sigma : \mathcal{R} \to \mathbb{R}^2 \) which sends vertices of \( \mathcal{R} \) to the nodes \( X \subset D \) and sends a \( k \)-simplex of \( \mathcal{R} \) to the (potentially degenerate) \( k \)-simplex given by the convex hull of the vertices implicated. This \( \sigma \) takes the pair \( (\mathcal{R}, \mathcal{F}) \) to \( (\mathbb{R}^2, \partial \mathcal{D}) \). The long exact sequences on these two pairs yields the following commutative square:
the homological criterion holds for one [top] and fails for the other [bottom]. The culprit in the case of failure is a cycle of length four in \( H_1(R) \). This creates a hole in the Rips complex that is not present in the cover. Note, however, that a small change in the positions of the nodes implicated in this 4-cycle can create a hole in the cover without changing the topology of the network. No technique that relies solely upon the network topology can determine coverage in such a case. The homological criterion is effective for covers that are sufficiently robust with respect to perturbing the points while maintaining the network topology.

**Generators for Power Conservation**

The addition of some homological algebra to the sensor network can do more than confirm coverage. Indeed, it is a straightforward consequence of the proof that the domain \( \Omega \) lies within the subcover of \( \mathcal{U} \) given by those nodes implicated in the generator \([\alpha]\).

Figure 4. The homological criterion holds for some covers [top] but not for others [middle]. Failure is caused by a 1-cycle in the Rips complex [bottom].

Figure 5. A redundant cover [top] can be simplified [bottom] by the appropriate choice of generator for \( H_2(R, F) \) [middle].

For a sensor network that has a highly redundant cover, one can save power and bandwidth by placing nonessential nodes in a sleep mode. The crucial question: which nodes can be deactivated without sacrificing coverage? Or, in a dynamic setting, how does one cycle nodes from sleep to wake modes without losing coverage? The answer lies in choosing the appropriate "minimal" generators for \( H_2(R, F) \) that implicate as few 0-simplices as possible. Figure 5 gives an example of a "small" generator yielding a more efficient cover.

**Pursuit and Evasion**

There are a number of related contexts in which a homological criterion can solve a global problem. Consider the situation in which the nodes change position as a function of time. For simplicity, assume that the fence nodes are fixed. Such a situation might arise with sensors used to detect a forest fire, since one could establish a ring of fixed nodes outside the forest and allow the nodes inside the forest to be passively locomoted by environmental forces (e.g., animals).

It may well be the case that there are not enough sensors to cover the domain bounded by the outer ring. However, as the sensors change locations, holes in the cover can open and close in a complex fashion. The evasion problem for this scenario is whether an unknown evader can navigate through...
beled subcomplex common to a wandering hole. Even if coverage is never attained, one can still hope that any hole in which the evader begins is "squeezed" out eventually.

To address this problem, one proceeds as follows. Assume that the network communication graph is updated at certain time intervals $0 = t_1 < \ldots < t_i < \ldots < t_N = 1$, producing an ordered sequence of communication graphs $G_i$, for $i = 1 \ldots N$. These induce a corresponding sequence of Rips complexes $R_i$. We impose the following additional assumptions:

A5: If two nodes are within broadcast radius at time steps $t_i$ and $t_{i+1}$, then they remain so for all $t_i \leq t \leq t_{i+1}$.

A6: Nodes may go off-line or come on-line, represented by deleting or inserting the nodes in the appropriate graph $G_i$.

A7: Fence nodes remain fixed and on-line.

Given this sequence of network graphs (see Figure 6), it is by no means obvious whether there is a wandering hole in the coverage network. We amalgamate the sequence of Rips complexes into a single simplicial cell complex $\mathcal{R}$ as follows. For each $i = 1, \ldots, N - 1$, let $R_i \cap R_{i+1}$ denote the largest labeled subcomplex common to $R_i$ and $R_{i+1}$. This is well defined since all vertices (and thus all simplices) have unique labels. We define the amalgamated Rips complex to be the quotient of the disjoint union $\bigsqcup R_i$ obtained by identifying $R_i \cap R_{i+1} \subset R_i$ with $R_i \cap R_{i+1} \subset R_{i+1}$ for each $i$. This yields a cell complex built from simplices (though not necessarily a combinatorial simplicial complex, since multiple simplices may share the same vertex set). Note that, given A7, the fence $\mathcal{F}$ is a subcomplex of each $R_i$ and thus is identified to a well defined cycle $\mathcal{F} \subset \mathcal{R}$.

**Theorem 4.** [1] Consider a set of mobile nodes $X(t)$ in a domain $\mathcal{D} \subset \mathbb{R}^2$ satisfying A1-A7. Any continuous curve $p : [0, 1] \to \mathcal{D}$ must have $p(t) \in \mathcal{U}(t)$ for some $0 \leq t \leq 1$ if there exists $[\alpha] \in H_2(\mathcal{R}, \mathcal{F})$ such that $\partial \alpha \neq 0$.

The proof of this result is in the same spirit as that of Theorem 3. Note that there are no bounds on the speed or cunning of the evader.

**Persistence of Homology**

The ease with which Theorem 3 is proved is due chiefly to the restrictions placed on the fence nodes in A4. With this condition, it is relatively easy to extend these results. Besides the time-dependent case reviewed above, homological methods work for domains that are not simply connected, for barrier coverage problems in 3-dimensions, for systems with communication errors or variable radii, and for hole detection and repair [1]. The control over the fence nodes is manifested in the proof of Theorem 3 in Equation (1), where $\sigma_* : H_i(\mathcal{F}) \to H_i(\partial \mathcal{D})$ is known to be an isomorphism.

Such control over the fence may be physically realistic in some settings where, say, one can explicitly build a ring of sensors around a potentially hazardous environment and then inject sensors in the interior of the domain. Equivalently, given an unbounded network and a cycle in the communication graph, one can query whether the region of the plane bounded by this cycle lies in the cover. A more realistic setting for boundary phenomena is one in which nodes can sense if they are near the boundary $\partial \mathcal{D}$ and can register themselves as fence nodes. For example, a very coarse range-finder can detect the presence of a wall within a set distance, without necessarily knowing the distance to the wall.

We therefore consider a system of stationary nodes which can detect the presence of the boundary of the domain $\partial \mathcal{D}$ within some fixed fence radius $r_f$. This choice of system leads to a collection of fence nodes $X_f \subset X$ which spans a fence subcomplex $\mathcal{F} \subset \mathcal{R}$, the maximal simplicial complex generated by the fence nodes and edges between them. The analogous coverage criterion in this case should be the existence of a generator $[\alpha] \in H_2(\mathcal{R}, \mathcal{F})$ such that $\partial \alpha \neq 0$. Unfortunately, this is no longer sufficient for coverage. Consider the network in Figure 7, in which the fence...
subcomplex $F$ has a loop that is coned off to a disc in $R$. This complex has $H_2(R, F) + 0$, yet the map $\sigma_4 : H_1(F) \to H_1(\partial D)$ is the zero-map, and Equation (1) is no longer useful in guaranteeing a cover. It is the existence of these fake cycles that complicates matters. To a "global" observer, the example of Figure 7 is easily seen to have degree zero. The challenge is to have the network determine this by "local" observations.

There is a simple homological criterion for coverage in this setting where the fence nodes are not controlled [2]: it uses persistent homology and requires some additional capabilities on the part of the sensor network. The heuristic behind this use of persistence is that the fake cycle of Figure 7 does not survive if the network increases its broadcast radius a small amount. Were this to happen, the "diagonals" of the 1-cycle in the fence subcomplex would be filled in, killing the relative 2-cycle.

P1: Nodes broadcast their unique ID numbers. Each node can detect the identity of any node within radius $r_s$ via a strong signal, or via a weak signal within a larger radius $r_w$, where $r_w \geq r_s/\sqrt{10}$.

P2: Nodes have radially symmetric covering domains of cover radius $r_s \geq r_w/\sqrt{2}$.

P3: Nodes lie in a compact domain $D \subset R^d$ and can detect the presence of the boundary $\partial D$ within a fence detection radius $r_s$.

P4: The restricted domain $D - C$ is connected, where

$$C = \{ x \in D : || x - \partial D || \leq r_s + r_f/\sqrt{2} \}.$$

P5: The fence detection hypersurface $\{ x \in D : || x - \partial D || = r_f \}$ has internal injectivity radius at least $r_f/\sqrt{2}$ and external injectivity radius at least $r_f$.

The crucial feature is that sensors that are within signal detection range can distinguish weak versus strong signals, yielding a binary measure of in-range distance. The fence nodes are not controlled, but there is a need for (somewhat severe) restrictions on the shape of the domain so as to exclude pinching (P4) and wrinkling (P5).

Such a system gives rise to a pair of Rips complexes, $R_s$ and $R_w$, computed at the strong and weak radii respectively. Each is outfitted with a fence subcomplex, $F_s \subset R_s$ and $F_w \subset R_w$. There is a natural inclusion of pairs

$$t : (R_s, F_s) \to (R_w, F_w),$$

since increasing the signal detection radius from $r_s$ to $r_w$ only increases network connectivity.

**Theorem 5.** [2] For a set of nodes $X$ in a domain $D \subset R^d$ satisfying P1-P5, the sensor cover $U$ contains the restricted domain $D - C$ if the induced homomorphism

$$t_* : H_2(R_s, F_s) \to H_2(R_w, F_w)$$

is nonzero.

The key that makes this theorem work is a squeezing theorem for the Čech complex. For a set of points $X \subset R^d$, let $C_s(X)$ denote the Čech complex of the cover of $X$ by balls of radius $\epsilon/2$. Let $R_s(X)$ denote the Rips complex of the network graph having vertices $X$ and edges between vertices within distance $\epsilon$ in $R^d$.

**Theorem 6.** [2] Fix $X$ a set of points in $R^d$. Given $\epsilon' < \epsilon$, there is chain of inclusions

$$R_{\epsilon'}(X) \subset C_s(X) \subset R_{\epsilon}(X)$$

if $\frac{\epsilon}{\epsilon'} \geq \sqrt{\frac{2d}{d+1}}$.

Moreover, this ratio is the smallest for which the inclusions hold in general.

This is the type of result that is ideal for engineering applications. The Rips complex is computable, but does not give an accurate representation of the topology of the cover. The Čech complex gives the exact homotopy type of the cover, but it is not computable with the coarse information available from the network. Theorem 6 tells how to infer Čech data from Rips data.

This technique of comparison between Rips complexes at two different scales $\epsilon, \epsilon'$ is a simple instance of the more general theory of persistent homology [3], [10]. This concerns the homological properties of nested families of topological spaces. Although the algebra and ideas involved are classical, the subject has been heavily driven by applications in computational geometry and nonlinear data analysis. Persistent homology is an algebraic topology for the twenty-first century.

Theorem 5 is not the final word in homological coverage criteria for systems with a fence radius and is best thought of as a proof-of-concept for homological methods. The hypotheses for this theorem flow from the mathematical details as opposed to the engineering details. For topological methods to make a serious contribution to security and sensor networks, it is important for the mathematics (and mathematicians) to work in conjunction with the engineers implementing the sensor networks.

The homological coverage criteria surveyed here are the beginning of a larger foray of topological ideas in the theories of networks and sensing. We note in particular the need for these coverage criteria to be distributed (so that networks can compute local homology and agree on global coverage), asynchronous (so that updates to the network are
not dependent on a simultaneous sampling of the network), and fault tolerant (to accommodate the stochastic nature of sensor networks).

On Computational Topology

"Topology! The stratosphere of human thought!
In the twenty-fourth century it might possibly be of use to someone..."
—The First Circle, A. Solzhenitsyn

The results we review here are but one branch of the rapidly evolving area of applied computational topology. The need to move from local to global is one that a large spectrum of engineers and scientists are finding to be prevalent. Very few of the calculus-based tools with which they are most familiar prove sufficient. Recently, it has been demonstrated that homology theory is useful for problems in data analysis and shape reconstruction, computer vision, robotics, rigorous dynamics from experimental data, and control theory. See [7] for an overview of some current applications.

Topology is especially keen at giving criteria for when one can or cannot find a particular global object (a homeomorphism, a nonzero section, an isotopy, etc.); this falls under the rubric of obstruction theory. This perspective is one that has not yet permeated the applied sciences, in which the question, "What is possible?" is usually approached from the top-down, "Here's something we can build," as opposed to the bottom-up approach that topological methods yield. A brilliant example of this obstruction-theoretic viewpoint in an applied context is Farber's topological complexity for robot motion planning [5].

In this article, we use homology theory to give coverage criteria for networked sensors which are "nearly senseless". It seems counterintuitive that one can provide rigorous answers for a network with neither localization capabilities nor distance measurements. A topologist is not surprised that such course data can be integrated into a global picture. Some engineers are. Homological methods have the pleasant consequence that they may allow engineers to focus on designing simpler sensors that are nevertheless useful in a security network. Why bother miniaturizing GPS for "smart dust" if you can solve the problem without it? If topological methods can determine the minimal sensing needed to solve a global problem, then such methods may have significant impact on the way systems and sensors are developed and deployed.

References

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Interview with Joan Birman

Joan S. Birman is a leading topologist and one of the world’s foremost experts in braid and knot theory. She was born on May 30, 1927, in New York City. She received a B.A. degree in mathematics in 1948 from Barnard College and an M.A. degree in physics two years later from Columbia University. She worked on mathematical problems in industry for several years, raised three children, and eventually returned to graduate school in mathematics. She received her Ph.D. in 1968 at the Courant Institute at New York University, under the direction of Wilhelm Magnus. She was on the faculty of the Stevens Institute of Technology (1968–1973), during which time she also held a visiting position at Princeton University. Her influential book *Braids, Links, and Mapping Class Groups* (Annals of Mathematics Studies, number 82, 1974) is based on a series of lectures she gave during her time at Princeton. In 1973 she joined the faculty of Barnard College, Columbia University, where she has remained ever since and where she is now Research Professor Emeritus.

Birman’s honors include a Sloan Foundation Fellowship (1974–1976), a Guggenheim Fellowship (1994–1995), and the Chauvenet Prize of the Mathematical Association of America (1996). She was a member of the Institute for Advanced Study, Princeton, in spring 1987. In 1997 she received an honorary doctorate from Technion Israel Institute of Technology. She received the New York City Mayor’s Award for Excellence in Science and Technology in 2005.

Birman has had twenty-one doctoral students and numerous collaborators. She has served on the editorial boards of several journals and was among the founding editors of two journals, *Geometry and Topology* and *Algebraic and Geometric Topology*. Both journals are now published by the nonprofit Mathematical Sciences Publishing Company, for which Birman serves on the board of directors.

In 1990 Birman donated funds to the AMS for the establishment of a prize in memory of her sister, Ruth Lyttle Satter, who was a plant physiologist. The AMS Ruth Lyttle Satter Prize honors Satter’s commitment to research and to encouraging women in science. It is awarded every other year to a woman who has made an outstanding contribution to mathematics research.

What follows is an edited version of an interview with Joan Birman, conducted in May 2006 by Notices Deputy Editor Allyn Jackson and Associate Editor Lisa Traynor.

**Early Years**

*Notices*: Let’s start at the beginning of your life. Were your parents American? Were they immigrants?

**Birman**: My father was born in Russia. He grew up in Liverpool, England, and came to the United States when he was seventeen, to search for lost relatives and to seek a better life. My mother was born in New York, but her parents were immigrants from Russia-Poland.

*Notices*: What did your father do?

**Birman**: He started as a shipping clerk in the dress industry and worked his way up to become a successful dress manufacturer. He told his four daughters repeatedly that the U.S. was the best country in the world, a land of opportunity. Paradoxically, he also told them, “do anything but go into business.” He wanted us all to study.
Notices: Did your mother have a profession?
Birman: No, she was a housewife. Neither of my parents finished high school.

Notices: Why did they emphasize their four daughters getting an education?
Birman: Jewish culture, as it was handed down to us, included the strong belief that Jews survived for so many years in the Diaspora because they were "the people of the book". The free translation, when I brought home an exam with a grade of 98, was "what happened to the other 2 points?" Becoming an educated person, and using that education to do something bigger than just to earn money, was set up to my generation as a very important goal.

Notices: When you were a child, did you like mathematics?
Birman: Yes, I liked math, from elementary school, and even earlier than that, although I did not know enough to pinpoint what I liked.

Notices: Were there teachers in your early years who encouraged you in mathematics, or who were inspiring?
Birman: In elementary school that's hard to say, although we certainly had challenging math. I went to an all-girls high school in New York, Julia Richmond High School. It was really a rough inner-city high school, but within it there was a small academic unit, a school within a school. We had some very good teachers. We had a course in Euclidean geometry, and every single night we would have telephone conversations and argue over the solutions to the geometry problems. That was my introduction to proof, and I just loved it, it was wonderful. When the course ended, I joined a small group of girls who campaigned for more geometry, but the teacher (her name was Miss Mahoney) was willing but perhaps not knowledgeable enough to know how to continue to challenge the intellectual interests of this eager group of girls! She taught us 3-dimensional Euclidean geometry, and that was a little dull. If she had taught us hyperbolic geometry, or group theory, where we would have encountered new ideas, we would have been in heaven!

Notices: Usually high school girls are on the phone talking about their hair.
Birman: We did that too! Actually I was in this little group, and we were definitely regarded as being nerds. Most of the girls in our selective school within a school worked hard and got good grades, but talked all the time about boys and clothes. I was a late developer and wasn't ready for that. I didn't date at all until I was in college. Still, at one point I was elected president of the class, so the other students could not have been really hostile. I felt accepted, and even liked. There was an atmosphere of tolerance.

Notices: Were your sisters also interested in math?
Birman: Yes. My oldest sister, Helen, was a math major at Barnard, and the next one, Ruth, was a physics major. Ruth ultimately became a plant physiologist. She was Ruth Satter of the Satter Prize. She had a fine academic career, before her untimely death from leukemia. Helen is independently wealthy and is a philanthropist, with very special interests of her own. My younger sister, Ada, became a kindergarten teacher. She was less oriented toward academics.

Notices: Did you like math when you went to college?
Birman: Two things changed. First, the college math course that I was advised to take at Swarthmore was a cookbook calculus course, and it was both boring and unconvincing. So I looked around and found other things that appealed to me (astronomy, literature, psychology), although I did major in math. Then I transferred to Barnard College, in order to be able to live in New York. At Barnard, the math offerings were all low-level. When you got to the point where you were ready for serious math, you were directed to courses at Columbia, which at that time was an all-male school. That was the first time that I hit a situation where I was one of a very small number of girls. Most of the Barnard women were cowed by it and gave up. Eventually I was the only girl in my classes, and I caught the idea that maybe math was not for girls.

From Bachelor's Degree to Industry
Notices: But then you did get a bachelor's degree.
With husband Joe in 1954.

Birman: Yes. But there was a long gap before I went on to graduate school. The social atmosphere had presented unexpected difficulties. My parents not only expected their four daughters to get married, but we were to get married in order! There was all kinds of nonsense like that. But on the other hand, the only way that a respectable girl could get out from under her parents control was to marry, so I was not averse to the idea. But I did not want to make a mistake in my choice, and that took attention.

I did think about going to graduate school, but I understood how hard math was. I thought it would take lots of concentrated effort, as it must for any serious student. I was afraid that I would wreck my life if I gave math that kind of attention at that time. (I think I was right. As we talk, Joe and I have been married for fifty-six years, and he has been my biggest supporter.) Actually, I didn't really decide not to go to graduate school, but when the opportunity arose to put it off and accept an interesting job, the job was appealing.

The job was very nice. I was extremely lucky. It was at an engineering firm that made microwave frequency meters. These meters were cylindrical cans with two parameters, the radius of the base and the depth (or height). The radius was fixed, but the depth could be changed with a plunger, changing the resonant frequency. The (depth-to-resonant frequency) curve was nonlinear, and the problem was that they had a hard time calibrating the dials, putting the notches on to indicate what the frequency would be as you pushed the plunger in. They hired me because they had the idea that they could sell more meters if they could push in the plunger in a novel way that would yield an approximately linear response curve. In calculus I had learned about ladders sliding against a wall, and in the job interview the idea came up that the curve that gave the height of the ladder as a function of its distance from the wall might be a curve that could be fitted to the experimental data. The idea worked very well. For about eight months I computed the parameters, and they constructed meters of all sizes with plungers that pushed in along an axis orthogonal to the axis of the can. The dials were for all practical purposes linear. I was very happy!

But when that project ended, they set me to work taking measurements on an oscilloscope, and that was pretty dull. One day I happened to run into my old physics professor from Barnard, and he offered me a position as the physics lab assistant at Barnard. I took the position and applied to graduate school in physics. I realized that my job possibilities would improve if I had a physics degree.

I did get a master's degree in physics, but I do not have good intuition for the subject. I felt they could just tell me anything, and I would have to believe it. I am astonished these days at the way in which physics has fed into math. Physicists do seem to have an intuition that goes beyond what mathematicians very often see, and they have different tests of truth. I just didn't have that intuition. Yet I really enjoyed the physics lab, because when I saw things in the lab, I knew they were true. But I didn't always trust the laws of physics that we learned. On the other hand, I got an MA, and then I got a better job.

Notices: This was in the aircraft industry?

Birman: Yes. It was in the days of analog computers. I worked on a navigation computer. The pilot would be flying a plane, and the computer would send a radar signal to the ground. The signal would be bounced back to the plane. The computer measured the Doppler shift and used it to compute air speed and altitude. My part of the whole thing was error analysis—to figure out the errors when the plane was being bounced around by changes in air pressure. A second problem was that of maximizing aircraft range for a fixed amount of fuel. A third was the design of a collision avoidance system.

Notices: Were there many women?

Birman: I worked at three different engineering firms. At one of them there were several women, but at the others I don't recall any other women.

Wandering toward Graduate School

Notices: You got married when you were studying physics in graduate school. Did you stop working then?

Birman: No, I continued to work until I had a child, five years later. When my first child was born, I planned to go back to work because I really liked what I was doing. But that posed a problem. In those days, there was no day care. Unless you had a family member to take care of your children (and my mother and mother-in-law were unable to do that), it was almost impossible. My husband and I had thought, very unrealistically, we will put an ad in the paper and hire somebody. But then, I had this huge responsibility for our baby, and I just couldn't see leaving him with somebody about whom I knew very little. My husband was very encouraging about my going back to work. I did work a few days a week. First I worked two days a week,
then one day a week after we had a second child. Just before our third child was born, my husband had been invited to teach in a distant city. He had been in industry and was thinking about a switch to academia. During that year, I had to stop my part-time job, but it had already dwindled down to one day a week. When I came back I knew I couldn’t work that way anymore. So I went to graduate school with the idea of learning some new things for when I’d go back to work. You can see that I led a very wandering and undirected life! It amazes me that I got a career out of it—and it has been a really good career!

Notices: When did you then decide that you would get a Ph.D.?

Birman: I started grad school in math right after my younger son was born, on January 12, 1961. I went to New York University, where my husband was on the faculty, so that my tuition was free. NYU’s Courant Institute had an excellent part-time program, with evening courses that were essentially open admissions. I took linear algebra the first semester, and then real and complex analysis the following year. And then I decided I could handle two courses a year, and did.

One of the first courses I took was complex analysis, with Louis Nirenberg. In the first lecture he said, “A complex number is a pair of real numbers, with the following rules for adding and multiplying them.” I certainly knew about “imaginary numbers”, but he put them into a framework that was sound mathematics. It sounds like a trivial change, but it was not. Eventually, I also had a course in topology, which I loved, with Jack Schwartz. He was not a topologist, and when I go back and look at my notes, I see it was a weird topology course! He was somebody who liked to try new things. He taught us cohomology in a beginning topology course—not homology, not even the fundamental group! But I really loved that course. It really grabbed me, although the approach had its downside, as I knew almost no examples. I had started studying at Courant with the intention of learning some applied mathematics. But everything I learned pushed me toward pure mathematics.

At Courant I was starting to pile up enough courses for an MA, and there was a required master’s final exam. When I took the exam, I didn’t realize it was also the Ph.D. qualifying exam. I was surprised when I passed it for the Ph.D. That’s when I applied for financial assistance, but to get it I had to be a full-time student. So that’s really when I started on a Ph.D. track. There were not many women around. The people in the department were very nice to me—they realized that I had three children, and they did not give me heavy TA assignments. Karen Uhlenbeck was one of the students there, but she transferred out. Cathleen Morawetz was on the faculty, and I took one course from her.

Notices: Your adviser was Wilhelm Magnus. How did he end up being your adviser?

Birman: After passing the qualifying exams, one had to take a series of more specialized exams for admission to research. My husband was on the NYU faculty, and the first question I was asked in one of the exams was, “Who is smarter, you or your husband?”

Notices: That was the first question?

Birman: Yes, it’s ludicrous, in 2006. Later on when I became a mathematician, I met the person who asked this question and reminded him of it, and he said, “Oh no, not me! I didn’t say that”.

Notices: How did you answer the question?

Birman: I laughed. It was the only thing to do. Afterwards I started to get really angry about it. It was a stupid question!

Anyway, I passed that exam too and went looking for an advisor. The first person I approached was the topologist Michel Kervaire, but he wasn’t interested. He said, “You’re too old and you don’t know enough topology.” He was right, I didn’t know enough topology. And I can understand why he would be skeptical of a person my age. You have to be convinced when you see someone who is outside of the usual framework that the person is a serious student, and he had never been my classroom teacher.

I went to speak to Nirenberg. He was very helpful to me. I read the Notices interview with him, and he had told you that he loved inequalities. That’s funny, because I remember he asked me, “Do you like inequalities?” And I said, “No, I don’t like inequalities!” He said, “Then you don’t want to study applied math.” And he was right!

Notices: That was a good question to ask!

Birman: It was an excellent question. After that I went to talk to Wilhelm Magnus. He had noticed me, because I had done some grading for him. He was an algebraist, but he had noticed that I loved topology, and so he met me halfway and gave me a paper to read about braids. That showed great sensitivity on his part. It was a terrific topic. He later told me of his habit of picking up strays, and in some way I was a stray.

Notices: What paper was it that he gave you?

Birman: It was a paper by Fadell and Neuwirth [1]. The braid groups were defined in that paper as the fundamental group of a certain configuration.
space. Magnus said that he didn’t understand the definition, and it took me a long time to understand it. Finally I did, and I was very happy. Magnus had worked on the mapping class group of a twice-punctured torus, and he had suggested that I could extend this work to a torus with 3 or 4 punctures. My thesis ended up being about the mapping class group of surfaces of any genus with any number of punctures. He thought that was a real achievement. As soon as I understood the problem well enough, I solved it. It was both fun and very encouraging.

Around this time there was a very different paper by Garside on braids that interested me greatly [2]. I was aware of the fact that there was a scheme for classifying knots with braids. When I saw that Garside had solved the conjugacy problem in the braid group, I thought that was going to solve the knot problem. I couldn’t have been more mistaken, but still, it grabbed my interest. I am still working on it—right now I am trying to show that Garside’s algorithm can be made into a polynomial algorithm. This is important in complexity theory. So my interest in that problem dates back to graduate school.

Moving Into Research

Notices: After you got your Ph.D., you got a job at Stevens Institute of Technology.

Birman: I had not done a thorough job on applications and was not offered any job until late August 1968, when Stevens Institute had some unexpected departures. The first year I was there I started working with Hugh M. Hilden (who is known as Mike). We solved a neat problem that year and wrote several really good papers. The one I like best is the first in the series [3].

The work with Hilden was very rewarding. My thesis had been on the mapping class group of a punctured surface. I showed there is a homomorphism from the mapping class group of a punctured surface to that of a closed surface, induced by filling in the punctures. I worked out the exact sequence that identified the kernel of that homomorphism, but I didn’t know a presentation for the cokernel, the mapping class group of a closed surface, and realized that was a problem that I would like to solve. The whole year I talked about it to Mike, whose office was next to mine, and finally we solved the problem for the special case of genus 2. As it turned out, our solution had many generalizations, but the key case was a closed surface $\Sigma$ of genus 2. In that case, the mapping class group has a center, and the center is generated by the class of an involution that I’ll call $\iota$. The orbit space $\Sigma/\iota$ is a 2-sphere $S^2$, and the orbit space projection $\Sigma \rightarrow \Sigma/\iota = S^2$ gives it the structure of a branched covering space, the branch points being the images on $S^2$ of the 6 fixed points of $\iota$. We were able to use the fact that the mapping class group of $S^2$ of $S^2$ minus those 6 points was a known group (related to the braid group), to find a presentation for the mapping class group $\mathcal{M}(\Sigma)$ of $\Sigma$. The difficulty we had to overcome was that mapping classes are well-defined only up to isotopy. We knew that in genus 2, every mapping class was represented by a map that commuted with $\iota$, but we did not know whether every isotopy could be deformed to a new isotopy that commuted with $\iota$. We felt it had to be true, but we couldn’t see how to prove it. One day Mike and I had the key idea, together. The idea was to look at the path traversed on $\Sigma$ by one of the 6 fixed points, say $p$, under the given isotopy. This path is a closed curve on $\Sigma$ based at $p$. Could that closed curve represent a nontrivial element in $\pi_1(\Sigma, p)$? It was a key question. Once we asked the right question, it was easy to prove that the answer was no, and as a consequence our given isotopy could be deformed to one that projected to an isotopy on $S^2$. As a consequence, there is a homomorphism $\mathcal{M}(\Sigma) \rightarrow \mathcal{M}(S^2)$, with kernel $\iota$. Our hoped-for presentation followed immediately. It was a very fine experience to work with Mike, to get to know him as a person via shared mathematics. It was the first time I had done joint work, and I enjoyed it so much that ever since I have been alert to new collaborations. They are different each time, but have almost all been rewarding.

At that point I was thoroughly involved in mathematics. But my husband had a sabbatical, and I had promised him that I would take a year off so that he could spend his sabbatical with collaborators in France. So I took a leave of absence from my job and found myself in Paris, and in principle it should have been a lovely year. But we had three children, and once again I had lots of home responsibilities! Moreover, I didn’t know any of the French mathematicians, because I had come to France without any real introductions, and nobody was interested in braids. French mathematics at that time was heavily influenced by the bourbaki school. I found myself very isolated and discouraged. Looking for a problem that I could handle alone, I decided to do a calculation.

There is a homomorphism from the mapping class group of a surface to the symplectic group. People knew defining relations for the symplectic group, but not for the mapping class group, unless the genus is $\leq 2$. I was interested in the kernel of that homomorphism, which is called the Torelli group. It was an immense calculation. I finished it, and I did get an answer [4], which was later improved with the help of a Columbia graduate student, Jerome Powell. In 2006 a graduate student at the University of Chicago, Andy Putman, constructed the first conceptual proof of the theorem that Powell and I had proved. Putman’s proof finally verifies the calculation I did that year in France!
When I returned from France I was invited to give a talk at Princeton on the work that Hilden and I had done together. That was when my career really began to get going, because people were interested in what we had done. I was invited to visit Princeton the following year. I did that, commuting from my home in New Rochelle, New York, to Princeton, New Jersey. That was a very long commute.

Notices: Was it around this time that you gave the lectures that became your book *Braids, Links, and Mapping Class Groups* [5]?

Birman: Exactly. The lectures were attended by a small but interested group, including Ralph Fox and Kunio Murasugi, and James Cannon, at that time a postdoc. Dmitry Papakyriakopoulous was also at Princeton, and he was very welcoming to me.

Braids had not been fashionable mathematics, and their role in knot theory had been largely undeveloped. Three topics that I developed in the lectures and put into the book were: (1) Alexander's theorem that every link type could be represented, nonuniquely, by a closed braid, (2) Markov's theorem, which described the precise way in which two distinct braid representatives of the same link type were related, one of those moves being conjugacy in the braid group, and (3) Garside's solution to the problem of deciding whether two different braids belonged to the same conjugacy class. I had chosen those topics because I was interested in studying knots via closed braids, and together (1), (2), and (3) yielded a new set of tools.

When I had planned the lectures at Princeton, to my dismay I learned that there was no known proof of Markov's theorem! Markov had announced it in 1935, and he had sketched a proof but did not give details, and the devil is always in the details. When I told my former thesis advisor, Wilhelm Magnus, he remarked that the sketched proof was very likely wrong! But luckily, I was able to follow Markov's sketch, with the help of some notes that Ralph Fox had taken at a seminar lecture given by a former Princeton grad student (his name vanished when he dropped out of grad school). After some number of 2:00 a.m. bedtimes I was able to present a proof. There are now some six or seven conceptually different proofs of this theorem, but the one in my 1974 book was the first.

Knot Polynomials and Invariants

Notices: Can you tell us about your interaction with Vaughan Jones, when he was getting his ideas about his knot polynomial?

Birman: One day in early May 1984, Vaughan Jones called to ask whether we could get together to talk about mathematics. He contacted me because he had discovered certain representations of the braid group and what he called a "very special" trace function on them, and people had told him that I was the braid expert and might have some ideas about its usefulness. He was living in New Jersey at the time, so he was in the area, and we agreed to meet in my office. We worked in very different parts of mathematics and we had the expected difficulties in understanding each other's languages. His trace arose in his work on von Neumann algebras, and it was related to the index of a type II1 subfactor in a factor. All that was far away from braids and links. When we met, I told him about Alexander's theorem, and Markov's theorem, and Garside's work. He told me about his representations and about his trace function. Of course, his explanations were given in the context of operator algebras. I recall that I said to him at one point, Is your trace a matrix trace? And he said no, it was not. Well, that answer was correct, but he did not say that his trace was a weighted sum of matrix traces, and so I did not realize that, if one fixed the braid index, the trace was a class invariant in the braid group. He understood that very well and did not understand what I had missed. He would willingly have said more, if he had, because he is super-generous and truly decent. In between our meetings he gave the matter much thought (which I did not!), and one night he had the key idea that by a simple rescaling of his trace, it would in fact become invariant under all the moves of Markov's theorem, and so become a link invariant. He told me all this, in great excitement, on the telephone. The proof that his normalized trace was a link invariant was immediate and crystal clear. After all, a good part of my book had been written with the goal of making the Alexander and Markov theorems into useful tools in knot theory, and Vaughan had used them in a very straightforward way.
Was his new invariant really new, or a new way to look at something known? He did not know. Examples were needed, and a few days later we met again, in my office, to work some out. That was probably May 22, 1984. The new link invariant was a Laurent polynomial. My first thought was: it must be the Alexander polynomial. So I said, "Here are two knots (the trefoil and its mirror image) that have the same Alexander polynomial. Let's see if your polynomial can distinguish them." To my astonishment, it did! Well, we checked that calculation very carefully, on lots more examples, because the representative of the Kinoshita-Terasake 11-crossing knot, whose Alexander polynomial was zero, fishing it out of my file cabinet we learned very quickly, that same day, that the new polynomial was nonzero on it. So in just that one afternoon, we knew that he not only had a knot invariant, but even more it was brand new. I remember crossing Broadway on my way home that night and thinking that nobody else knows this thing exists! It was an amazing discovery. Very quickly, other parts of the new machinery came to bear, and the world of knot theory experienced an earthquake. There was not just the Jones polynomial, but also its cousins, the HOMFLY and the Kaufman polynomials, and lots more. And some of the stuff in my book about mapping class groups was relevant too. Much later, Garside's machinery appeared too, in a particular irreducible representation of the braid group that arose via the same circle of ideas. Garside's solution to the word problem was used by Daan Krammer to prove that braid groups are linear.

There was another related part to this story. In 1991 Vladimir Arnold came to the United States to visit Columbia for a semester. I knew Arnold and met him in the lobby as he arrived, in September, with his suitcase. He is a very exciting and enthusiastic man. He put down his suitcase right then and there and opened it on the floor next to the elevator to get out a paper he had brought for me. It was by his former student Viktor Vassiliev. He said, "You have to read this paper, it's wonderful, it contains new knot invariants, and they come from singularity theory, and it's fine work, and I would like your help in publicizing it!" Of course I looked at the paper. At that point there had been an explosion in new knot invariants, and the open question was what they meant geometrically. And here Arnold was, with more invariants! The old ones were polynomials, the new ones were integers (lots of integers!) Arnold asked me to copy and distribute the paper in the United States. So one afternoon shortly after his arrival I made lots of photocopies, and sent them out to everyone I could think of who seemed appropriate. But even as I did it I suspected the knot theory community might not be so overjoyed to have yet more knot invariants coming unexpectedly out of left field! There is resistance to learning new things. We had just learned about operator algebras, and suddenly we had to learn about singularity theory! But Arnold kept after me, at tea every day.

Xiao-Song Lin was an assistant professor in the department, and his field is knot theory. We ran a seminar together and talked every day. We were good friends, and he was always ready to talk about math. I told him about the paper of Vassiliev. We read it together, and we finally understood most of it. We said, here are the Vassiliev invariants, and there are the knot polynomials—and they must be related in some way. But how? For a fixed knot or link, its Jones polynomial was a one-variable Laurent polynomial with integer coefficients, whereas its Vassiliev invariants were an infinite sequence of integers, or possibly of rational numbers.

We had an idea that perhaps we should, for the moment, set aside the fact that the Vassiliev invariants came from the machinery of singularity theory, and try to construct them from their properties. We did that because we knew that the Jones polynomial (the simplest of the knot polynomials) could be constructed from its properties. We thought that might be a way for us see a connection. That had good and bad consequences. The bad one was that later, Vassiliev invariants were renamed "finite type invariants", and were defined via our axioms. In the process their origins in singularity theory were lost and remain underdeveloped to this day.

Soon Lin and I realized how to make the connection we had been seeking. We had the idea of making a change of variables in the Jones polynomial, changing its variable from \( x \) to \( t \), with \( x = e^t \).
The Jones polynomial was a Laurent polynomial in $x$, and $e^{kt}$ has an expansion in positive powers of $t$ for every positive and negative integer $k$. This change in variables changes the Jones polynomial to an infinite series in powers of $t$. We were able to prove that the coefficients in that infinite series satisfied all of our axioms for Vassiliev invariants, and so were Vassiliev invariants [6]. Everything went quickly with that idea—eventually all the knot polynomials were related to Vassiliev invariants in this way. They are generating functions for particular infinite sequences of FT invariants. But in fact the set of FT invariants is larger than those coming from knot polynomials. They are more fundamental objects.

**Rich Problems, Rich Collaborations**

**Notices:** Can you tell us about your recent work with Menasco that involved the Markov theorem?

**Birman:** That is another aspect of the same underlying project, to understand knots through braids. In 1990 at the International Congress in Kyoto, when Vaughan Jones got the Fields Medal, I gave a talk on his work. Afterward Bill Menasco invited me to give a colloquium based on it in the math department in Buffalo. So I gave a talk there about Vaughan Jones’s work, and I stayed at Bill’s house that night. We started to talk, and he said, “What problems are you working on? What’s your dream?” I told him my dream is to classify knots by braids. I had an idea about how you could avoid the “stabilization” move in Markov’s theorem. Then about three weeks later, I got a letter from him saying “I have an idea how we might try to prove the ‘Markov theorem without stabilization’ (MTWS).” And that’s when our collaboration began. Of course, my original conjecture was much too simple. We kept solving little pieces of the sought-for theorem. We wrote eight papers together. The last one stated and proved the MTWS [7]. There was also an application to contact topology [8].

I like to collaborate. My collaborators are also my best friends. Bill Menasco and I are very good friends. We have had such a long collaboration. But we have very different styles. He can sit in a chair and stare at the ceiling as he works on mathematics, but I like to talk about it all the time.

**Notices:** Why do you do mathematics?

**Birman:** To put it simply, I love it. I’m retired right now, I don’t have any obligations, and I keep right on working on math. Sometimes mathematics can be frustrating, and often I feel as if I’ll never do another thing again, and I often feel stupid because there are always people around me who seem to understand things faster than I do. Yet, when I learn something new it feels so good! Also, if I work with somebody else, and it’s a good piece of mathematics, we get to know each other on a level that is very hard to come by in other friendships.

**Notices:** Let’s go back to the connections between your work and complexity theory. Did you come up with an algorithm that can tell whether a knot is the trivial knot?

**Birman:** Yes. But the algorithm that Hirsch and I discovered [9] is slow on simple examples, and it is slow as the complexity of the example grows. Yet it has the potential to be a polynomial algorithm, and I don’t think that’s the case for the more fashionable algorithms coming from normal surface theory. There is a misunderstanding of our paper. Readers who did not read carefully saw that we used normal surfaces in our paper (in a somewhat tangential manner). They dismissed our paper as being derivative, but it was not. There are ideas in our work that were ignored and not developed.

However, at the present moment it seems most likely that the problem of algorithmically recognizing the unknot will be solved via Heegaard Floer knot homology. That is a very beautiful new approach, and fortunately there is an army of graduate students working on it and making rapid progress. It was, somehow, fashionable from day one and received lots of attention. That can make a big difference in mathematics.

**Notices:** Are there connections between this and the $P$ versus $NP$ problem?

**Birman:** Yes, there are connections, but they are not directly related to the unknot algorithm. A problem that has been shown to be $NP$-complete is “non-shortest words in the standard generators of the braid group”. If you had an algorithm to show that a word in the standard generators of the braid group is not the shortest representative of the element it defines, and could do that in polynomial
Birman with some of her former graduate students.

Birman: Braiding and knotting are very fundamental in nature, even if the connections do not jump out at you. They can be subtle.

Notices: Why do braids have all these different connections?

Birman: No, of course not. The disparity in the numbers of men and women at the most prestigious universities (and I include Columbia in that) is striking. Anyone who enters a room in the math building at Columbia when a seminar is in progress can see it.

Notices: Which result of yours gave you particular pleasure?

Birman: There are many ways to answer that question. I have had much pleasure from discovering new mathematics. That happened, for example, when I was working on my thesis. The area was rich for the discovery of new structure, and (unlike most students) I experienced very little of the usual suffering, to bring me down from that high. I have also gotten much pleasure from collaborations and the friendships they brought with them. I would probably single out my good friend Bill Menasco as one of the best of my collaborators. It has been a particular pleasure to me when others have built on my ideas, and I see them grow into something that will be there forever, for others to enjoy. In that regard, I would single out the work that was done by Dennis Johnson in the 1980s, which built in part on the calculation I had done alone in Paris in 1971 and in another part on my joint work with Robert Craggs [10]. In a related way, I get great pleasure when I understand an idea that came from way back. An example was when I read several papers of J. Nielsen from the 1930s on mapping class groups. (I had to cut open the pages in the library, they had been overlooked for a long time.) Nielsen’s great patience and care in explaining his ideas, and their originality and beauty, reached out over the years. I also feel privileged to have worked as an advisor of very talented young people and to have been a participant in the process by which they found their own creative voices.

It would be dishonest not to add that the competitive aspect of math is something I dislike. I also find that the pleasure in various honors that have come to me is not so lasting and have the disagreeable aspect of making me feel undeserving. The pleasure in ideas and in work well done is, on the other hand, lasting. But it’s easy to forget that.

Women in Mathematics

Notices: The situation for women in mathematics has changed greatly. Have all the problems been solved?

Birman: Enormously, in my lifetime. On the whole, I think the profession is now very accepting
of women. When I took my first job I was the first woman faculty member at Stevens Institute of Technology. A few years later, I was the only woman faculty member (and I was a visitor) in the Princeton math department. Now one sees ever-increasing numbers of women faculty members, although the numbers in the top research faculties are still very small. That is certainly the case at Columbia, but this year for the first time, Columbia's freshman class of graduate students was half men, half women. Just six years ago it was all men, no women.

Recently several young people I know who are husband-and-wife mathematicians have gotten jobs in the same department. There used to be nepotism rules against that. It's such a big effort for a department to make, to hire two people at the same time, in whatever fields they happen to be in, sometimes the same field. It's impressive that departments care enough about doing right by women to do it. So yes, I think things are changing.

But there are serious issues regarding women in research. At the moment there are a very small number of women at the top of the profession. This is the very thing that Lawrence Summers [former Harvard University president] pointed out. What are the reasons for it, and what can we do about it? It would be good to try to understand why, and if we don't admit all possibilities, then we may never find out. So I was rather shocked that women on the whole did not want to look at that problem openly.

**Notices:** He offended a lot of women when he speculated that there might be a biological difference between men and women that accounts for the difference of performance.

**Birman:** Yes, he offended, but the reaction "stop, don't ask that question" was not a good response. Women in math have done so much to help other women, and the issues are so complex, that I was distressed that political correctness overshadowed the need to understand things better. The truth may not always be pleasant, but let's find out what it is. If women mathematicians refuse to face the issue openly, then who will do it for them? The sociologists? I hope not. However, that kind of discussion is not my strong point. I am too opinionated and tactless to say what needs to be said. Ralph Fox gave me tongue-in-cheek advice long ago: "Speak often and not to the point, and soon they will drop you from all the committees."

I did, however, wonder for many years whether there was a way for me to help other women. Rather early in my career I began to work with male graduate students, and I enjoyed that very much. Yet the first time a Columbia woman graduate student (Pei-Jun Xu, Ph.D. Columbia 1987) asked whether she could work with me, my private reaction was "together we will probably make a total mess of it". We did not, and she wrote a fine thesis, and on the way I understood that I could help her in more ways than math just because we were both women and I sensed some of her unspoken concerns. Ever since then I realized that was the unique way that I could help other women—simply by taking an interest, working with them when it was appropriate, and being open to their conflicts and sensitive to their concerns.

**Notices:** That's what it comes down to, the women actually doing mathematics.

**Birman:** Yes, of course it does. I have heard some women who are bitter because they feel the rewards of research don't seem big enough for the sacrifice. Of course there are men who feel that way too. Fritz John, a very fine research mathematician, once said to me that at the end of the day the reward was "the grudging admiration of a few colleagues". Well, if what you are looking for is admiration because you have done a great piece of work, admiration is often not there (and maybe the work isn't so great either). What is much more important, to me, is when somebody has really read and understood what I have done, and moved on to do the next thing. I am thrilled by that. Sure, it's nice to get a generous acknowledgment, but that is a bonus. The real pleasure is to be found in the mathematics.

**References**

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The theory of **locally homogeneous geometric structures** on manifolds is a rich playground of examples on the border of topology and geometry. While **geometry** concerns quantitative relationships between collections of points, **topology** concerns the loose qualitative organization of points. Given a geometry (such as Euclidean geometry) and a manifold with some topology (such as the round 2-sphere), how many ways can one put the geometry, at least locally, on the manifold? The familiar fact that no metrically accurate world atlas exists is just the fact that the sphere admits no Euclidean geometry. However, the wide variety of geometries (homogeneous spaces of Lie groups) and manifolds leads to a fascinating array of questions.

Here is a precise definition. Consider a homogeneous space $X$ with a transitive Lie group $G$ of diffeomorphisms. In the spirit of Felix Klein’s 1872 Erlangen program, $X$ admits a **geometry** defined by the symmetry group $G$.

Klein simply defined the “geometry” to be all the objects on $X$ together with the $G$-invariant relations between them.

So a Euclidean structure on a manifold is simply a system of Euclidean coordinates related by isometries on overlapping coordinate patches. Such a structure defines a Riemannian metric locally isometric to Euclidean space (and hence having zero curvature). In fact this structure is equivalent to a flat Riemannian metric.

A **projective structure** on a manifold $M$ is a system of local coordinates modeled on a projective space $P$ so that on any two overlapping coordinate patches, the change of coordinates is locally a projective transformation of $P$. Recall that a **projective space** is the $n$-dimensional space $P(V)$ of all 1-dimensional linear subspaces of a vector space $V$ of dimension $n + 1$.

A **collineation** (or **projective transformation**) of $P(V)$ is the map induced on projective space by a linear transformation of $V$. **Projective geometry** (in the spirit of Felix Klein’s Erlangen program) is the study of objects on projective space $P$ invariant under the collineation group $\text{Aut}(P)$ of $P$. For example, lines, hyperplanes, conics, quadrics, and cross-ratio are all meaningful concepts in projective geometry. On a manifold with a projective structure there is a **local projective geometry** that, at least locally, agrees with the geometry of the model space $P$. Projective structures arise in many areas of mathematics, including differential geometry, mathematical physics, topology, and analysis.

This definition is what may also be called a **flat projective structure**, since the coordinate changes are **locally constant** maps into the Lie group of collineations of $P$. More general projective structures, defined as Cartan connections modelled on projective space, can be defined, although we do not discuss them here. The analogous Cartan connections for Euclidean geometry are just Riemannian metrics, where the Euclidean geometry is defined infinitesimally (on each tangent space). We are interested in structures where the geometry is defined **locally**, and this is detected by the vanishing of a certain curvature tensor. See Sharpe [3] for an excellent treatment of Cartan connections, including general projective connections.

Coordinate atlases may be a bit unwieldy and can be replaced by a **developing map** $\text{dev}$, which is...
defined on the universal covering $\tilde{M}$ into the model space $X$ and which globalizes the coordinate charts.

One simply begins with one coordinate chart and analytically continues it over all of $M$ (the action of $G$ is analytic). Since the analytic continuation may depend on the path (or chain of overlapping coordinate patches), $\text{dev}$ is defined only on a covering space—a multi-valued function in nineteenth-century parlance. The coordinate changes globalize to a holonomy representation $\pi_1(M) \to G$ with respect to which the developing map $\text{dev}$ is equivariant.

A complex-projective structure or a $\mathbb{CP}^1$-structure is a structure locally modelled on the Riemann sphere $\mathbb{CP}^1$, with coordinate changes restrictions of complex linear fractional transformation. Since projective transformations are analytic, every $\mathbb{CP}^1$-structure determines an underlying complex structure. For $n = 1$, these structures were studied in the nineteenth century in relation to Schwarzian differential equations and their monodromy.

A Schwarzian differential equation on a domain $\Omega \subset \mathbb{CP}^1$ is given by

$$ w''(z) + \frac{1}{2} q(z) w(z) = 0 $$

where $\Omega \subset \mathbb{C}$ is a holomorphic function. In a neighborhood of $z_0 \in \Omega$, the solutions form a two-dimensional complex vector space, and one chooses a basis $w_1(z), w_2(z)$ of solutions. Any other basis is related by a linear transformation. Analytic continuation defines a holomorphic map $$(\tilde{w}_1, \tilde{w}_2) : \tilde{\Omega} \to \mathbb{C}^2$$

on the universal covering $\tilde{\Omega} \to \Omega$, such that the deck transformations are realized by linear transformations of $\mathbb{C}^2$. The corresponding quotient

$$ \tilde{\phi} : \tilde{M} \to \mathbb{CP}^1 $$

$$ z \mapsto \tilde{w}_1(z) / \tilde{w}_2(z) $$

is a developing map for a projective structure on $\Omega$.

More generally, let $\Sigma$ be a Riemann surface and regard $q(z)$ as a holomorphic quadratic differential on $\Sigma$—the holomorphic tensor field $\phi = q(z) dz^2$ is a section of the tensor product square of the canonical line bundle (the holomorphic cotangent bundle) of $\Sigma$. The solution $w(z)$ is a section of another holomorphic line bundle over $\Sigma$, and the developing map $\phi$ relates to the quadratic differential by the Schwarzian derivative:

$$ \phi, z := \left( \frac{\phi''(z)}{\phi'(z)} \right)' - \frac{1}{2} \left( \frac{\phi''(z)}{\phi'(z)} \right)^2 = q(z), $$

which is equivalent to $\phi$ being the projective solution to (1). By standard existence and uniqueness of solutions to systems of (holomorphic) differential equations, any holomorphic developing map arises from a holomorphic quadratic differential $\Phi$.
(where \( g \) is the genus of \( M \)) and, given \( \Sigma \), the quadratic differentials form a complex vector space \( \mathbb{C}^{2g-3} \). Thus all the \( \mathbb{C}P^1 \)-structures form a space homeomorphic to \( \mathbb{C}^{2g-6} \). Furthermore, without even “seeing” one structure, one understands the whole moduli space globally as a cell of dimension \( 12g - 12 \).

Figure 3. A small deformation of this developing map maps \( M \) to a domain in \( \mathbb{C}P^1 \) that has fractal boundary. The corresponding representation is quasi-Fuchsian, that is, topologically conjugate to the original Fuchsian representation. The developing map remains an embedding, and the holonomy representation embeds \( \pi_1(M) \) onto a discrete subgroup of \( \text{PSL}(2, \mathbb{C}) \). In contrast to the Fuchsian uniformization, where the developing image is a round disc, now the developing image has nonrectifiable boundary.

The individual structures are rich and fascinating, however. One may start with the Fuchsian uniformization, that is, the representation of the Riemann surface \( M \) as the quotient of a geometric disc by a Fuchsian group and deform it along a path of projective structures. (See Figure 1.)

In another direction, the uniformization of \( M \) as the quotient of a domain by a Schottky group gives another projective structure whose developing map is not injective although the holonomy group is discrete. See [2] for more information and other examples of Kleinian groups.

For \( \mathbb{R}P^2 \)-structures, which are structures modelled on the real projective plane, similar results are known.

For compact surfaces of genus \( g > 1 \), the deformation space is completely known to be a countable disjoint union of open cells of dimension \( 16(g - 1) \) [1]. One component consists of structures that are quotients of convex domains in \( \mathbb{R}P^2 \). However, it is not immediately clear how these structures relate to Riemann surfaces. Through a long development of the theory of hyperbolic affine spheres, culminating with work of Labourie and Loftin, this space naturally identifies with a holomorphic vector bundle over Teichmüller space whose fiber over a point \( \langle M \rangle \) is the space of holomorphic cubic differentials on \( M \). An example of such a projectively symmetrical convex domain is depicted on the cover of the November 2002 issue of the Notices (See Figure 5).

Figure 4. As the deformation parameter increases, the images of the fundamental octagons eventually meet and overlap each other. The developing map ceases to be injective, and in fact winds all over \( \mathbb{C}P^1 \). Typically the image of the holonomy representation is dense in \( \text{PSL}(2, \mathbb{C}) \).

Figure 5.
Although all eight of Thurston’s 3-dimensional geometries [4] can be given $\mathbb{R}P^3$-structures, not every closed 3-manifold admits such a structure (for example, Daryl Cooper has proved that $\mathbb{R}P^1#\mathbb{R}P^1$ admits no $\mathbb{R}P^3$-structure). The Poincaré conjecture for $\mathbb{R}P^3$-manifolds follows easily from the existence of the developing map. However, finding an $\mathbb{R}P^3$-structure on a connected sum seems particularly difficult. Yet recent examples of Benoist and Kapovich indicate a rich abundance of projective structures in dimensions three and higher.

The author gratefully acknowledges partial support from National Science Foundation grant DMS-0405605 and a Semester Research Award from the General Research Board of the University of Maryland in Fall 2005. He thanks Bill Casselman and the members of the Experimental Geometry Lab at the University of Maryland (in particular Anton Lukyanenko and Ryan Hoban) for their help in producing the illustrations.

References
About the Cover
The cover for this issue was produced by Étienne Ghys and Jos Leys. It shows the trajectories of the stable and unstable curves at a point with respect to the Anosov flow due to the one-parameter subgroup of diagonal matrices of $\text{SL}_2(\mathbb{R})$ acting on $\text{SL}_2(\mathbb{R})/\text{SL}_2(\mathbb{Z})$. As the figure illustrates, the flow has chaotic aspects. Many more—indeed, an astonishing abundance of—such pictures are part of the remarkable article "Lorenz and modular flows: A visual introduction", which Ghys and Leys contributed as the November 2006 installment of the Feature Column on the AMS website http://www.ams.org/featurecolumn.

This picture is in fact a still shot from one of a collection of QuickTime™ animations embedded in the article which demonstrate better than any number of still shots the nature of the flow. The article derives from Ghys's presentation at the ICM in Madrid last summer and represents a very promising development in mathematical exposition. The beautiful result of Ghys's work was the coincidence, hitherto unsuspected, of two families of knots: one arising as periodic trajectories in the Anosov flow on $\text{SL}_2(\mathbb{R})/\text{SL}_2(\mathbb{Z})$ pictured here, and the other arising similarly in the flow of the well-known Lorenz attractor.

Hyperbolic Flow on the Space of Unit Lattices
The quotient $\text{SL}_2(\mathbb{R})/\text{SL}_2(\mathbb{Z})$ may be identified with the space of unit lattices $L$ in $\mathbb{C}$, and via the classical Weierstrass functions $g_2(L)$ and $g_3(L)$ this may in turn be identified with the complement of the discriminant locus $\Delta = g_2^3 - 27g_3^2 = 0$ in the unit three-sphere in $\mathbb{C}^2$, which happens to be a trefoil knot.

Keep in mind here that the three-sphere may be identified through stereographic projection with $\mathbb{R}^3 \cup \{\infty\}$.

Through each point in the complement there exist several interesting curves. One is its orbit $O$ with respect to the group of diagonal matrices, shown on the cover in white. Others are the stable and unstable manifolds at that point, which in this case correspond to the subgroups of upper and lower unipotent matrices. The flow compresses the stable points into $O$ but uncompresses the unstable ones into a surface that winds chaotically in space around it. The past and future of these trajectories are shown on the cover, one in green and the other in gold.

The figures opposite exhibit the forward flow of parts of the stable and unstable curves through one point, as well as the orbit $O$. (The motion is initially towards the reader). This can give only a feeble idea of what's in the animations of Ghys and Leys.

The Lorenz Flow
In an impressive paper published in 1983, Joan Birman and Bob Williams discussed the problem of classifying the knots that appeared as periodic orbits in the attractor associated to the Lorenz equation, the one discovered by Edward Lorenz much earlier as a model for deterministic chaos.
Knots in the Lorenz attractor.

They did carry out a classification, but not quite for the original problem. Instead, they used a geometric model proposed earlier by John Guckenheimer and Williams that transformed the problem into one involving two-dimensional flow on a branched surface and thence into one involving intersections with a slice, hence symbolic dynamics.

Intersecting the transverse slice on a branched surface.

They left open, albeit with some evidence to make their claim plausible, the very difficult problem of justifying this transformation. Recently, Warwick Tucker has shown by machine computation involving interval arithmetic that their model was justified.

Bob Williams commented, "Our paper was essentially the first one that treated periodic orbits as knots. ‘Essentially’ because ... my then colleague, John Franks, had written a paper connecting the Alexander polynomial of knots to a Weil type zeta function that a lot of us were thinking about at the time.... I had given a talk in a seminar on turbulence in Berkeley in 1976 in which I computed one of the zeta functions for the Lorenz periodic orbits. I concluded with the statement that most of them were knotted.

"At this time many dynamicists were thinking about knots—in particular when Vaughan Jones had his breakthrough. ... I think the Birman-Williams paper definitely had more impact in dynamics than it did in knot theory."

Joan Birman added, "Our paper was almost ignored by knot theorists. ... In some sense the work of Ghys proves that Lorenz made an incredible discovery when he found those equations. They are, in a very real way, the simplest example you can find of the onset of chaos."

References


All of the figures in this article are due to joint work by Ghys and Leys, but I wish to thank Leys especially for his tireless efforts in producing graphics files on short notice. I wish to thank both of them also for a great deal of patience in preparing the AMS feature column as well as for helping me to write this. Leys used the programs Knotplot, Povray, and Ultrafractal as his graphics tools. Of the last he says, "UF is probably the best program around for drawing fractal patterns. It comes with an extensive library of fractal formulas, which is constantly being extended, since UF allows users to write their own formulas and publish them for general use. It was this scripting feature that I found so appealing, as it opens the door for possibilities beyond fractals into the representation of geometric objects in general.... UF is very fast—the final image of one of our animations, with its 2,400,000 spheres takes about 45 seconds to complete on screen. In that time it calculates three Jacobi θ functions 2.4 million times!"

—Bill Casselman, Graphics Editor
(notices-covers@ams.org)
Fearless Symmetry: Exposing the Hidden Patterns of Numbers
Avner Ash and Robert Gross
Princeton University Press, 2006
302 pages, US$24.95
ISBN 0691124922

Every professional mathematician who has ever attended a cocktail party has had to answer the question: what is research in mathematics? For most of us, there is no easy answer, especially when the person asking adds, as an afterthought, "I thought that everything was known by now in mathematics." The professional mathematician then gauges the length of time that he or she has before the querier becomes sorry he asked, and then proceeds to discuss in down-to-earth terms a catchy mathematical subject. For number theorists, public key cryptography or Fermat's Last Theorem often has the potential to interest the casual listener.

Ash and Gross, in this welcome book, answer the question in the way we would all like to have the opportunity to do: at a leisurely pace, with motivating examples, and with digressions on how mathematicians really think, and how mathematics is "made". They chose a central, easy-to-state mathematical subject—equations and how to solve them—to motivate the mathematical adventure they are proposing to their readers. Starting from scratch, they explain some fundamental tools developed by mathematicians to tackle this motivating problem and many others. Their ultimate, fearless, goal is to explain the concept of reciprocity law for a representation of the Galois group of $\mathbb{Q}$, culminating in the use of such a reciprocity law in Andrew Wiles' proof of Fermat's Last Theorem. In this, they more than succeed.

Fearless Symmetry is written to be accessible to a broad audience, centered principally on those who have studied calculus. This is not a textbook, and very few proofs are offered. On the other hand, concrete examples are discussed, motivating the given definitions.

The first part of the book introduces groups, representations, complex numbers, modular arithmetic, and quadratic reciprocity. This could serve as a primer for a first course in abstract algebra. Undergraduates learning such topics for the first time would benefit from reading this book as a complement to a course, as this book makes for a relaxed introduction to the concepts and provides an interesting overview of where these may lead.

The second part of the book introduces the basics of Galois theory, elliptic curves, algebraic integers, Frobenius elements, and the far-reaching link that representations of the Galois group of $\mathbb{Q}$ can...
be obtained from geometric objects such as elliptic curves.

The third part of the book is the culmination of this adventure. Reciprocity laws are introduced and succinctly described by the authors as “the bringing together of two patterns. One pattern is the set of traces of Frobenius elements acting in a Galois representation. The other pattern comes from the black box—another mathematical object of some different type” (page 235). In the work of Wiles, the black box is analytic in nature, as the pattern is the set of coefficients in a Taylor expansion of a modular form. This is by no means an easy subject, but the reader is well-rewarded for her effort when seeing these tools applied to concrete mathematical problems such as the description of all rational solutions to a given equation. That it took over 300 years to prove that the integer solutions to Fermat’s equation \( x^n + y^n = z^n, \ n > 2, \) consist only in the trivial ones is a testimony to the difficulty of the field. The authors have taken the challenge and have succeeded admirably in bringing the essence of these cutting-edge research topics to a lay audience.

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Book Review

Mathematical Illustrations: A Manual of Geometry and PostScript
Reviewed by Denis Roegel

Mathematical Illustrations: A Manual of Geometry and PostScript
Bill Casselman
Cambridge University Press, 2005
336 pages, ISBN 0521839211
Hardcover, US$90.00; Paperback US$39.99

High quality mathematical illustration has long been a specialized craft, akin to the layout of musical scores or mathematical formulae. Illustrating a proof, or drawing a graph, used to be difficult, and it is easy to find errors in the drawings in old books. Drawing errors are of course a problem for the understanding of a proof. Unfortunately, such cases are still common in the current scientific literature, perhaps because mouse-made drawings do not take full advantage of the power now available. The shift of power, from hand-quality drawings to computer-quality drawings, goes back to the 1970s and started with the advent of good printers. New computer languages were developed for graphical tasks. In 1981, Brian Kernighan described his high-level PIC language for typesetting graphics [3]. At about the same time, the first version of the PostScript language was made public. Unlike languages such as PIC, PostScript was designed not as a user-oriented language but rather as a page description language to serve as an interface between graphics-producing software and printers. Printers with PostScript interpreters were then manufactured, and consequently software was written to produce PostScript files. These files were normally independent of the printer, provided the printer knew PostScript. This independence is still a major asset of typesetting software such as \( \TeX \), where one often first produces a PostScript file, then prints it. The software has to know only about PostScript, not about the printer.

PostScript can also be used directly as a graphics programming language, and Bill Casselman’s book Mathematical Illustrations: A Manual of Geometry and PostScript is devoted to the use of PostScript in the context of geometry.

A graphics language designed for the user has different requirements from one designed as a back-end for typesetting software. High-level languages such as PIC, MetaPost (created by Donald Knuth and John Hobby [4]), and others, try to achieve abstraction, flexibility, and naturalness. In MetaPost, for instance, drawing a segment from \((0,0)\) to \((100,40)\) is done with
\[
\text{draw \((0,0)--(100,40)\)}
\]

PostScript, instead, is a language designed to be interpreted easily by a machine, and the burden of creating PostScript code normally lies not on the user, but on some software’s driver. The same segment as above is drawn in PostScript with:

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Although there is a correspondence between the two expressions, the latter is obviously less user-friendly.

PostScript, in fact, is a stack- and list-based language. The language inherits features found in HP calculators using the Reverse Polish Notation. Other examples of such languages are FORTH and the BibTeX style language for typesetting bibliographies in TeX.

In a stack-based language, operands are given first (and put on a stack), then the operations. $2 \times 3 + 4 \div 2$ results in $23$. In PostScript, $2 3 \text{mul} 4 \text{add} \text{sub}$ will, for instance, push 2 and 3 on the stack, multiply them, push 4, adding it to the previous result 6, and subtracting 12, resulting in $-2$ on the stack. $100 \ 40 \ \text{lineto}$ means "draw a line from the current point to point $(100, 40)$." Casselman’s book shows how far one can go with such a language, and how it can be used for mathematical illustrations.

In fact, Casselman’s book is not only an introduction to PostScript, but actually a book covering two topics: geometry and PostScript. It was used by Casselman as a text for a third-year undergraduate course in geometry. Casselman is a mathematician interested in graphics [1, 2] and the book will appeal as much to mathematicians as it will appeal to programmers.

Casselman’s book certainly does its best to address the two topics of geometry and PostScript, and in this respect it is excellent. The real problem lies in the PostScript language, which quite honestly is not the simplest graphical language, especially for beginners. Mathematicians who already have some familiarity with programming will find the book interesting and will enjoy its dual perspective. Those who are beginning in graphics might however be misled, or even deterred, depending on how far their graphical notions extend and what their aims are. If the reader is interested in an introduction to PostScript, Casselman’s book certainly suits the purpose very well. But if the reader is looking for a practical language for making his/her own figures, I am doubtful that PostScript is the right choice. One should not forget that learning a language is an investment, and it may take years to take full advantage of certain languages. A better choice in this respect might be MetaPost, a language meant for users. One criterion for choosing a programming language for a given task is the number of people using that language. There are certainly more people programming in MetaPost than in PostScript (although many people manipulate PostScript files, of course).

One question raised by Casselman’s book concerns the communication between its two readerships, the mathematicians and the programmers. Will the worlds of these two kinds of users really merge, as the book would like them to? Before answering this question, let us ponder a number of other issues.

Mathematical Illustrations

The book is aimed at producing mathematical illustrations, but what are mathematical illustrations? A perusal of the book will show that what is meant are geometrical constructions (for instance for the Pythagorean Theorem), curves, 3-dimensional surfaces, and 3-dimensional objects. To a great extent, these illustrations are made of straight or curved lines, or of surfaces delimited by curves and colored in some way. Labels appear only seldom, and we will come back to this topic later.

PostScript is well suited to the task of making technical illustrations such as plans, diagrams, flow charts, etc. But technical illustrations are different from mathematical illustrations, and for the latter other languages, such as MetaPost, seem better suited.

Throughout the book, the author tries to develop his methodology. For instance, he writes that "programs should reflect concepts" or that "To get good results from PostScript, first get a simple picture up on the screen that comes somewhere close to what you want and then refine it and add to it until it is exactly what you want."

I would rather say that first a drawing should be on paper, and its logical structure analyzed. It is essential to separate the design of the drawing from its implementation, because the implementation choices can cripple the design and make it more difficult to change. Afterwards, when the design has been stabilized to some extent, we know better what we want to draw and how, and we can observe the result and fine-tune it.

The Content

Let us now review some of the content of the book. The first chapter, in little more than twenty pages, gives the basics of polygonal drawing. The second chapter adds nothing about PostScript but is a refresher on coordinate geometry. Chapter 3 develops the language by presenting the means to store and reuse data. Although the chapter distinguishes between variables and procedures, both are actually data and are stored in the same way. A variable stores a value, such as an integer or a string, and a procedure stores some text, which usually is a list of commands; these commands are grouped with braces. Chapter 4 explains quite extensively and very clearly how coordinate changes are handled through matrices representing affine transformations. A 2-dimensional transformation is represented by a matrix stored as an array of 6 elements, and these matrices can easily be inverted and multiplied.
This chapter also shows how affine transformations in the plane can be represented as 3-dimensional matrices in the plane $z = 1$. The book is full of interesting problems, but sometimes the problems seem quite complex and disproportionate with the notions they purport to introduce. Conditionals, for instance, are introduced after stating a problem of line intersection taking up more than three pages. There are probably easier ways to introduce these concepts. However, the problem is interesting for other reasons, as it puts into practice the various coordinate systems and the handling of arrays.

Chapter 5 discusses programming loops and arrays and illustrates them by the drawing of regular polygons. Function graphs are a natural application of loops. Incidentally, a PostScript path can be created with a loop, somewhat like a machine leaving a trail, but the path itself is drawn only at the end of the construction. This is convenient, as there is no need to store the coordinates in an array, and we find the same useful features in MetaPost, for instance. Arrays are a natural structure to loop on, and the drawing of general polygons given by a list of pairs is a good application. Arrays also provide a very general structure and can contain lists of heterogeneous elements. The first element could be an integer, the second a pair, and so on. Readers acquainted with more recent languages such as Python will find themselves in familiar territory.

Chapter 6 extends the basic drawing facilities introduced in chapter 1. Up to now, only segments could be drawn. The main topic of this chapter is Bézier curves. The theory of Bézier curves and the more general Bernstein polynomials is sketched. The author shows for instance that points of a Bézier curve are weighted averages of its control points, that is, of the points that define the curve.

Chapter 7 shows how curves can be drawn automatically. In general, the author stresses the importance of separating the construction of a curve from its drawing. For instance, drawing a hyperbola using the procedure hyperbola could be written as newpath -2 2 4 hyperbola stroke the path being drawn only when the stroke command is executed.

The author shows how a procedure $f$ can be defined in such a way that, taking a value $x$, it outputs a pair $[f(x) f'(x)]$ on the stack. This procedure can be used to produce the control points of the Bézier curves approximating the graph of the function $f$. Eventually, in order to draw a function quartic between $-1$ and $1$ using 8 Bézier segments, one merely writes

\begin{verbatim}
newpath
-1 1/ quarticmkgraph
stroke
\end{verbatim}

The "/" here means that the name "quartic", and not the definition of the function, is pushed on the stack. This allows the mkgraph function to call quartic as needed for various values of its parameter.

One such quartic given as an example is $x^4$ and this is coded by

\begin{verbatim}
/quartic{2 dict begin
/x exch def
[x x mul x mul x mul f(x)]=x^4
[x x mul x mul x mul f'(x)]=4*x^3
end} def
\end{verbatim}

Although the syntax is quite verbose, this gives the general idea of how function graphs can be drawn. (What follows "\%" are comments.) It is, by the way, possible to define a function taking a string representing an expression such as $x^4$ and producing $x \times x \times x \times x$ and $4 \times x \times x$. One could even imagine defining a function computing the formal derivative of a function. These topics are beyond the scope of this book, although they are tackled in Appendix 6 in the case of polynomials.

An extension of these ideas is the drawing of parameterized curves, where it is assumed that the array $[[x(t) x'(t)] [y(t) y'(t)]]$ is given. This is for instance applied to draw a circle out of 8 Bézier segments.

Chapter 8 is about the analysis of paths. Up to now, paths have been rather static. They were accumulated, and then drawn, but it is actually possible to work on a path as data. As an example, the author introduces 2-dimensional transformations and explains the role of the Jacobian derivative in the approximation of a map. If certain conditions are met, such a transformation is conformal and preserves angles. A path can then be transformed by going through its components using pathforall and building an array representing a new path, obtained from the transformed components of the initial one. Finally, the commands in the array are executed, and this produces the new path. This chapter then applies this technique to map transformations, such as cylindrical projections, Mercator projections, and stereographic projections.

Chapter 9 is about programming and takes as natural applications replicating structures, such as arrays or fractals. Recursion is a very natural expression of certain algorithms, but this naturalness requires some care, in particular when local variables are involved.

Sorting is an application of arrays. An array of integers can be sorted for instance by subdividing an array, and this can be done recursively. The first half can be sorted, then the second half, and then...
the sorted subarrays can be merged. Two sorting algorithms are presented in this chapter, the “bubble sort” and the “quicksort”.

An interesting application to sorting is a procedure finding the convex hull of a set of points in the plane. The algorithm is stated very clearly, but the procedures are not broken down enough for my taste.

Chapter 10 is an introduction to perspective and projective geometry. The author introduces the projective plane and homogeneous coordinates. This chapter is therefore a mathematical preliminary to the representation of 3-dimensional objects in two dimensions.

Chapters 11 and 12 are about transformations in three dimensions and introduce the various mathematical prerequisites and the matrix representations of the different operations, such as projections, rotations, etc.

Chapter 13 and the next one describe a 3-dimensional extension to PostScript. This extension facilitates the creation of simple 3-dimensional scenes. When it is used, the location of the eye can be defined and coordinates can be changed by translation, scaling, or rotation. Paths can be defined in 3 dimensions. The extension is provided with matrix operations that operate on $4 \times 4$ matrices.

Chapter 14 shows how convex polyhedra can be represented and how visibility and shading algorithms are used for its faces. Smooth surfaces are obtained either by a fine computation of the shading and the use of small grids, or by the use of the more elaborate shading features introduced in version 3 of PostScript. Casselman's book takes the reader to advanced topics such as Gouraud shading and illustrates them, for instance, on a sphere.

This chapter also serves as an introduction to more general 3-dimensional rendering, involving objects that are not mere convex polyhedra. We are introduced to an algorithm of binary space partition, whose code is available online.

The concluding chapter 15 is particularly interesting as it details algorithms for splitting arbitrary 2-dimensional surfaces into small triangles, for the purpose of shading and visibility control.

The book is supplemented by several useful appendices giving in particular a summary of commands, details about the editing and running environment, the inclusion of labels, and zooming.

The appendix on labels, called “Simple text display,” runs only four pages, and in my opinion this treatment is too brief. It may surprise the reader to find that labels actually seldom appear in the drawings for which code is given in the book, and there are two reasons for this. First, the author claims that a good drawing should speak for itself and does not need crutches such as labels. This is certainly true for some drawings, but not everyone will agree that it applies to all drawings. In particular, the author actually uses labels in certain figures (for instance in the pentagon on page 82) when he explains their structure. A second reason is that labels go somewhat beyond graphics and represent a bridge with text typesetting. Putting a label requires both the typesetting of text (and therefore dealing with fonts, symbols, special rules of positioning for exponents, etc.), and the location of this text with respect to the graphics. Hence, text and graphics somehow must communicate, and this is of course difficult. Casselman shows several cases of graphics labeling, but they are very basic.

Two Tracks
The two tracks of Casselman's book, mathematics and programming, are interleaved, but are also to a great extent independent. This is both an advantage and a drawback. It is an advantage because it allows the mathematician to learn about the theory of Bézier curves, projective geometry, homogeneous coordinates, and other interesting matters, including some that are given as (mathematical) exercises, without being bothered by the programming. Similarly, the programmer who wants to learn about PostScript will find an excellent introduction and will be able to skip all the mathematics. The exposition in both tracks is very clear and should satisfy readers from each field.

But the independence of the tracks, or rather, the fact that a reader need not read everything in order to progress, will also be likely to discourage mathematicians from reading the PostScript parts, and programmers from reading the mathematical parts. Still this could be interpreted positively, as it allows a programmer to finish his part of the book, and then to return to it for the remaining bits.

Will the mathematicians grasp the programming part? I am somewhat doubtful. The PostScript language is very unusual and, although very interesting and informative, it can hardly be viewed as an introductory programming language. It is likely, therefore, that only those readers with an interest in graphics, and with previous programming experience, will dive into the PostScript programming.

Yet, learning about PostScript is very rewarding. To most of us who are not familiar with a stack-based language, the book shows its beauty and versatility. Moreover, it illustrates the basic features of a general programming language, such as conditionals, loops, and structures like lists and trees, and shows how these structures can be used. The language is also graphics-oriented, and therefore has features that do not have a parallel in non-graphics languages, for instance path traversal.

The book could have been improved in several ways. First, the book is two-color, and perhaps
there could have been a few four-color pages, although that would have increased the cost. Second, although the author stresses the importance of good programming, the use of comments, etc., I feel that some pieces of code (pages 157-158, for instance) are too lengthy. They will frighten the mathematician; they could have been broken into smaller pieces. A procedure occupying two pages may be acceptable with certain languages, but I do not think it is with a stack-based language. There are also some technical inaccuracies. The author writes for instance (page 47) that "A procedure in PostScript is just any sequence of commands enclosed in brackets [...]." This is not correct. A sequence of commands enclosed in brackets [...] is a group, and it is possible to have groups without naming them. A procedure is a stored group of commands with some name. So, it is not true that a procedure is assigned to a variable, but a procedure is a variable. There is also an inaccuracy concerning pixel coloring. The author writes (page 237) that "pixels are colored in the order of their depth." This is not quite true for rendering engines such as OpenGL; instead, pixels get a new color if the color corresponds to a point in space nearer than the previous one used for coloring that pixel; the result does not depend on the order in which the pixels or objects are traversed. Finally, it is too bad that the author does not offer a comparison with other 2-dimensional or 3-dimensional graphical languages, such as MetaPost or OpenGL, although MetaPost is mentioned in the preface.

References
In the spring of 2006 four African-Americans received the Ph.D. degree in mathematics in one commencement at the University of Mississippi, a national record. This is a joyous note of reflection.

In 1848 a group of people just below the northern hills of Mississippi lobbied the legislature in Jackson to place a university where dense hickory-oak forest ruled supreme, a land filled with the mystique of Faulkner's Yoknapatawpha. When granted, the "other Oxford" established an ambitious plan for an institution of higher learning. What would have been the biggest refracting telescope of the then-modern world was ordered from Alvan Clark and Sons of Boston. Civil war erupted while the telescope was en route to Oxford, and the giant lens never arrived.

The news of the four African-American Ph.D.'s signals the opening to a new renaissance, long after that first promise. The university, with about fourteen thousand students on its main campus, has fourteen faculty members in its mathematics department. In 2000 the Department of Mathematics applied for a Graduate Assistance in Areas of National Need (GAANN) grant. Its arguments in the proposal were simple: Mississippi has a large constituency of African-Americans and a huge need for a technology renaissance for which it needs highly trained mathematicians. The mathematics department promised in particular to recruit, train, and graduate future African-American and female Ph.D.'s. The Department of Education bought into these arguments. The availability of a US$20,000 stipend for a GAANN fellowship at the Department of Mathematics of the University of Mississippi, where the going rate for a graduate assistantship was US$9,650, had enormous consequences. The GAANN grant first doubled the graduate student budget and then the graduate student population. Finally, it more than quadrupled the number of Ph.D. students. It was a transforming moment.

Eight GAANN fellows were supported from that first grant. Six have obtained their Ph.D.'s in mathematics (three of them African-American) and one more African-American is close to the finish line. Six of the eight fellows are female and four of these have obtained their Ph.D.'s. The grant created purpose and cohesion to the graduate program. The GAANN grant provided, as it were, a new lens from which to look outward. For the first time in more than fifty years the sectional meeting of the Mathematical Association of America took place on the Oxford campus in 2001. The GAANN grant enabled the GAANN fellows to go first to the national AMS/MAA meeting in New Orleans in 2001 and then to the International Congress of Mathematicians in Beijing, China, in 2002.

The transformation of the mathematics department at the University of Mississippi does not arrive in isolation. Bob Moses was the recipient of a MacArthur fellowship for an approach to teaching mathematics in his Algebra Project in Mississippi, based on understanding of the social and economic background of pupils. The university's commitment to diversity and its sense of responsibility to all citizens of Mississippi have created what its administration now calls the Renaissance Decade. The accomplishment of the four African-American Ph.D.'s in mathematics in Mississippi also is connected to other universities in the nation. At the University of Maryland, three female African-Americans received their mathematics Ph.D.'s in one commencement in 2003. The University of Iowa received a Presidential Award for its exemplary program that promises to deliver three minority Ph.D.'s in mathematics every year.

In reflecting on all these achievements, I was reminded of the following quote by Etta Falconer (the eleventh African-American female Ph.D.) upon
success in locales with a similar background. For instance, regional differences in economic prosperity could have a large and at times unexpected influence on a national concerted effort to raise the overall number of minority Ph.D.'s. A national strategy should include questioning practices in the culture of advancing mathematics research that hinder achievement of the highest degree for minorities, if such turn out to exist.

The Department of Education renewed GAANN funding to the Department of Mathematics at the University of Mississippi for 2006-2009. A student applying for a GAANN fellowship recently wrote to me:

It is very discouraging to have gone to predominantly African-American schools and institutions and not have one African-American mathematics professor. And what is even more disappointing is to go to a school, and be the only African-American student in all of your classes! It makes one feel that maybe "your kind" was not meant to do this.

Whether it be Iowa, Maryland, or Mississippi, a diverse cadre of teachers and researchers in mathematics will be a renaissance for all of American mathematics.

On a personal note, I arrived in Lafayette county from Europe more than twenty years ago, largely unaware of the complexity of the Yoknapatawpha region and I had not read Faulkner. I would like to take this opportunity to thank Carl Pomerance for his advice and inspiration to me when he visited the University of Mississippi, twice in the mid- and late 1990s and then once more a couple of years ago. He gave two beautiful lectures on mathematics at the university and an even more beautiful talk for high school kids at South Panola High School in Batesville, twenty miles west of Oxford, where he volunteered during Freedom Summer in 1964. I dedicate the accomplishment of the four African-American Ph.D.'s in mathematics at the University of Mississippi to him and all others who worked so hard to make success at the spring commencement 2006 at UM possible.
What Is Good for Mathematics? Thoughts on the Clay Millennium Prizes

Anatoly Vershik

Around the year 2000, when information about the Clay Milenium Prizes for the solution of the seven specially selected mathematical problems became public, I met my old friend Arthur Jaffe, who was then president of the Clay Mathematics Institute. I asked him: “What is this being done for?” At the time I felt that the assignment of huge (million-dollar) prizes was more in keeping with the style of show business, aiming at drawing attention to something or somebody at any price, whereas scientific life should avoid cheap popularization.

Indeed, thought I, will “money tags” attached to the solution of scientific problems, and not their intrinsic interest, add to the mathematicians’ enthusiasm?: if one of us is already working on the Riemann Hypothesis or the Poincare Conjecture, no additional enticement is needed. And it will attract serious mathematicians to one of these problems only if that person worked on the problem before or was an expert in the corresponding field.

Arthur answered me decidedly and professionally: “You understand nothing about the American way of life. If a politician, a businessman, a housewife will see that one can earn a million by doing mathematics, they will not discourage their children from choosing that profession, will not insist on their doing medicine, law, or going in for some other lucrative activity. And other rich philanthropists will be more likely to give money to mathematics, which is in such need of it.”

At the time that answer partially convinced me. Nevertheless, in the years that followed, I have not learned to understand the American way of life any better, and seem to understand the logic of life in Russia less and less.

Now that one of the “million dollar problems”—the Poincare Conjecture—has been solved, I would like to come back to my original question: was the million-dollar venture useful for mathematics? Let me say at once that I have returned to my original position.

As I mentioned above, the number of people working on the Poincare Conjecture and, probably, the other six problems, has not increased after the Clay millennium problems were announced. The person who solved it, G. Ya. Perelman, started working on it long before. The Clay Mathematics Institute has nothing to do with his solution. And the other mathematicians who still claim to have solved it, as far as I know, were also working on it before. And it is foolish to think that one of the nonspecialists (even a mathematician), having heard of the prize, has any chance of solving a problem of that level. Thus no rise in the progress of mathematics due to the new financial stimulus has occurred.

Intrinsically, the solution of the problem, as well as the method used to solve it, is a remarkable success of mathematics, an outstanding scientific achievement. And the Clay Institute has played no role in this.

I would also like to note that the stir created around the seven “millenium problems” creates the wrong impression in society about the work of mathematicians, supporting the hackneyed notion that it consists only in solving concrete problems. You don’t have to be an expert to understand how misleading that notion is. The discovery of new domains and relationships between different branches of mathematics, the setting of new problems, the development and perfection of the mathematical apparatus, and so on, are no less

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A journalist from Russia once asked me: “In order to get the million, do you have to solve all seven problems, or will one do?”
important and difficult parts of our science, without which it cannot exist.

More generally, will the approach of the Clay Institute increase interest in mathematics and increase the influx of young people into the field? I am not sure. One must understand that somebody fascinated by mathematics as a teenager needs no additional stimuli, while those who, in their choice of profession, are primarily interested in ensuring a normal comfortable life do not need a million-dollar prize for solving an inaccessible problem, but need something completely different.

As to the interest of the general public in mathematics, it certainly did flare up for a while. No newspaper or TV channel passed by the sensational news. From August 20 and 21, when articles in the New York Times and the New Yorker appeared, to mid-September, passions did not die down. How many journalists inquired at our institute, seeking out mathematicians they knew or didn't know, asking for interviews, asking questions about the nature of the problem, demanding what its impact on everyday life is! Now at least everyone knows the name of Henri Poincaré and, of course, that of Perelman, and people interested in science did learn something about the problem. This was the case, and it was a good thing.

But what interests nonmathematicians above all? What questions are heard most often in this clamor? Such was the fate of the first test of the Clay Institute's initiative that it involved unexpected tragicomic circumstances. One can say that these circumstances were apparently unrelated to the expectations of the organizers, although who knows what is related, what isn't. The main question that interests the mass media and the general public is not the problem whose solution mathematicians were eagerly waiting for so many years, not what is going on in mathematics—all that was too difficult to understand, too inaccessible. And not even the personality of G. Ya. Perelman ("Completely nuts, he's a mathematician, they're all like that"). No. The main question was: "Why did he refuse the million?" Actually, after numerous explanations, some journalists (not all), and through them part of the public, finally understood that so far only the Fields Medal has been refused, the million has not been awarded yet. Nevertheless, the overwhelming part of the commentaries, at least in the Russian media, concerned that question only. Unfortunately, most of these commentaries were unintelligent, tactless, or even obnoxious.

All this moves to the background the meaningful part of the event and impedes the reader's real understanding of it. And, of course, the most improbable gossip is picked up with enthusiasm, such as that Perelman was supposedly slighted, thrown out of the institute, his results were plagiarized and so on. For example, see the article by N. Lobastova and M. Hirst in the Sunday Telegraph of August 28, or in the Wikipedia article about G. Ya. Perelman (which, most unfortunately, are referenced by the site of the International Mathematical Union). There are other, obviously unforeseen, consequences of the million-dollar undertaking.

Here is one of them. As the present example shows, some serious mathematicians have succumbed to the temptation of engaging in a discussion of the question of priority, involving real and imaginary complications. This is being done quite professionally, but it is difficult to avoid the thought that the aim is not only to share in the honor of solving an outstanding problem, but also to share in the spoils. Let us hope that the mathematical community will reject these claims, but where is the guarantee that in less obvious situations such attempts will not be successful?

In my opinion, all this clamor and fuss show that this method of promoting mathematics is warped and unacceptable, it does not popularize mathematics as a science, on the contrary, it only bewilders the public and leads to unhealthy interest. I don't think that these passions are only explained by the peculiarities in the behavior of today's hero, which of course tend to aggravate the emotions; things are deeper. The question is, does mathematics need such an indecent interest? Would such a reaction have occurred if not for the conspicuous presentation of the Clay prizes? Probably not. The proof of Fermat's Last Theorem in 1996 by Andrew Wiles did not lead to such a tumult, although the problem solved was no less important than Poincaré's.

The explanation is simple: two poorly compatible things became too closely connected: a serious scientific result and, out there in the forefront, the "million".

Within their own community, certain mathematicians, e.g., Paul Erdős, when setting a problem, liked to estimate their value by a number of bottles of beer, or glasses of martini, or a small number of dollars, but that was done in fun and was harmless. The French Academy at one time also proposed prizes for the solution of some mathematical problems, but the prizes were rather modest and were never presented with such pomp. The prestigious Fields Medal is above all a medal; the monetary prize given in parallel is modest, remains in the background, and is hardly ever talked about. The Nobel Prize and the Abel Prize, despite discussions about the equity of the choice of prizewinner, bring to mind, above all, the idea of outstanding scientific achievements. Rare refusals to accept the prizes have occurred in the past, but always had concrete motivations; convincing or not—but that is another question.

Certainly, after an important mathematical problem is solved, and many were solved in the twentieth century, the author should be
significantly encouraged (provided he/she does not refuse), and means for this are usually found. There is one thing wrong about mathematical prizes—there just aren’t enough of them. Unfortunately, as things stand now, the few prizes that exist are distributed among the same small group of people. But again, this is another question.

In our case we are dealing with an a priori, an excessive monetary estimate of the solution of one of several scientific problems. Is it really necessary to estimate their cash equivalent (with a long line of zeros), and if so, how are we to go about it? The Hilbert problems were not evaluated in millions, but their popularity among active mathematicians did not suffer from this. To transform serious research problems into something like a million-dollar lottery is a totalistic means to indulge the bad taste of the mob. In response, we get a social effect in keeping with the underlying scale of “values”. Science should be promoted by more sophisticated means, while the funds that far-seeing business people are willing to bestow on mathematics, and which we need so badly, should be used more efficiently. Popularization of math for the general public is indeed necessary, but not of the kind that is characteristic of the worst manifestations of present-day mass culture.

Undoubtedly, mathematics is in dire need of serious support, including financial support, as well as in the need of a general public much better informed about what goes on in our field. In contrast to this, the newspapers, especially in Russia, are presently “discussing” a completely different question: Is mathematical education, and mathematics itself, really necessary in contemporary society (see the series of articles on the subject in http://www.gazeta.ru and other sources)? However strange it may seem, the topic of the “millions” only inflames such passions and guides them in the wrong direction, while the situation of Russian scientists, especially the younger ones, remains as difficult as ever.

The Clay Institute conducts a very useful and successful program for supporting young mathematicians, helps organize scientific conferences and seminars, and so on, and this work can serve as an example for other foundations or private individuals.

But I firmly believe that the mathematical community can and must find new reasonable means of propaganda and promotion (and I don’t mean popularization only). New means (including monetary ones, of course) are needed to attract attention to mathematics and to the outstanding events in our science, as are dignified ways of expressing recognition to its most outstanding representatives.
Bressan Awarded Feltrinelli Prize

Alberto Bressan of Pennsylvania State University has been selected to receive the Antonio Feltrinelli Prize in Mathematics, Mechanics, and Applications of the Accademia Nazionale dei Lincei. The prize carries a monetary award of 65,000 euros (approximately US$82,000), a certificate, and a gold medal.

Bressan has done important research in nonlinear analysis, differential equations, and control theory. He is best known for his breakthrough work in hyperbolic conservation laws, in which he established the uniqueness and other fundamental properties of solutions and the convergence of vanishing viscosity approximations.

The Accademia Nazionale dei Lincei, founded in 1603, is considered to be Italy's most prestigious scientific society. One of its first members was Galileo Galilei. The Feltrinelli Prize is among the highest awards given to Italian citizens for achievements in the arts, music, literature, history, philosophy, medicine, and physical and mathematical sciences. The prize is awarded in the area of physical and mathematical sciences only once every five years. Among the previous winners have been Francesco Tricomi, Guido Stampacchia, and Enrico Bombieri.

—From a Pennsylvania State University announcement

Tao Awarded 2006 SASTRA Ramanujan Prize

The 2006 SASTRA Ramanujan Prize will be awarded to Terence Tao of the University of California, Los Angeles. This annual prize, which was launched in 2005, is for outstanding contributions to areas of mathematics influenced by the genius Srinivasa Ramanujan. The age limit for the prize has been set at thirty-two, because Ramanujan achieved so much in his brief life of thirty-two years. The US$10,000 prize will be awarded at the International Conference on Number Theory and Combinatorics, December 19-22, 2006, at SASTRA University in Kumbakonam, India, Ramanujan's hometown.

The 2006 prize citation is as follows: "Terence Tao is awarded the 2006 SASTRA Ramanujan Prize for his path-breaking contributions in number theory, harmonic analysis, representation theory, and partial differential equations, which have had a major impact in combinatorics and ergodic theory as well. Among other things, the prize recognizes his notable contributions to the famous Kakeya Problem in higher dimensions, which has major applications in Fourier analysis and partial differential equations, especially his joint work with Nets Katz, Izabella Laba and others, that significantly improves all previously known estimates for the fractal dimension using new and surprisingly simple combinatorial ideas in an ingenious way. The prize also recognizes his outstanding joint work with Ben Green on long arithmetic progressions of prime numbers, in particular, the resolution of the longstanding conjecture that there are arbitrarily long arithmetic progressions of prime numbers, by brilliantly combining methods of ergodic theory with the ideas of Tim Gowers. In addition, the prize recognizes Tao's joint work with Jean Bourgain and Nets Katz in generalizing a fundamental problem of Erdős and Szemerédi on the sumsets and product sets of integers, by developing a 'sum-product theory' that has led to breakthroughs in harmonic analysis and number theory. The prize also makes note of Tao's fundamental work on wave maps that figure prominently in Einstein's general theory of relativity, the new insights that he and his collaborators provided in the study of Schrödinger equations, and the resolution of the saturation conjecture in representation theory in collaboration with Allen Knutson."

Tao was born in Adelaide, Australia, in 1975 and lived there until 1992. He did his B.Sc. (Honours) and M.Sc. at Flinders University of South Australia. He then went to Princeton University in 1992 for his Ph.D., which he completed in 1996 under the direction of Elias Stein. He
received a Sloan Dissertation Fellowship for the final year of his Ph.D. work. He is currently professor at the University of California in Los Angeles. He received the Salem Prize (2000), the AMS Böcher Prize (2002), and the AMS Conant Prize (2005). In 2006 he received a Fields Medal as well as a MacArthur Fellowship.

The 2006 SASTRA Ramanujan Prize Committee consisted of: Krishnaswami Alladi (chair), George Andrews, Manjul Bhargava, James Lepowsky, Tom Koornwinder, Kannan Soundararajan, and Michel Waldschmidt.

—From a SASTRA Ramanujan Prize announcement

Faddeev, Ruelle, and Witten Awarded Poincaré Prizes

The International Association of Mathematical Physics (IAMP) has awarded the 2006 Henri Poincaré Prizes for mathematical physics to LUDVIG D. FADDEEV of the Steklov Institute of Mathematics, St. Petersburg, and the Euler International Mathematical Institute; DAVID RUELLE of the Institut des Hautes Études Scientifiques, Bures-sur-Yvette; and EDWARD WITTEN of the Institute for Advanced Study, Princeton. Faddeev was honored for his contributions to the theory of quantum fields, quantization of noncommutative gauge theories, scattering in quantum mechanics and quantum field theory, and the theory of integrable systems. Ruelle was cited for his contributions to quantum field theory, to both classical and quantum statistical mechanics, and to dynamical systems theory. Witten was honored for his work on string theory, which has also influenced geometry and topology. Each prize carries a cash award of 10,000 euros (approximately US$12,000).

The Poincaré Prize, which is sponsored by the Daniel Iagolnitzer Foundation, recognizes outstanding contributions that set the foundation for novel developments in mathematical physics. The prize is awarded every three years. The 2006 prizes were presented at the International Congress on Mathematical Physics in Rio de Janeiro.

—From an IAMP announcement

2006 Information-Based Complexity Young Researcher Award

JAKOB CREUTZIG of Technische Universität Darmstadt, Germany, and DIRK NUIJENS of Katholieke Universiteit, Leuven, Belgium, have been awarded the Information-Based Complexity (IBC) Young Researcher Award for 2006. The award is given for significant contributions to information-based complexity by a young researcher who has not reached his or her thirty-fifth birthday by September 30 in the year of the award. The award carries a cash prize of US$1,000 and a plaque.

The award committee consisted of Josef Dick, University of New South Wales; Frances Kuo, University of New South Wales; Christiane Lemieux, University of Calgary; Friedrich Pillichshammer, University of Linz; Joseph F. Traub, Columbia University; and Henryk Woźniakowski, Columbia University and University of Warsaw.

—Joseph F. Traub

DMV Prizes

The Deutsche Mathematiker-Vereinigung (DMV, German Mathematical Society) awarded prizes at a meeting in Bonn in September 2006.

HANS FÖLLMER of the Humboldt-Universität Berlin received the DMV Cantor Medal. Föllmer is the leading German probability theorist of his generation. He has had a decisive influence on the development of the field of stochastics, especially stochastic analysis and applications to financial markets. Previous recipients of the Cantor Medal are Friedrich Hirzebruch, Yuri Manin, Volker Strassen, Jacques Tits, Erhard Heinz, Jürgen Moser, and Karl Stein.

GEORGE SZPIRO received the DMV Media Prize of 4,000 euros (approximately US$5,000) for his monthly column in the Swiss newspaper Neue Zürcher Zeitung. The column presents a wide range of mathematical themes that Szpiro has carefully researched and written up. He regularly succeeds in making complex mathematical ideas accessible and enjoyable to a wide public. His columns have been collected into two books, Mathematics for Sunday Morning (2005) and Mathematics for Sunday Afternoon (2006), both available in English.

ULF VON RAUCHHAUPT received the DMV Journalism Prize for his article "Professor Gödel und der Wahrheit (Professor Gödel and Truth)", which appeared in the Frankfurter Allgemeine Sonntagszeitung on April 23, 2006. The article, written on the occasion of the 100th anniversary of the birth of Kurt Gödel, describes how his ideas shook the foundations of mathematics.

The DMV also recognized the contributions of HANS MAGNUS ENZENSBERGER to mathematical popularization. Enzensberger, a prominent German poet and essayist, presented a much-admired lecture at the International Congress of Mathematicians in Berlin in 1998 about the role of mathematics in culture. The lecture, Zugbrücke Ausser Betrieb, was published as a booklet in German with facing English translation by A. K. Peters. Enzensberger has also written a children’s book, The Number Devil (1999), which has appeared in both German and English.

—Allyn Jackson
Mathematics Opportunities

Proposal Due Dates at the DMS

The Division of Mathematical Sciences (DMS) of the National Science Foundation (NSF) has a number of programs in support of mathematical sciences research and education. Listed below are some of the programs and their proposal due dates for the year 2007. Please refer to the program announcement or contact the program director for more information.

December 12, 2006 (full proposal): East Asia and Pacific Summer Institutes for U.S. Graduate Students

December 15, 2006 (full proposal): Joint DMS/NIGMS Initiative to Support Research in the Area of Mathematical Biology

January 13, 2007 (full proposal): Mathematical Biology


February 1, 2007 (full proposal): Collaboration in Mathematical Geosciences

February 19, 2007 (full proposal): Interdisciplinary Grants in the Mathematical Sciences (IGMS)

June 2, 2007 (full proposal): University-Industry Cooperative Research Programs in the Mathematical Sciences

June 5, 2007 (full proposal): Enhancing the Mathematical Sciences Workforce in the Twenty-First Century

June 6, 2007 (full proposal): Research Experiences for Undergraduates: REU site proposals to the Antarctic program

August 23, 2007 (full proposal): Conferences, Workshops, and Special Meetings in the Mathematical Sciences: Special Meetings only

September 21, 2007 (full proposal): Focused Research Groups (FRG) in the Mathematical Sciences

October 2, 2007 (full proposal): Algebra, Number Theory and Combinatorics; Analysis

For further information see the website http://www.nsf.gov/funding/pgm_list.jsp?ord=date&type=all&org=DMS&sel_org=DMS&status=1. The mailing address is Division of Mathematical Sciences, National Science Foundation, Room 1025, 4201 Wilson Boulevard, Arlington, VA 22230. The telephone number is 703-292-5111.

—From the DMS website

NDSEG Fellowships

As a means of increasing the number of U.S. citizens trained in disciplines of military importance in science and engineering, the Department of Defense (DoD) awards National Defense Science and Engineering Graduate (NDSEG) Fellowships each year to individuals who have demonstrated ability and special aptitude for advanced training in science and engineering. The fellowships are awarded for a period of three years for study and research leading to doctoral degrees in mathematical, physical, biological, ocean, and engineering sciences. Approximately 200 fellowships will be awarded in 2007.

The NDSEG Fellowship Program is open only to applicants who are citizens or nationals of the United States. NDSEG Fellowships are intended for students at or near the beginning of their graduate studies in science or engineering. Applicants must have received or be on track to receive their bachelor's degrees by fall of 2007. Applications are encouraged from women, persons with disabilities, and minorities, including members of ethnic minority groups such as African American, American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, Hispanic, or Latino.

Complete applications must be submitted electronically or postmarked by January 8, 2007. Application materials are available from, and completed applications should be returned to, the American Society for Engineering Education (ASEE) at: NDSEG Fellowship Program, c/o American Society for Engineering Education, 1818 N Street, N.W., Suite 600, Washington, DC 20036; telephone 202-331-3516; email:
AMS-AAAS Mass Media Summer Fellowships

The American Association for the Advancement of Science (AAAS) sponsors the Mass Media Science and Engineering Summer Fellows Program through which graduate students work during the summer in major media outlets. The AMS provides support each year for one or two graduate students in the mathematical sciences to participate in the program. In past years the AMS-sponsored fellows have held positions at Scientific American, Business Week, Voice of America, Discovery Channel Online, National Geographic Television, Popular Science, the Chicago Tribune, and Time magazine.

Fellows receive a weekly stipend of US$450 plus travel expenses to work for ten weeks during the summer as reporters, researchers, and production assistants in media organizations. They observe and participate in the process by which events and ideas become news, improve their ability to communicate about complex technical subjects in a manner understandable to the public, and increase their understanding of editorial decision making and of how information is effectively disseminated. Each fellow attends an orientation and evaluation session in Washington, D.C. and begins the internship in mid-June. Fellows submit interim and final reports to AAAS. A wrap-up session is held at the end of the summer.

Mathematical sciences faculty are urged to make their graduate students aware of this program. The deadline to apply for fellowships for the summer of 2007 is January 15, 2007. Further information about the fellowship program and application procedures is available online at http://www.aaas.org/programs/education/MassMedia/index.shtml, or applicants may contact Stacey Pasco, Manager, Mass Media Program, AAAS Mass Media Science and Engineering Fellows Program, 1200 New York Avenue, NW, Washington, DC 20005; telephone: 202-326-6441; fax: 202-371-9849; email: spasco@aaas.org.


—AMS-AAAS announcement

Maria Mitchell Women in Science Award

The Maria Mitchell Association offers an annual award to recognize an individual, program, or organization that encourages the advancement of girls and women in studies and careers in science and technology. Maria Mitchell (1818-1889) was the first woman astronomer and first woman astronomy professor in the United States.

The award may be given in the natural and physical sciences, mathematics, engineering, computer science, or technology. The winner will be chosen by a national jury of distinguished educators and scientists and will receive a cash award of US$5,000. Funding for the award is provided by a grant from the Henry Luce Foundation.

Nominations will be accepted in January 2007. Guidelines and nomination forms are available from the website http://www.mmo.org/category.php?catid=14, or contact the Maria Mitchell Women in Science Award Committee, Maria Mitchell Association, 4 Vestal Street, Nantucket, MA 02554; telephone 508-228-9198.

—From a Maria Mitchell Association announcement

Departments Coordinate Job Offer Deadlines

A group of mathematical sciences departments has adopted an agreement to coordinate deadlines for acceptance of postdoctoral job offers. The purpose is to ensure that applicants do not have to make decisions about job offers before the results of the National Science Foundation (NSF) postdoctoral fellowship competition are announced. The agreement applies only to offers of postdoctoral positions and not tenure-track positions, and only to applicants who are less than two years past the Ph.D. The departments have agreed not to require these applicants to decide about a job offer before Monday, February 12, 2007. The NSF has already agreed that it will complete its review of applications by January 31, 2007, at the latest, and that all awardees of NSF postdoctoral fellowships will receive notification by February 8, 2007. The list of participating departments, together with additional information, may be found on the Web at http://www.ams.org/employment/postdoc-offers.html.

—Ellen Maycock, AMS Meetings and Professional Services Department

Focused Topic Area in Computational Mathematics

The Computational Mathematics Program of the Division of Mathematical Sciences (DMS) at the National Science Foundation has a long history of supporting basic research on numerical methods and algorithm design in large-scale computation for problems in science and engineering. The program has a focused topic area in fiscal year 2007 that addresses longtime behavior of numerical methods in large-scale scientific computing. This area of emphasis should not discourage the community from submitting proposals in the usual wide variety of computation-
related fields, but should be viewed as a special topic of interest.

Unsolicited research proposals to DMS addressing cross-cutting topics in one or more aspects of large-scale scientific computing may be considered in this focused topic area. Novel and creative numerical approaches that address solving real physical problems are invited. Such proposals should be submitted to the Computational Mathematics Program before January 15, 2007. For more information see the NSF website, http://www.nsf.gov/dms/index.jsp?div=DMS. Prior to submitting a proposal, investigators are strongly encouraged to contact the Computational Mathematics Program. The primary contacts are: Leland Jameson, 703-292-4883, ljameson@nsf.gov; Thomas Russell, 703-292-4863, trussell@nsf.gov; and Junping Wang, 703-292-4488, jwang@nsf.gov.

—From a DMS announcement

News from the Clay Mathematics Institute

CMI Annual Meeting

Each year the Clay Mathematics Institute (CMI) holds a meeting at which it presents the Clay Research Awards and lectures on the awardees’ work. In past years this event has been held in November.

Beginning in 2006 the Institute will hold its annual meeting in the spring using an expanded format which includes the awards and a two-day series of ten lectures. The lectures are intended for an audience of nonspecialists and will generally address recent breakthroughs.

The next CMI annual meeting will be held in Cambridge, Massachusetts, May 14-15, 2007. Below is the list of confirmed speakers and topics. Two additional speakers, as well as exact titles of the talks and information about schedule and venue, will be announced later.

Alessio Corti and Shigefumi Mori: Recent progress in higher-dimensional algebraic geometry and minimal models
Alex Eskin: Dynamics of rational billiards
David Fisher: Quasi-isometries and rigidity of solvable groups
Mark Kisin: Modularity of Galois representations
Curt McMullen: Complex dynamical systems
Peter Ozsvath: New invariants in low-dimensional topology
Richard Taylor: The Sato-Tate conjecture

Further information about the meeting and the lectures will be posted at http://www.claymath.org/annual_meeting; for general information about the CMI, see http://www.claymath.org.

Past recipients of the Clay Research Award are: Manindra Agrawal, Manjul Bhargava, Alain Connes, Nils Dencker, Ben Green, Richard Hamilton, Laurent Lafforgue, Gérard Laumon, Bao-Châu Ngô, Oded Schramm, Stanislav Smirnov, Terence Tao, Edward Witten, and Andrew Wiles. Recipients receive a bronze sculpture by Helaman Ferguson and substantial, flexible research support for one year.

Information on past recipients is available at http://claymath.org/research_award/.

CMI 2007 Summer School

The CMI Summer School on “Homogeneous flows, moduli spaces, and arithmetic” will be held at the Centro di Ricerca Matematica Ennio De Giorgi, Pisa, Italy, from June 11 to July 6, 2007.

Designed for graduate students and mathematicians within five years of their Ph.D., the program is an introduction to the theory of flows on homogeneous spaces, moduli spaces, and their many applications.

These flows give concrete examples of dynamical systems with highly interesting behavior and a rich and powerful theory. They are also a source of many interesting problems and conjectures. Furthermore, understanding the dynamics of such concrete systems leads to numerous applications in number theory and geometry regarding equidistributions, diophantine approximations, rational billiards, and automorphic forms.

The school will consist of three weeks of foundational courses and one week of mini-courses focusing on more advanced topics. The foundational courses will be: “Unipotent flows and application” by Alex Eskin and Dmitry Kleinbock, “Diagonalizable actions and arithmetic applications” by Manfred Einsiedler and Elon Lindenstrauss, and “Interval exchange maps and translation surfaces” by Jean-Christophe Yoccoz. Shorter courses will be given by Svetlana Katok and Shahar Mozes. Advanced minicourses will be given by Balint Barczy, Artur Avila, Hee Oh, Akshay Venkatesh, and others.

Funding is available to graduate students and postdoctoral fellows who are within five years of receipt of their Ph.D. Standard support amounts will include funds for local expenses and accommodation plus economy travel.

The organizers of the CMI 2007 Summer School are: Manfred Einsiedler, David Ellwood, Alex Eskin, Dmitry Kleinbock, Elon Lindenstrauss, Gregory Margulis, Stefano Marmi, Peter Sarnak, Jean-Christophe Yoccoz, and Don Zagier.

The deadline for application is February 28, 2007. For more information and an application form see http://www.claymath.org/programs/summer_school/2007/ or contact summerschool@claymath.org; telephone: 617-995-2600.

—CMI announcement

News from the Bernoulli Center

The Bernoulli Center (CIB), funded jointly by the Swiss National Science Foundation and the Swiss Federal Institute of Technology in Lausanne, has issued a call for proposals of two one-semester programs during the period July 1, 2009-June 30, 2010. Those who are interested in organizing a program at the CIB should submit a two-page letter of intent by February 1, 2007. For more details see http://bernoulli.epfl.ch/recruiting.

—Bernoulli Center Announcement
Current Events Session at Joint Meetings

The Joint Mathematics Meetings in New Orleans in January 2007 will feature a special session called "Current Events Bulletin", which will showcase four expository lectures on topics at the frontier of mathematical research. The session is organized by AMS past-president David Eisenbud, director of the Mathematical Sciences Research Institute in Berkeley.

The format for the talks follows the model of the famous Bourbaki Seminars in that mathematicians with especially strong expository skills speak on work not their own and written versions of the talks are prepared beforehand and distributed at the session. But there are some novel features too. The talks are generally more accessible than those of the Bourbaki Seminars, and the coverage is broader and includes applied areas. Often a talk begins with a general, nontechnical presentation of the topic, lasting about twenty minutes. There is a short break, and then the talk continues with a more detailed presentation of how the topic is used in a particular setting. The "Current Events" sessions have drawn large audiences and have turned out to be one of the most popular activities at the Joint Meetings. The written versions of the talks are collected in an attractive booklet distributed at the session.

A tradition has also developed for the talks to appear in print. Some of them have been expanded to appear as articles in the Bulletin of the AMS.

For the session in New Orleans, the speakers and their lecture titles follow:

ROBERT GHRIST, University of Illinois, Urbana-Champaign, Barcodes: The persistent topology of data.

AKSHAY VENKATESH, New York University, Flows on the space of lattices: Work of Einsiedler, Katok and Lindenstrauss.

IZABELLA LABA, University of British Columbia, From harmonic analysis to arithmetic combinatorics.

BARRY MAZUR, Harvard University, The structure of error terms in number theory and an introduction to the Sato-Tate Conjecture.

The session will take place Sunday, January 7, 2007, from 1:00 p.m. to 4:45 p.m. Information about this and other Joint Meetings activities is available on the AMS Meetings website, http://www.ams.org/meetings.

—Allyn Jackson

Erdős Memorial Lectures

In April 2006 Béla Bollobás of the University of Memphis and Cambridge University presented the 2006 Erdős Memorial Lecture at the Central Section Meeting at the University of Notre Dame. The title of his lecture was "Inhomogeneous Random Graphs".

The Erdős Memorial Lectures are presented annually at AMS sectional meetings. This lecture series is made possible through the generosity of Andrew Beal, a Dallas banker who has committed US$100,000 as a prize for the solution of the so-called Beal Conjecture. The AMS holds the prize funds, and Beal has requested that income from the funds be used to support the lecture series. See the webpage http://www.math.unt.edu/~mauldin/beal.html for more information about the Beal Conjecture and prize.

The next Erdős Memorial Lecture will be given by Andrew J. Granville from the Université de Montréal at the 2007 Spring Southeastern Section Meeting in Davidson, NC, in March 2007. Previous Erdős Lecturers are Persi Diaconis, Bernd Sturmfels, Avi Wigderson, Hillel Furstenberg, Carl Pomerance, John H. Conway, and Ronald L. Graham. For further information, see the webpage http://www.ams.org/meetings/erdos-lect.html.

—Allyn Jackson
My Summer at Scientific American

Each year the AMS sponsors a fellow to participate in the Mass Media Fellowship program of the American Association for the Advancement of Science. This program places science and mathematics graduate students in summer internships at media outlets. In the piece below, the 2006 AMS Fellow, Brie Feingold of the University of California, Santa Barbara, describes her experiences during her fellowship at Scientific American magazine. For information about applying for the fellowship, see “Mathematics Opportunities” in this issue of the Notices or visit the website http://ehrweb.aaas.org/massmedia.htm. The application deadline is January 15, 2007.

Words often trigger emotions, and “mathematics” is no exception. A Yahoo search for “I hate math” triggered 158,000 hits. But I was hard-pressed to find another subject equally as disliked. “I hate literature” produced a paltry 300 hits, and even “I hate science” yielded only 14,900. Why does the word “math” elicit revulsion?

While there is no outright propaganda against mathematics, the public lacks reliable information about what mathematics is and who studies it. Whereas many people are familiar with branches of science, most can name few, if any, branches of mathematics. Topology is often confused with topography, algebra is synonymous with what was learned in high school, and real analysis is mostly known for its listing in the college course catalogues as “Real Anal.”

If we were a country with such an unfavorable image, we might try boosting tourism, creating diplomatic ties, and using positive advertising. In this scenario, mathematicians, scientists, and their students are natives of foreign lands; science journalists are tour guides; media consumers are tourists. This summer, I stepped out of my role as native and into the role of guide for those wishing to tour science and math country.

Just as a tour guide is responsible to both locals and tourists, a science writer must balance the interests of both scientists and readers while maintaining friendly relations with each. I was beholden to Scientific American’s readers, who spend an average of 71 minutes reading up to 130 pages of articles and ads. As short a time as this may seem, it is longer than the time that magazine buyers devote to reading the Economist or Reader’s Digest.

On the other side of the equation, the researchers who write for Scientific American are well known in their fields and usually write for journals read only by their colleagues. Staff editors write the remaining articles according to their interests and expertise, thus, I interned at a fairly elite touring agency where both tourists and tour guides were willing to travel to remote areas.

But even my editors complained that good math stories were too few and too difficult to find. Were it not for Square One (a television show I watched on PBS), one might think Mathland had not sent any photos of the beautiful scenery or encouraged any visits to its regional monuments. Some may argue that we need new inhabitants (math students), not tourists (math fans). But many students arrive in Mathland with no perspective. They visit one city—for example, Algebra—for a year, where one family (a few math teachers) hosts them. But what if they took a few side trips through Combinatorics, Graph Theory, or even Differential Equations? One good tour could inspire subsequent longer visits and eventually even citizenship. The science writer can initiate that chain of events by giving the first tour.

From my first day as an intern, I looked forward to writing a story that would both pique readers’ interest and explain new ideas in mathematics. Were I looking for a biology, chemistry, or physics story, I might find ideas on Eurekalert, an Internet resource specifically for science journalists where public information offices and organizations post catchy summaries of recent research. Or I could look at the weekly “tip sheets” provided by the Proceedings of the National Academy of Sciences. But in my eight weeks of internship, I remember only one mathematics story posted in such a manner. So at the suggestion of my mentor, Mariette DiChristina, I hopped on the subway and interviewed mathematicians at the Courant Institute at New York University. I called professors whose websites described applications of topology (my field of interest). During my time at Scientific American I was able to use only a small fraction of the information I gathered, but thanks to those discussions I have some ideas for future articles.

To set up a viable trip to Mathland, I needed to collaborate with a local who would share directions as well as local color. Even amiable and available locals often assumed that I already knew the major landmarks and had the equipment necessary for the trip. As scientific papers are naturally addressed to the locals, such papers cannot serve as a guide for tourists, and even I used them only as prompts to guide my interviews. Of course, the best way to enjoy the rugged terrain is by traveling there oneself: diving into the lakes, exploring the forests, digging in the dirt. The best way to enjoy math is by doing it. Without that firsthand experience, a tour guide is needed to describe those activities and their power, to give an aerial view, and to point out the amazing forces at work. I tried to perform the role of tour guide by extracting from scientists essential characteristics of their research, their inspiration for conducting it, and the landscape in which it was situated.

Eventually my editor accepted one of my math-related stories. While talking to mathematician Leslie Greengard at the Courant Institute, I learned about his fast algorithms research and about the video inpainting research of computer scientist Guillermo Sapiro at the University of Minnesota. In October 2006 my one-page article titled “Inpaint by Number” described how Sapiro used partial differential equations in an algorithm to automatically edit video. The article could contain no equations or unexplained jargon. And the phrase “partial differential equations” was considered jargon. Although I relied heavily on analogies and indirect means to describe the algorithm, it occurred to me that even technical proofs leave some explorations up...
to the reader. As a guide, I aimed to appeal to the reader's sense of the aesthetic as well as the pragmatic and to provoke further investigation. I was pleased that my editor retained the words "partial differential equations" (even if they were in parentheses) in the article rather than simply replacing them with "mathematics".

Aside from writing about video software, I wrote other short pieces about Caesarean births, schizophrenia, American social life, robots, and engineered tissue. I also transcribed and shortened interviews conducted by editor Steve Mirsky with Nobel Prize winners in medicine and physics. During one of these transcriptions I learned the confusion a little jargon can create, especially in radio. As I was listening to the tape, I heard the speaker say something like "I like to say that these computers go Teraclops speed in order to..." Not knowing what he was talking about, I dutifully searched "Teraclops" on the Internet, thinking that it might be some sort of mythical creature or dinosaur. Twenty minutes later I decided that I must have heard the word incorrectly. Maybe he was saying "Terafllops". Thinking that this made even less sense, I was surprised to read that "TeraFLOPS" means $10^{12}$ floating point operations per second. Had the speaker used simpler language to deliver the same idea, I would have avoided the detour I took.

After my summer of interviewing, searching, and composing, I no longer become defensive on hearing the statement "I hate math." Instead, I feel the urgent need to respond with the sincere question, "What kind of math do you hate?" By asking such an essential question, I issue a passport to Mathland, forcing the recipient to explain his/her thoughts more clearly. Having observed my native land from an outsider's perspective, I am now more prepared to encourage my students to go beyond being tourists and to explore the terrain independently. Through this internship I discovered new reasons to study mathematics and new ways to think about my role as a mathematician.

—Brie Feingold, University of California, Santa Barbara
Reference and Book List

The Reference section of the Notices is intended to provide the reader with frequently sought information in an easily accessible manner. New information is printed as it becomes available and is referenced after the first printing. As soon as information is updated or otherwise changed, it will be noted in this section.

Contacting the Notices
The preferred method for contacting the Notices is electronic mail. The editor is the person to whom to send articles and letters for consideration. Articles include feature articles, memorial articles, communications, opinion pieces, and book reviews. The editor is also the person to whom to send news of unusual interest about other people's mathematics research.

The managing editor is the person to whom to send items for "Mathematics People", "Mathematics Opportunities", "For Your Information", "Reference and Book List", and "Mathematics Calendar". Requests for permissions, as well as all other inquiries, go to the managing editor.

The electronic-mail addresses are notices@math.ou.edu in the case of the editor and notices@ams.org in the case of the managing editor. The fax numbers are 405-325-7484 for the editor and 401-331-3842 for the managing editor. Postal addresses may be found in the masthead.

Upcoming Deadlines
December 15, 2006: Applications for AMS Epsilon Fund. See the website http://www.ams.org/outreach/epsilon.html or contact Membership and Programs Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294; telephone 800-321-4267, ext. 4170; email: prof-serv@ams.org.

Where to Find It
A brief index to information that appears in this and previous issues of the Notices.
AMS Bylaws—November 2005, p. 1239
AMS Email Addresses—February 2006, p. 251
AMS Ethical Guidelines—June/July 2006, p. 701
AMS Officers 2005 and 2006 (Council, Executive Committee, Publications Committees, Board of Trustees)—May 2006, p. 604
AMS Officers and Committee Members—October 2006, p. 1076
Conference Board of the Mathematical Sciences—September 2006, p. 911
Information for Notices Authors—June/July 2006, p. 696
Mathematics Research Institutes Contact Information—August 2006, p. 798
National Science Board—January 2007, p. 57
New Journals for 2004—June/July 2006, p. 697
NRC Board on Mathematical Sciences and Their Applications—March 2006, p. 369
NRC Mathematical Sciences Education Board—April 2006, p. 488
NSF Mathematical and Physical Sciences Advisory Committee—February 2006, p. 255
Program Officers for Federal Funding Agencies—October 2006, p. 1072 (DoD, DoE); December 2006 p. 1369 (NSF)
Stipends for Study and Travel—September 2006, p. 913


January 10, 2007: Applications for AAUW Selected Professions Fellowships. See http://www.aauw.org/fga/fellowships_grants/selected.cfm or contact the AAUW Educational Foundation, Selected Professions Fellowships, P.O. Box 4030, Iowa City, IA 52243-4030.


February 1, 2007: Applications for AWM Travel Grants and Mentor-Travel Grants. See http://www.awm-math.org/travelgrants.html; telephone 703-934-0163; email: awm@math.umd.edu; or contact Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030.


March 1, 2007: Applications for National Academies Christine Mirzayan Graduate Fellowships for the summer program. See http://www7.nationalacademies.org/policyfellows or contact The National Academies Christine Mirzayan Science and Technology Policy Graduate Fellowship Program, 500 Fifth Street, NW, Room 508, Washington, DC 20001; telephone: 202-334-2455; fax: 202-334-1667; email: policyfellows@nas.edu.

April 15, 2007: Applications for AMS “Math in Moscow” Scholarships for fall 2007. See http://www.mccme.ru/mathimmoscow or contact Math in Moscow, P.O. Box 524, Wynnewood, PA 19096; fax +7095-291-65-01; email: mim@mccme.ru. For information and application forms for the AMS scholarships see http://www.ams.org/outreach/mimmoscow.html or contact Math in Moscow Program, Membership and Programs Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294; email: student-serv@ams.org.

May 1, 2007: Applications for AWM Travel Grants. See http://www.awm-math.org/travelgrants.html; telephone 703-934-0163; email: awm@math.umd.edu; or contact Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030.

June 1, 2007: Applications for National Academies Christine Mirzayan Graduate Fellowships for the fall program. See http://www7.nationalacademies.org/policyfellows or contact The National Academies Christine Mirzayan Science and Technology Policy Graduate Fellowship Program, 500 Fifth Street, NW, Room 508, Washington, DC 20001; telephone: 202-334-2455; fax: 202-334-1667; email: policyfellows@nas.edu.


October 1, 2007: Applications for AWM Travel Grants. See http://www.awm-math.org/travelgrants.html; telephone 703-934-0163; email: awm@math.umd.edu; or contact Association for Women in Mathematics, 11240 Waples Mill Road, Suite 200, Fairfax, VA 22030.

July 1, 2009-30, 2010: Call for proposals for programs at the Bernoulli Center. See “Mathematics Opportunities” in this issue.

National Science Board

The National Science Board is the policymaking body of the National Science Foundation. Listed below are the current members of the NSB. For further information, visit the website http://www.nsf.gov/nsb/.

Mark R. Abbott
Dean and Professor
College of Oceanic and Atmospheric
Sciences
Oregon State University

Dan E. Arvizu
Director and Chief Executive
National Renewable Energy
Laboratory (NREL)

Barry C. Barish
Linde Professor of Physics Emeritus
Director, Laser Interferometer
Gravitational-Wave Observatory
(LIGO)

California Institute of Technology

Steven C. Beering (Chair)
President Emeritus
Purdue University
Reference and Book List

Cornilla P. Benbow
Patricia and Rodes Hart Dean of Education and Human Development
Peabody College of Education and Human Development
Vanderbilt University

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Seattle, Washington

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University of North Carolina at Chapel Hill

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Dean for Undergraduate Education
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Massachusetts Institute of Technology

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Center for Solar Terrestrial Research
Department of Physics
New Jersey Institute of Technology

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American Association for the Advancement of Science

Douglas D. Randall
Professor of Biochemistry
and Thomas Jefferson Fellow
Director, Interdisciplinary Plant Group
University of Missouri

Arthur K. Reilly (Consultant)
Senior Director
Cisco Systems, Inc.

Jon C. Strauss
President Emeritus
Harvey Mudd College

Kathryn D. Sullivan (Vice Chair)
Science Advisor
Center of Science and Industry
Columbus, Ohio

Thomas N. Taylor
Roy A. Roberts Distinguished Professor
Department of Ecology and Evolutionary Biology
Curator of Paleobotany in the Natural History Museum and Biodiversity Research Center
University of Kansas

Richard F. Thompson
Keck Professor of Psychology and Biological Sciences
University of Southern California

Jo Anne Vasquez
Director of Public Policy
Center for Research on Education in Science, Mathematics, Engineering, and Technology

Arizona State University
Arden L. Bement Jr.
(member ex officio)
Director
National Science Foundation

Michael P. Crosby
Executive Officer and Office Director
National Science Board

Book List
The Book List highlights books that have mathematical themes and are aimed at a broad audience potentially including mathematicians, students, and the general public. When a book has been reviewed in the Notices, a reference is given to the review. Generally the list will contain only books published within the last two years, though exceptions may be made in cases where current events (e.g., the death of a prominent mathematician, coverage of a certain piece of mathematics in the news) warrant drawing readers' attention to older books. Suggestions for books to include on the list may be sent to notices-booklist@ams.org.

*Added to “Book List” since the list's last appearance.


Pursuit of Genius: Flexner, Einstein, and the Early Faculty at the Institute
CALL FOR PAPERS: Authors are cordially invited to submit papers to http://www.dynamicpublishers.com, A. Abraham, School of Computer Science, Chung-Ang University, 221, Heukseok-dong,Dongjak-gu, Seoul 156-756, Korea

ISSN 1554-1010 Subscription Rate for Vol 1, 2006 (4 Issues): Library/Inst.: US$ 300.00; Personal: US$ 100.00, S/H

NEURAL, PARALLEL & SCIENTIFIC COMPUTATIONS

CALL FOR PAPERS: Authors are cordially invited to submit papers to http://www.dynamicpublishers.com, M. SAMBANDHAM, Department of Mathematics, Morehouse College, Atlanta, GA 30314, USA.

ISSN 1061-5369. Subscription Rate for Vol 14, 2006 (4 Issues): Library/Inst.: US$ 400.00; Personal: US$ 100.00, S/H

DYNAMIC SYSTEMS & APPLICATIONS

CALL FOR PAPERS: Authors are cordially invited to submit papers to http://www.dynamicpublishers.com, M. SAMBANDHAM, Department of Mathematics, Morehouse College, Atlanta, GA 30314, USA, http://www.dynamicpublishers.com/

ISSN 1056-2176. Subscription Rate for Vol 15, 2006 (4 Issues): Library/Inst.: US$ 400.00; Personal: US$ 100.00, S/H

Reference and Book List


Mathematics Calendar

The most comprehensive and up-to-date Mathematics Calendar information is available on e-MATH at http://www.ams.org/mathcal/.

January 2007

*8–13 Geometry, Topology, and their interactions, Morelia, Mexico.
Description: This conference will bring together mathematicians who use geometric methods to study topological problems and mathematicians who use topological methods to study geometric problems, for example, geometric group theorists with high dimensional topologists. The conference is held in honor of the mathematical contributions of Tom Farrell and Lowell Jones.
Speakers: Alejandro Adem, Igor Belegradek, Ken Brown, Fred Cohen, Chris Connell, Frank Connolly, Mike Davis, Tsachik Gelander, Ian Hambleton, Luis Hernandez-Lamoneda, Bruce Hughes, Tadeusz Januszkiewicz, Lizhen Ji, Qayum Khan, Bruce Kleiner, Chris Leininger, Peter Linell, Bob Oliver, Ionne Ortiz, Erik Pedersen, Frank Quinn, M. S. Raghunathan, Holger Reich, Xiaochun Rong, Ben Schmidt, Anna Wienhard, Kevin Wortman, and Guoliang Yu.
Contact: If you have any questions, contact one of the organizers: Jim Davis (Indiana University), jfdavis©indiana.edu; Daniel Juanmathematical contributions of Tom Farrell and Lowell Jones.
Information: http://www.math.indiana.edu/~jfdavis/MoreliaConf.html.

*15–19 Higher Structures in Geometry and Physics Conference in honor of Murray Gerstenhaber's 80th and Jim Stasheff's 70th birthdays, IHÉS, Paris, France.
Speakers: Paul Baum (Penn State), Lawrence Breen (Paris 13), Giovanni Felder (ETH Zurich), Kenji Fukaya (Kyoto), Ezra Getzler (Northwestern), Anthony Giaquinto (Loyola U, Chicago), Simone Gutt (UL Brussels), Johannes Huebschmann (Lille 1), Hiroshi Jaffr (Kyoto), Mikhail Kapranov* (Yale), Bernhard Keller (Paris 7), Maxim Kontsevich (IHES), Yvette Kosmann-Schwarzbach (Polytechnique), Janko Latschev (Humboldt U, Berlin), Jean-Louis Loday (Strasbourg I), Sergei Merkulov (Stockholm), Pierre Schapira (Paris 6), Daniel Sternheimer (Dijon), Dennis Sullivan (CUNY), Charles Torossian (ENS Paris), Boris Tsygan (Northwestern), Alan Weinstein (UC Berkeley).
Information: http://www.math.psu.edu/ging/IEP07/.

*18–19 DIMACS Workshop on Information Security Economics, DIMACS Center, CoRE Bldg, Rutgers University, Piscataway, New Jersey.
Description: The goal of this workshop is to expand the interest in economics of information security. Topics of interest include economics of identity and identity theft, liability, torts, negligence, other legal incentives, game theoretic models, security in open source and free software, cyber-insurance, disaster recovery, reputation economics, network effects in security and privacy, return on security investment, security risk management, security risk perception both of the firm and the individual, economics of trust, economics of vulnerabilities, economics of malicious code, economics of electronic voting security, and economic perspectives on spam.
Local Arrangements: Workshop Coordinator, DIMACS Center, workshop@dimacs.rutgers.edu, 732-445-5928.
Information: http://dimacs.rutgers.edu/Workshops/InformationSecurity/.

*22–26 Geometric linearization of graphs and groups, Centre Bernoulli, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland.
Topics: Embeddings of graphs, groups and metric spaces in Hilbert and Banach spaces, with applications.

This section contains announcements of meetings and conferences of interest to some segment of the mathematical public, including ad hoc, local, or regional meetings, and meetings and symposia devoted to specialized topics, as well as announcements of regularly scheduled meetings of national or international mathematical organizations. A complete list of meetings of the Society can be found on the last page of each issue.
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 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 every third issue until it has been held and a reference will be given in parentheses to the month, year, and place of the issue in which the complete information appeared. Asterisks (*) mark those announcements containing new or revised information.
In general, announcements of meetings and conferences held in North America carry only the 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. In any case, if there is any application deadline with respect to participation in the meeting, this fact should be noted. All communications on meetings and conferences in the mathematical sciences should be sent to the Editor of the Notices in care of the American Mathematical Society in Providence or electronically to notices@ams.org or mathcal@ams.org.
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 no more than one issue of the Notices prior to the meeting in question. To achieve this, listings should be received in Providence eight months prior to the scheduled date of the meeting. The complete listing of the Mathematics Calendar will be published only in the September issue of the Notices. The March, June/July, and December issues will include, along with new announcements, references to any previously announced meetings and conferences occurring within the twelve-month period following the March issue. New information about meetings and conferences that will occur later than the twelve-month period will be announced once in full and will not be repeated until the date of the conference or meeting falls within the twelve-month period.
The Mathematics Calendar, as well as Meetings and Conferences of the AMS, is now available electronically through the AMS website on the World Wide Web. To access the AMS website, use the URL: http://www.ams.org/.
Mathematics Calendar

Speakers: Indira Chatterji (The Ohio State University); Alexander Dranishnikov (University of Florida); Cornelia Drutu (Université Lille I); Misha Gromov (IHES); Erik Guentner (University of Hawaii, Manoa); Nati Linial (The Hebrew University of Jerusalem); Jiri Matousek (The Charles University, Prague); GrahamNiblo (University of Southampton); Yann Ollivier (ENS Lyon); Stratos Prassidis (Canisius College, New York); Mark Sapir (Vanderbilt University); Amin Shokrollahi (EPFL, Lausanne); Roman Segera (Vanderbilt University); Jean-Philippe Vert (Ecole des Mines de Paris); Gerhard Wanner (Université de Genève); Guoliang Yu (Vanderbilt University)


Information: http://bernoulli.epfl.ch/graphs/conf.html

February 2007

*10-11 14th Southern California Geometric Analysis Seminar,
University of California, San Diego, California.

Description: Graduate students, fresh Ph.D.s and minorities are especially welcome to join our annual seminar.

Funding: Partial financial support is available.

Information: http://www.math.ucla.edu/~acgan/

*15-16 February Fourier Talks, University of Maryland, College
Park, Maryland.

Description: Each year the two-day February Fourier Talks, organized by the Norbert Wiener Center in the Department of Mathematics at the University of Maryland, College Park, feature a diverse array of invited talks in the field of Harmonic Analysis and Applications. A single track of presentations from top academic, industry, and government researchers is scheduled, allowing ample time for interaction with other participants.

Information: For updated details and registration information, please see the conference site at http://www.norbertwiener.umd.edu/FFT/

*24 Combinatexas’07: Combinatorics in the South Central U.S.,
Texas A&M University, College Station, Texas.

Program and Speakers: This one-day conference will focus on
Algebraic Combinatorics and Algebraic Graph Theory.

Confirmed speakers: Ioana Dumitriu (University of Washington),
Ari Duval (University of Texas, El Paso), Miguel Mendez (Venezuelan Institute of Scientific Research), Douglas West (University of Illinois), Herbert Wilf (University of Pennsylvania).

Deadline: February 15, 2007. There is no registration fee for the conference.


March 2007

*10-13 2007 ASL Annual Meeting, University of Florida, Gainesville,
Florida.

Invited Speakers: A. Blass, M. Benedikt, N. Dobrinen, N. Greenberg,

18th Annual Goedel Lecturer: E. Hrushovski.

Special Sessions: Computability Theory (N. Greenberg) Algebraic

Information: http://www.math.ufl.edu/~jal/logic/year/asl/

*22-25 Analysis on Homogeneous Spaces, Tucson, Arizona.

Goal: The main goal of the conference is to gather leading
specialists from several different fields, which all relate to homo­
genous spaces, to foster cross-disciplinary interaction, communicate recent advances and assist younger participants in develop­
successful research strategies. Women and minority participants are especially encouraged to apply.

Principal Speakers: Robert Bryant (Duke), Michael Gekhtman (Notre
Dame), Simon Gindikin (Rutgers), Carolyn Gordon (Dartmouth),
James Isenberg (Oregon), Michael Kapovich (UC Davis), Gestur
Olafsson (Louisiana State), Nolan Wallach (UCSD).

Deadlines: Travel and accommodation support is available for
advanced graduate students and young researchers without their
own travel funds. Deadline for applications is January 10, 2007.
Deadline for contributed talks is December 20, 2006.

Organizers: Philip B. Foth, David Glickenstein, and Kirti Joshi (Uni­
versity of Arizona).

Information: http://math.arizona.edu/~abs/.

*26-29 International Colloquium On Stochastic And Potential
Analysis, Abououawas Hotel, Hammamet, Tunisia.

Main Topics: Stochastic Analysis-Potential Theory-Probability the­
ory.

Invited Speakers: Albert Shiryaev (Moscow, Russia), Marta Sanz
Solé (Barcelona, Spain), Tusheng Zhang (Manchester, U.K.), Wolfhard
Hansen (Bielefeld, Germany), Youssef Ouknine (Marrakesh, Mor­
occo), Henri Schurz (Southern Illinois-U.S.A), Eckhard Platen (Syd­
ney, Australia), Dominique Bakry (Toulouse, France), Lucian Beznea
(Bucharest-Romania), Zhen-Qing Chen (Washington, U.S.A.), Klaus
Janssens (Dusseldorf-Germany), Said Hamadene (Lemans, France).

Deadline: The deadline for registration is February 26, 2007.

Information: email: ibtiessem_hdhiri@yahoo.fr.

April 2007

*9-13 Geometry of Integrable Systems, Hanoi University of Educa­
tion, Hanoi, Vietnam.

Topics: Various notions of integrability; Local and global properties of integrable (non)Hamiltonian systems in finite and infinite dimen­
sions; Obstructions to integrability; Quantum integrable systems;
Perturbations of integrable systems.

Speakers: (* ) to be confirmed. Michele Audin (Univ. of Stras­
bourg, France), Alexei Bolsinov (Loughborough Univ., UK), Francesco
Calogero (Univ. “La Sapienza”, Italy), Boris Dubrovin (*SISIA, Italy),
Holger Dohn (Loughborough Univ., UK), Gregorio Falqui (*Univ.
Milano, Italy), Jean-Pierre Françoise (Univ. Paris 6, France), Jarino
Hietarinta (Univ. of Turku, Finland), Thomas Kappeler (Univ. of
Zurich, Switzerland), Yuji Kodama (Ohio State Univ., USA), Juan
Morales (UP Barcelona, Spain), Peter Olver (*Univ. Minnesota, USA),
Duong Hong Phong (Columbia Univ., USA), Jean-Pierre Ramis (Univ.
of Toulouse, France), Jonathan Robbins (Univ. Bristol, UK), Tudor
Ratiu (EPFL, Switzerland), San Vu Ngoc (Univ. of Grenoble, France),

Visa Information: Most foreigners need a visa to enter Vietnam, but it is very
easy to obtain the visa in general. We will take care of it for you, or
if you wish you can ask for a tourist visa by yourself.

Deadlines: In case you want us to take care of your hotel and visa,
then we need your passport information before January 31, 2007.

istration: Please send an email to Nguyen Tien Zung (tienzung AT
picard.ups-tlse.fr) if you are interested in the conference.

Differential Geometry, Brussels, Belgium.

Organizer: K. U. Brussel, K. U. Leuven, EHSAL.


*18-20 DIMACS Workshop on Discrete Mathematical Problems in
Computational Biomedicine, DIMACS Center, CoRE Bldg, Rutgers
University, Piscataway, New Jersey.

Short Description: How to process very large volumes of high­
dimensional data and discover vital information contained in those
data are among the most challenging issues in computational
biomedicine. These data could be experimental data in protein
structures, spatial-temporal data in medical imaging, and DNA
sequences in human genome database, to name just a few. Mathematical modeling and computer technologies are playing important roles in this investigation. We are particularly interested in discrete problems in the development and deployment of this area.

- 18-20 Mathematical modeling and computer technologies are playing important roles in this investigation. We are particularly interested in discrete problems in the development and deployment of this area.

- 21-22 Graduate Student Topology Conference, University of Chicago, Chicago, Illinois.

**Purpose:** Of this conference is to gather graduate students in topology and provide them with the opportunity to give talks, communicate recent advances, exchange ideas, and meet other students in their field. The schedule will consist of keynotes lectures by Ib Madsen (Aarhus) and Haynes Miller (MIT), and many student talks. Talks should be accessible to an audience of graduate students of varying levels and need not be about original research, but simply something the speaker enjoys and wishes to share. Some (NSF) funding will be available, but we encourage participants to ask their own departments for support.

**Keynote Speakers:** Ib Madsen (Aarhus) and Haynes Miller (MIT).

**Deadlines:** Registration will begin in December.

**Funding:** Please submit your registration by February 23, 2007, to be considered for funding.

**Information:** [http://www.math.uchicago.edu/~gcanc/](http://www.math.uchicago.edu/~gcanc/)

### May 2007

- **14-18 Conference on Cryptography and Digital Content Security**, Centre de Recerca Matematika, Barcelona, Spain.

**Scientific Committee:** Touraj Ebrahimi, Franck Leprevost.

**Co-ordinators:** Enric Nart, Jorge Luis Villar.


**Information:** [http://www.crm.cat/ContentSecurity/](http://www.crm.cat/ContentSecurity/)


**Description:** The Rényi Institute will host a focused workshop on the application of p-adic techniques to the study of rational points on varieties defined over finite, local or global fields. The aim is to present the latest developments in the area and to stimulate further research. Graduate students and postdocs interested in this rapidly developing field are also warmly welcome.

**Speakers:** Pierre Berthelot (Rennes), Amon Besser (Be'er Sheva and Princeton), Antoine Chamblert-Loir (Rennes), Bruno Chiarellotto (Padova), Kiran S. Kedlaya (Boston), Minhyong Kim (West Lafayette), Vadim Vologodsky (Chicago).

**Information:** [http://www.renyi.hu/conferences/padic/](http://www.renyi.hu/conferences/padic/)

### June 2007

- **27-June 2 Spring School on Analysis: Function Spaces, Inequalities and Interpolation**, Paseky nad Jizerou, Czech Republic.

**Main speakers:** Grahame Bennett, Bjarne Javeth, Mario Milman.

**Language:** English.

**Grants:** Probably support for a limited number of students.

### Deadlines

**For reduced fee and support:** February 15, 2007.

**http://www.karlin.mff.cuni.cz/katedry/kma/as/jun07/**

**28-June 2 Advanced Course on Group-Based Cryptography**, Centre de Recerca Matematika, Barcelona, Spain.

**Co-ordinator:** Enric Ventura.

**Speakers:** Vladimir Shpilrain, City College of New York, Non-commutative Cryptography; Alexei Miasnikov, McGill University, Complexities of Algorithms.

**Information:** [http://www.crm.cat/AGroupBased/](http://www.crm.cat/AGroupBased/)

**29-30 DIMACS Workshop on Computational Methods for Predicting Outcome in Cancer**, DIMACS Center, CoRE Bldg, Rutgers University, Piscataway, New Jersey.

**Purpose:** The purpose of the workshop will be to consider new computational models for validating predictive factors and combining them into predictive systems. The workshop will bring together investigators and practitioners to exchange research ideas and interests, as well as to discuss new directions and identify open problems in the development and application of cancer predictive systems for personalized medicine.

**Description:** The practice of medicine depends on the science of prediction. Prediction depends on clinical observations or laboratory variables or factors that are linked to outcome. These factors can be anatomic, histological, and/or molecular. Found in all specialties of medicine, predictive factors take on significant clinical meaning when treatment options are available, and they become more important if treatment options are limited and not always effective.

**Purpose:** The purpose of the workshop will be to consider new computational models for validating predictive factors and combining them into predictive systems. The workshop will bring together investigators and practitioners to exchange research ideas and interests, as well as to discuss new directions and identify open problems in the development and application of cancer predictive systems for personalized medicine.

**Local Arrangements:** Workshop Coordinator, DIMACS Center, workshopds@dimacs.rutgers.edu, 732-445-9292.

**Information:** [http://www.math.rutgers.edu/Workshops/ComputationalMethods/](http://www.math.rutgers.edu/Workshops/ComputationalMethods/)

### 4-15 Moduli spaces of Riemann surfaces and related topics, Centre de Recherches Mathématiques, Montreal, Canada.

**Topics:** Moduli spaces and Frobenius manifolds, Hurwitz spaces and Hurwitz numbers, Spaces of Abelian and quadratic differentials and billiards in polygons, Weil-Petersson geometry, Moduli spaces, Graph combinatorics and random matrices, Riemann-Hilbert problems, Determinants of Laplacians.

**Invited Speakers:** Igor Artamonik (Moscow), Indranil Biswas (Tata), Alexander Bobenko (Berlin), Leonid Chekhov (Steklov, Moscow), Boris Dubrovin (SISSA), Vladimir Fock (JTEP), Ian P. Goulden (Waterloo), Tamara Grava (SISSA), John Harnad (Concordia), Claire Herzberg (Stuttgart), Jacques Hurbubiste (McGill), Ilia Itenberg (Strasbourg), David Jackson (Waterloo), Lisa Jeffrey (Toronto), Maxim Kazarian (Moscow), Christian Klein (MPG Leipzig), Alexey Kotokov (Montreal), Sergei K. Lando (Moscow), Marta Mazzocco (Manchester), Andrew McIntyre (CRM, Concordia), John McKay (Concordia), Todor Milanov (Stanford), Ian Morrison (Fordham), Robert Penner (USC), Emma Previato (Boston U), Sergei Shadrin (Moscow and Paris), Mikhail Shapiro (Michigan State U), Vasilisa Shramchenko (Oxford), Ivan Strachan (Glazgon), Leon Takhtajan (Stone Brooklyn), Marc Troyanov (EPFL, Switzerland), Taro Vakil (Stanford), Richard A. Wentworth (John Hopkins), Scott Wolpert (Michigan), Ken-ichi Yoshikawa (Tokyo), Peter Zograf (St.Petersburg), Dimitri Zvonkin (Jussieu, Paris).

**Information:** [http://www.mathstat.concordia.ca/faculty/bartolo/Conference/index.html](http://www.mathstat.concordia.ca/faculty/bartolo/Conference/index.html)

### 5-8 Days on Diffraction-2007, St. Petersburg, Russia.

**Scope:** Mathematical aspects of wave propagation, asymptotic techniques, electromagnetics: sound propagation and vibration, elastic waves and seismology, nonlinear waves, microwave and quantum waveguides, inverse problems, numerical approaches, non-stationary phenomena.
Mathematics Calendar

Information: http://math.nwu.edu/DM/.

* 7-9 Ordinal and Symbolic Data Analysis (OSDA) 2007, Ghent University, Ghent, Belgium.
Call for Papers: This is a preliminary announcement. The first announcement, with a list of invited speakers and a call for contributed talks, will be mailed in November 2006.
Theme: The common theme of the conferences is motivated by increase oil production.

Hua Xin Lin, Christopher Wyom (University of California at Santa Barbara, Constantine Dafermos (Brown University), Maria Esteban (Université Paris Dauphine), Craig Evans (University of California at Berkeley), Nicola Fusco (Université di Napoli), Patrick Gerard (Université Paris Sud), Roland Glowinski (University of Houston), Peter Lax (New York University), Pierre-Louis Lions (Collège de France), Nadir Masmoudi (New York University), Yves Meyer (École Normale Supérieure de Cachan), Gaëteon Milton (University of Utah), Louis Nirenberg (New York University), Olivier Pironneau (Université Pierre et Marie Curie), Tristan Riviè`re (ETH Zurich), Evariste Sanchez-Palencia (Université Pierre et Marie Curie), Denis Serre (École Normale Supérieure de Lyon), Didier Smets (Université Pierre et Marie Curie), Vsevolod Solonnikov (Steklov Institute & Università di Ferrara), Mete Soner (Koc University), Vladimir Sverak (University of Minnesota),
Information: http://www.crm.umontreal.ca/Algebra.

* 11-15 Barcelona Conference on C*- Algebras and Their Invariants, Centre de Recerca Matemàtica, Barcelona, Spain.
Co-ordinator: Ivo Dellacherie.
Information: email: thierry.marchant@vassar.edu.

* 18-24 Algebraic Topology: Old and New (M. M. Postnikov Memorial Conference), Stefan Banach International Mathematical Center (Bedlewo, Poland).
Information: email: at2007@vassar.edu.

Description: Oil production and the factors involved in the process are of prime importance in today's world. The understanding and modeling of the physical and chemical processes are necessary to increase oil production. It is also a very difficult subject since oil reservoirs are very complex. Simulation of flow inside a porous medium involves dealing with several phases, multiple scales and heterogeneity. Among the topics to be covered are the physical and chemical properties of reservoirs, mathematical and numerical models of multiphase flow in porous media, and geostatistics and stochastic differential equations.
Main Speakers: Zhangxin Chen (Southern Methodist University), Martin Diaz (Universitario de Iberia), Malgorzata Peszynska (University of Wyoming) and Mohammad Piri (University of Wyoming).
Information: B. Chen-Chapteiner, Department of Mathematics, University of Wyoming, Laramie, Wyoming 82071; email: bchen@uwyo.edu; http://www.uwyo.edu/MME/

http://www.crm.cat/enumeration.

* 25-30 International Conference "Algebraic Analysis and Around" in honor of Professor Masaki Kashiwara's 60th birthday, Kyoto University, Kyoto, Japan.

Topics: Algebraic analysis (microlocal analysis, representation theory, D-modules, crystal basis, applications to number theory and algebraic geometry).

July 2007

Speakers: Giovanni Alberti (Università di Pisa), Abbas Bahri (Rutgers University), Yann Brenier (Université de Nice), Luis Caffarelli (University of Texas at Austin), Michael Crandall (University of California at Santa Barbara), Constantine Dafermos (Brown University), Maria Esteban (Université Paris Dauphine), Craig Evans (University of California at Berkeley), Nicola Fusco (Université di Napoli), Patrick Gerard (Université Paris Sud), Roland Glowinski (University of Houston), Peter Lax (New York University), Pierre-Louis Lions (College de France), Nadir Masmoudi (New York University), Yves Meyer (Ecole Normale Superieure de Cachan), Gaëteon Milton (University of Utah), Louis Nirenberg (New York University), Olivier Pironneau (Université Pierre et Marie Curie), Tristan Riviè`re (ETH Zurich), Evariste Sanchez-Palencia (Université Pierre et Marie Curie), Denis Serre (Ecole Normale Superieure de Lyon), Didier Smets (Université Pierre et Marie Curie), Vsevolod Solonnikov (Steklov Institute & Università di Ferrara), Mete Soner (Koc University), Vladimir Sverak (University of Minnesota),
Information: http://www.crm.umontreal.ca/Algebra.

* 13-19 1007 ASL European Summer Meeting (Logic Colloquium '07), Wrocław, Poland.
Information: email: asl@vassar.edu.

December 2007

* 7-11 Fourth Pacific Rim Conference on Mathematics: Celebrating the Tenth Anniversary of the Liu Bie Ju Centre for Mathematical Sciences, City University of Hong Kong, Hong Kong.
Description: The Conference, which is open to all areas of mathematics, will have eight Focus Sessions. Each Focus Session will include a Plenary Speaker and several invited speakers. In addition, the focus sessions will give talks to celebrate the Tenth Anniversary of the Liu Bie Ju Centre for Mathematical Sciences, City University of Hong Kong.
Plenary Speakers: Jean-Pierre Bourguignon (Institut des Hautes Etudes Scientifiques), Philippe G. Ciarlet (City Univ. of Hong Kong), Hyo Chul Kim (Tianjin National Univ.), Ta-Tsien Li (Fudan Univ.), Tianping Liu (Stanford Univ.), Gaven Martin (Univ. of Auckland), Amnon Neeman (Australian National Univ.), Michael J.D. Powell (Univ. of Cambridge), Steve Smale (Toyota Technological Institute, Chicago), Seiji Ukai (City Univ. of Hong Kong), Zhaohu Vafa (Tata Institute of Fundamental Research), Roderick W.-C. Wong (City Univ. of Hong Kong), Paul Yang (Princeton Univ.), Xiping Zhu (Zhejiang Univ.), Xiping Zhang (Peking Univ.),
For enquiries, please e-mail to Ms Sophie Xie at MCLBJ@cityu.edu.hk. Note: Registration is compulsory.

NOTICES OF THE AMS
VOLUME 54, NUMBER 1
64
New Publications Offered by the AMS

Algebra and Algebraic Geometry

Algebra and Its Applications
Dinh V. Huynh, S. K. Jain, and S. R. López-Permouth, Ohio University, Athens, OH, Editors

This volume consists of contributions by speakers at a Conference on Algebra and Its Applications that took place in Athens, Ohio, in March of 2005. It provides a snapshot of the diversity of themes and applications that interest algebraists today. The papers in this volume include some of the latest results in the theory of modules, noncommutative rings, representation theory, matrix theory, linear algebra over noncommutative rings, cryptography, error-correcting codes over finite rings, and projective-geometry codes, as well as expository articles that will provide algebraists with an accessible introduction to areas outside their own expertise.

The book will serve both the specialist looking for the latest result and the novice seeking an accessible reference for some of the ideas and results presented here.


Contemporary Mathematics, Volume 419

The Moduli Problem for Plane Branches
Oscar Zariski with an appendix by Bernard Teissier Translated by Ben Lichtin

Moduli problems in algebraic geometry date back to Riemann’s famous count of the 3g − 3 parameters needed to determine a curve of genus g. In this book, Zariski studies the moduli space of curves of the same equisingularity class. After setting up and reviewing the basic material, Zariski devotes one chapter to the topology of the moduli space, including an explicit determination of the rare cases when the space is compact. Chapter V looks at specific examples where the dimension of the generic component can be determined through rather concrete methods. Zariski’s last chapter concerns the application of deformation theory to the moduli problem, including the determination of the
dimension of the generic component for a particular family of curves.

An appendix by Bernard Teissier reconsiders the moduli problem from the point of view of deformation theory. He gives new proofs of some of Zariski's results, as well as a natural construction of a compactification of the moduli space.

Contents: Preliminaries; Equisingularity invariants; Parametrizations; The moduli space; Examples; Applications of deformation theory; Bibliography; Appendix.

University Lecture Series, Volume 39


V. Shpilrain and A. Ushakov, A new key exchange protocol based on the decomposition problem; V. Shpilrain and G. Zapata, Using the subgroup membership search problem in public key cryptography.

Contemporary Mathematics, Volume 418


Differential Equations

Applications

Algebraic Methods in Cryptography

Lothar Gerritzen, Ruhr-Universität Bochum, Germany, Dorian Goldfeld, Columbia University, New York, NY, Martin Kreuzer and Gerhard Rosenberger, Universität Dortmund, Germany, and Vladimir Shpilrain, The City College of New York, NY, Editors

The book consists of contributions related mostly to public-key cryptography, including the design of new cryptographic primitives as well as cryptanalysis of previously suggested schemes. Most papers are original research papers in the area that can be loosely defined as "non-commutative cryptography"; this means that groups (or other algebraic structures) which are used as platforms are non-commutative.

This item will also be of interest to those working in algebra and algebraic geometry.


Hyperbolic Partial Differential Equations

Peter D. Lax, New York University, Courant Institute, NY

The theory of hyperbolic equations is a large subject, and its applications are many: fluid dynamics and aerodynamics, the theory of elasticity, optics, electromagnetic waves, direct and inverse scattering, and the general theory of relativity. This book is an introduction to most facets of the theory and is an ideal text for a second-year graduate course on the subject.

The first part deals with the basic theory: the relation of hyperbolicity to the finite propagation of signals, the concept and role of characteristic surfaces and rays, energy, and energy inequalities. The structure of solutions of equations with constant coefficients is explored with the help of the Fourier and Radon transforms. The existence of solutions of equations with variable coefficients with prescribed initial values is proved using energy inequalities. The propagation of singularities is studied with the help of progressing waves.

The second part describes finite difference approximations of hyperbolic equations, presents a streamlined version of the Lax-Phillips scattering theory, and covers basic concepts and results for hyperbolic systems of conservation laws, an active research area today.

Four brief appendices sketch topics that are important or amusing, such as Huygens' principle and a theory of mixed initial and boundary value problems. A fifth appendix by Cathleen Morawetz describes a nonstandard energy identity and its uses.

Titles in this series are copublished with the Courant Institute of Mathematical Sciences at New York University.

Contents: Basic notions; Finite speed of propagation of signals; Hyperbolic equations with constant coefficients; Hyperbolic equations with variable coefficients; Pseudodifferential operators and energy inequalities; Existence of solutions; Waves and rays; Finite difference approximation to hyperbolic equations; Scattering theory; Hyperbolic systems of conservation laws; Huygens' principle for the wave equation on odd-dimensional spheres; Hyperbolic polynomials; The multiplicity of eigenvalues;
Mixed initial and boundary value problems; Energy decay for star-shaped obstacles.

Courant Lecture Notes, Volume 14

General and Interdisciplinary

Exposition by Emil Artin: A Selection
Michael Rosen, Brown University, Providence, RI, Editor

Emil Artin was one of the great mathematicians of the twentieth century. He had the rare distinction of having solved two of the famous problems posed by David Hilbert in 1900. He showed that every positive definite rational function of several variables was a sum of squares. He also discovered and proved the Artin reciprocity law, the culmination of over a century and a half of progress in algebraic number theory.

Artin had a great influence on the development of mathematics in his time, both by means of his many contributions to research and by the high level and excellence of his teaching and expository writing. In this volume we gather together in one place a selection of his writings wherein the reader can learn some beautiful mathematics as seen through the eyes of a true master.

The volume’s Introduction provides a short biographical sketch of Emil Artin, followed by an introduction to the books and papers included in the volume. The reader will first find three of Artin’s short books, titled The Gamma Function, Galois Theory, and Theory of Algebraic Numbers, respectively. These are followed by papers on algebra, algebraic number theory, real fields, braid groups, and complex and functional analysis. The three papers on real fields have been translated into English for the first time.

The flavor of these works is best captured by the following quote of Richard Brauer. “There are a number of books and sets of lecture notes by Emil Artin. Each of them presents a novel approach. There are always new ideas and new results. It was a compulsion for him to present each argument in its purest form, to replace computation by conceptual arguments, to strip the theory of unnecessary ballast. What was the decisive point for him was to show the beauty of the subject to the reader.”

This item will also be of interest to those working in number theory.

Copublished with the London Mathematical Society beginning with Volume 4. Members of the LMS may order directly from the AMS at the AMS member price. The LMS is registered with the Charity Commissioners.


History of Mathematics, Volume 30

Geometry and Topology

Surveys in Noncommutative Geometry
Nigel Higson and John Roe, Pennsylvania State University, University Park, PA, Editors

In June 2000, the Clay Mathematics Institute organized an Instructional Symposium on Noncommutative Geometry in conjunction with the AMS-IMS-SIAM Joint Summer Research Conference. These events were held at Mount Holyoke College in Massachusetts from June 18 to 29, 2000. The Instructional Symposium consisted of several series of expository lectures which were intended to introduce key topics in noncommutative geometry to mathematicians unfamiliar with the subject. Those expository lectures have been edited and are reproduced in this volume.

The lectures of Rosenberg and Weinberger discuss various applications of noncommutative geometry to problems in “ordinary” geometry and topology. The lectures of Lagarias and Tretkoff discuss the Riemann hypothesis and the possible application of the methods of noncommutative geometry in number theory. Higson gives an account of the “residue index theorem” of Connes and Moscovici.

Noncommutative geometry is to an unusual extent the creation of a single mathematician, Alain Connes. The present volume gives an extended introduction to several aspects of Connes’ work in this fascinating area.

This item will also be of interest to those working in mathematical physics.

Titles in this series are copublished with the Clay Mathematics Institute (Cambridge, MA).
Contents: J. Rosenberg, A minicourse on applications of non-commutative geometry to topology; S. S. Chang and S. Weinberger, On Novikov-type conjectures; N. Higson, The residue index theorem of Connes and Moscovici; J. C. Lagarias, The Riemann hypothesis: Arithmetic and geometry; P. Tretkoff, Noncommutative geometry and number theory.

Clay Mathematics Proceedings, Volume 6

Parametrized Homotopy Theory
J. P. May, The University of Chicago, IL, and J. Sigurdsson, University of Sheffield, England

This book develops rigorous foundations for parametrized homotopy theory, which is the algebraic topology of spaces and spectra that are continuously parametrized by the points of a base space. It also begins the systematic study of parametrized homology and cohomology theories.

The parametrized world provides the natural home for many classical notions and results, such as orientation theory, the Thom isomorphism, Atiyah and Poincaré duality, transfer maps, the Adams and Wirthmüller isomorphisms, and the Serre and Eilenberg-Moore spectral sequences. But in addition to providing a clearer conceptual outlook on these classical notions, it also provides powerful methods to study new phenomena, such as twisted K-theory, and to make new constructions, such as iterated Thom spectra.

Duality theory in the parametrized setting is particularly illuminating and comes in two flavors. One allows the construction and analysis of transfer maps, and a quite different one relates parametrized homology to parametrized cohomology. The latter is based formally on a new theory of duality in symmetric bicategories that is of considerable independent interest.

The text brings together many recent developments in homotopy theory. It provides a highly structured theory of parametrized spectra and it extends parametrized homotopy theory to the equivariant setting. The theory of topological model categories is given a more thorough treatment than is available in the literature. This is used, together with an interesting blend of classical methods, to resolve basic foundational problems that have no nonparametrized counterparts.

Contents: Prologue; Point-set topology, change functors, and proper actions: Introduction to Part I; The point-set topology of parametrized spaces; Change functors and compatibility relations; Proper actions, equivariant bundles and fibrations; Model categories and parametrized spaces: Introduction to Part II; Topologically bicomplete model categories; Well-grounded topological model categories; The qf-model structure on \( \mathcal{K}_G \); Equivariant qf-type model structures; Ex-fibrations and ex-quasifibrations; The equivalence between Ho\(\mathcal{K}_G \) and \( \text{Ho}G\mathcal{K}_G \); Parametrized equivariant stable homotopy theory: Introduction to Part III; Enriched categories and G-categories; The category of orthogonal G-spectra over B; Module structures for parametrized G-spectra; Adjunctions and compatibility relations; Module categories, change of universe, and change of groups; Parametrized duality theory: Introduction to Part IV; Fiberwise duality and transfer maps; Closed symmetric bicategories; The closed symmetric bicategory of parametrized spectra; Costenoble-Waner duality; Fiberwise Costenoble-Waner duality; Homology and cohomology, Thom spectra, and addenda: Introduction to Part V; Parametrized homology and cohomology theories; Equivariant parametrized homology and cohomology; Twisted theories and spectral sequences; Parametrized TSP's and generalized Thom spectra; Epilogue: Cellular philosophy and alternative approaches; Bibliography; Index; Index of notation.

Mathematical Surveys and Monographs, Volume 132

Number Theory

Proceedings of the St. Petersburg Mathematical Society, Volume XI
N. N. Uraltseva, St. Petersburg State University, Russia, Editor

This and the next volume in the series (see TRANS2/219) consist of articles written on the occasion of the 60th birthday anniversary of the well-known St. Petersburg specialist in number theory Sergey Vostokov. Among the authors are many students and colleagues of Vostokov. The articles are devoted to topics in number theory that are close to Vostokov's scientific interests.

The book is suitable for graduate students and researchers interested in number theory.


American Mathematical Society Translations—Series 2, Volume 218
Proceedings of the St. Petersburg Mathematical Society, Volume XII

N. N. Uraltseva, St. Petersburg State University, Russia, Editor

This and the previous volume in the series (see TRANS2/218) consist of articles written on the occasion of the 60th birthday anniversary of the well-known St. Petersburg specialist in number theory Sergey Vostokov. Among the authors are many students and colleagues of Vostokov. The articles are devoted to topics in number theory that are close to Vostokov's scientific interests.

The book is suitable for graduate students and researchers interested in number theory.

Contents: T. Fukaya and K. Kato, A formulation of conjectures on $p$-adic zeta functions in noncommutative Hwasawa theory; B. Eck and H. Koch, On maximal $2$-extensions of $\mathbb{Q}$ with given ramification; A. Merkurjev, On the norm residue homomorphism of degree two; A. Suslin, $SK_1$ of division algebras and Galois cohomology revisited; I. Fesenko, Measure, integration and elements of harmonic analysis on generalized loop spaces.

American Mathematical Society Translations—Series 2, Volume 219


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New AMS-Distributed Publications

General and Interdisciplinary

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Art for a House of Mathematics

Anna Campbell Bliss, Bliss Studio Publications, Salt Lake City, UT

The book, like the mural it describes, develops structural connections with the arts, sciences, and culture while conveying the range and beauty of mathematics.

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Marta Sanz-sole and Javier Soria, University of Barcelona, Spain, Juan Luis Varona, University of La Rioja, Logroño, Spain, and Joan Verdera, University Autónoma, Barcelona, Spain, Editors

The International Congress of Mathematicians (ICM) is held every four years. It is a major scientific event, bringing together mathematicians from all over the world and demonstrating the vital role that mathematics play in our society. In particular, the Fields Medals are awarded to recognize outstanding mathematical achievement. At the same time, the International Mathematical Union awards the Nevanlinna Prize for work in the field of theoretical computer science.

The proceedings of ICM 2006, published as a three-volume set, present an overview of current research in all areas of mathematics and provide a permanent record for the congress. The first volume features the works of Fields Medalists and the Nevanlinna Prize winner, the plenary lectures, and the speeches and pictures of the opening and closing ceremonies and award sessions. The other two volumes present the invited lectures, arranged according to their mathematical subject.

A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: Volume I: Contents to be announced later. Volume II: Logic and foundations: R. Downey, Algorithmic randomness and computability; L. Neeman, Determinacy and large cardinals; M. Rathjen, The art of ordinal analysis; T. Scanlon, Analytic difference rings; S. Thomas, Borel rigidity and the classification problem for the torsion-free abelian groups of finite rank; Algebra: W. Crawley-Boevey, Quiver algebras, weighted projective lines, and the Deligne-Simpson problem; M. du Sautoy and F. Grunewald, Zeta functions of groups and rings; B. Keller, On differential graded categories; R. Rouquier, Derived equivalences and finite dimensional algebras; M. Sapir, Algorithmic and asymptotic properties of groups; A. Seress, A unified approach to computations with permutation and matrix groups; A. Smoktunowicz, Some results in noncommutative ring theory; Number theory: M. Bhargava, Higher composition laws and applications; C.-L. Chai, Hecke orbits as Shimura varieties in positive characteristic; H. Darmon, Heegner points, Stark-Heegner points and values of L-series; K. Fujiwara, Galois deformations and arithmetic geometry of...
Shimura varieties; B. Green, Generalising the Hardy–Littlewood method for primes; G. Laumon, Aspects géométriques du Lemme Fondamental de Langlands-Shelstad; P. Michel and A. Venkatesh, Equidistribution, L-functions and ergodic theory: on some problems of Yu. Linnik; W. Nizioł, p-adic motivic cohomology in arithmetic; C. Skinner and E. Urban, Vanishing of L-functions and ranks of Selmer groups; V. Vatsal, Special values of L-functions modulo p; Algebraic and complex geometry: V. Alexeev, Higher-dimensional analogues of stable curves; J.-B. Bost, Evaluation maps, slopes, and algebraicity criteria; T. Bridgeland, Derived categories of coherent sheaves; L. Ein and M. Mustaţă, Invariants of singularities of pairs; T. Graber, Rational curves and rational points; J.-M. Hwang, Rigidity of rational homogeneous spaces; T. Terasoma, Geometry of multiple zeta values; Y. Tschiinkel, Geometry over nonclosed fields; J. Wlodarczyk, Algebraic Morse theory and the weak factorization theorem; Geometry: C. Böhm and B. Wilking, Manifolds with positive curvature operators are space forms; S. Brendle, Elliptic and parabolic problems in conformal geometry; K. Honda, The topology and geometry of contact structures in dimension three; M. Kapovich, Generalized triangle inequalities and their applications; B. Kleiner, The Heintze conjecture for negatively curved spaces: uniformization, geometrization and rigidity; F. Lalonde, Lagrangian submanifolds: from the local model to the cluster complex; X. Liu, Gromov–Witten invariants and moduli spaces of curves; T. Mabuchi, Extremal metrics and stabilities on polarized manifolds; G. Mikhailov, Tropical geometry and its applications; W. P. Minicozzi II, Embedded minimal surfaces; Y.-G. Oh and K. Fukaya, Floer homology in symplectic geometry and in mirror symmetry; A. Ros, Properly embedded minimal surfaces with finite topology; C.-L. Terng, Applications of loop group factorization to geometric soliton equations; Topology: I. Agol, Finiteness of arithmetic Kleinian reflection groups; M. R. Bridson, Non-positive curvature and complexity for finitely presented groups; M. Khovanov, Link homology and categorification; Y. N. Minsky, Curve complexes, surfaces and 3-manifolds; F. Morel, A1-algebraic topology; K. Ono, Development in symplectic Floer theory; P. Ozsváth and Z. Szabó, Heegaard diagrams and Floer homology; K. Vogtmann, The cohomology of automorphism groups of free groups; Lie groups and Lie algebras: R. Bezrukavnikov, Noncommutative counterparts of the Springer resolution; A. Braverman, Spaces of quasi-maps into the flag varieties and their applications; G. Henniart, On the local Langlands and Jacquet–Langlands correspondences; N. Mondal, On the bounded cohomology; B.-C. Ngô, Fibration de Hitchin et structure endosкопique de la formule des traces; F. M. Opdam, Hecke algebras and harmonic analysis; P. Schneider, Continuous representation theory of p-adic Lie groups; Y. Shalom, The algebraization of Kazhdan's property (T); D. Soudry, Rankin–Selberg integrals, the descent method, and Langlands functoriality; B. Speh, Representation theory and the cohomology of arithmetic groups; T. A. Springer, Some results on compactifications of semisimple groups; Analysis: M. Eon, Quasiconformal geometry of fractals; S. Hofmann, Local Tb theorems and applications in PDE; S. V. Konyagin, Almost everywhere convergence and divergence of Fourier series; L. P. Rothschild, Iterated Sege mappings of real submanifolds in complex space and applications; S. Smirnov, Towards conformal invariance of 2D lattice models; E. J. Straube, Aspects of the $L^2$-Sobolev theory of the $\bar{\partial}$-Neumann problem; V. N. Temlyakov, Greedy approximations with regard to bases; X. Tolsa, Analytic capacity, rectifiability, and the Cauchy integral; Operator algebras and functional analysis: F. Barthe, The Brunn–Minkowski theorem and related geometric and functional inequalities; B. Klartag, Isomorphic and almost-isometric problems in high-dimensional convex geometry; N. Ozawa, Amenable actions and applications; M. Rordam, Structure and classification of C*-algebras; S. J. Szarek, Convexity, complexity, and high dimensions; G. Yu, Higher index theory of elliptic operators and geometry of groups; Ordinary differential equations and dynamical systems: O. N. Ageev, On spectral invariants in modern ergodic theory; V. Bergelson, Ergodic Ramsey theory: a dynamical approach to static theorems; N. Chernov and D. Dolgopyat, Hyperbolic billiards and statistical physics; R. de la Llave, Some recent progress in geometric methods in the instability problem in Hamiltonian mechanics; E. Einsiedler and E. Lindenstrauss, Diagonalizable flows on locally homogeneous spaces and number theory; Author index; Volume III: Ordinary differential equations and dynamical systems (continued): G. Christ, Braids and differential equations; A. Gorodetski, B. Hunt, and V. Kaloshin, Newton interpolation polynomials, discretization method, and certain prevalent properties in dynamical systems; B. Kra, From combinatorics to ergodic theory and back again; P. Le Calvez, From Brouwer theory to the study of homeomorphisms of surfaces; M. Shub, All, most, some differentiable dynamical systems; A. Zorich, Geodesics on flat surfaces; Partial differential equations: S. Bianchi, Asymptotic behavior of smooth solutions for partially dissipative hyperbolic systems and relaxation approximation; P. Gérard, Nonlinear Schrödinger equations in inhomogeneous media: well-posedness and ill-posedness of the Cauchy problem; F. Golse, The periodic Lorentz gas in the Boltzmann-Grad limit; M. J. Gursky, Conformal invariants and nonlinear elliptic equations; H. Ishii, Asymptotic solutions for large time of Hamilton–Jacobi equations; M. Pulvirenti, The weak-coupling limit of large classical and quantum systems; O. Savin, Symmetry of entire solutions for a class of semilinear elliptic equations; S. Serfaty, Vortices in the Ginzburg–Landau model of superconductivity; N. S. Trudinger, Recent developments in elliptic partial differential equations of Monge–Ampère type; L. Vega, The initial value problem for nonlinear Schrödinger equations; J. J. L. Velázquez, Singular solutions of partial differential equations modelling chemotactic aggregation; Mathematical physics: A. S. Cattaneo, From topological field theory to deformation quantization and reduction; B. Derrida, Matrix ansatz and large deviations of the density in exclusion processes; J.-M. Maillet, Correlation functions of the XXZ Heisenberg spin chain: Bethe ansatz approach; M. Mariño, Gromov–Witten invariants and topological strings: a progress report; T. Rodnianski, The Cauchy problem in general relativity; C. Schweigert, J. Fuchs, and I. Runkel, Categorification and correlation functions in conformal field theory; A. Soffer, Soliton dynamics and scattering; C. Villani, Hypocoercive diffusion operators; Probability and statistics: A. Bovier, Metastability: a potential theoretic approach; R. Cour, On ising droplets; A. Dembo, Simple random covering, disconnection, late and favorite points; P. Donnelly, Modelling genes: mathematical and statistical challenges in genomics; K. D. Elworthy and X.-M. Li, Geometric stochastic analysis on path spaces; J. Fan and R. Li, Statistical challenges with high dimensionality: feature selection in knowledge discovery; A. Guionnet, Random matrices and enumeration of maps; S. P. Lalley, The weak/strong survival transition on trees and nonamenable graphs; Y. Le Jan, New developments in stochastic dynamics; P. McCullagh and J. Yang, Stochastic classification models; A. Okounkov, Random partitions and instanton counting; D. Picard and G. Kerkyacharian, Estimation in inverse problems and second-generation wavelets; W. Werner, Conformal restriction properties; Combinatorics: A. Barvinok, The complexity of generating functions for integer points in polyhedra and beyond; M. Bousquet-Mélou, Rational and algebraic series in combinatorial enumeration;
Classified Advertisements

Positions available, items for sale, services available, and more

CALIFORNIA

CALIFORNIA STATE UNIVERSITY, LOS ANGELES
Department of Mathematics and
Department of Biological Sciences

Applications are invited for a tenure or tenure-track joint position in mathematics and biological sciences at the university. Assistant or full professor (rank commensurate with experience) starting in the fall of 2007. Candidates must have a strong background in applied mathematics, biology, and computer science. Ability to teach a range of undergraduate and graduate courses in mathematics and biology relevant to the candidate's experience is essential. Publications in peer-reviewed journals and/or grant activity is required. Applicants with relevant academic/industrial postdoctoral research experience and those who can involve undergraduate and graduate students in their research will be given preference. Send letter of application, vita, three letters of recommendation and official transcript from institution awarding the degree to Dr. P. K. Subramanian, Chair, Department of Mathematics, California State University at Los Angeles, 5151 State University Drive, Los Angeles, CA 90032. An Equal Opportunity, Title IX, Disabled Employer.

DISTRICT OF COLUMBIA

GEORGE WASHINGTON UNIVERSITY

In an effort to increase its research stature and expand its undergraduate and doctoral programs, the Mathematics Department of The George Washington University is recruiting a tenure-track associate professor in either applied mathematics or probability. The successful applicant is expected to teach at all undergraduate and graduate levels, excel in research, interact with researchers in mathematics or other disciplines, and become actively involved in the life of the department and the university. Basic Qualifications: Applicants must possess a Ph.D., excellent teaching credentials as demonstrated by your teaching approach and either teaching evaluations or letters from peers or supervisors, a record of excellent research as demonstrated by publications in research journals, the potential for leadership as demonstrated in your letters of recommendation.

Preferred Qualifications: Preference will be given those applicants with prior research experience. For those applicants in applied mathematics, preference will be shown to those applicants with experience in computing. To Apply: Send a brief cover letter, CV, synopsis of your research plans (not to exceed three pages), and evidence of good teaching (which should include an overview of your teaching approach) to: Professor John B. Conway, Associate Professor Search, Mathematics, Old Main, 1922 F Street NW, Washington, DC 20052. Also arrange to have at least three letters of recommendation sent to the same address or to mathsearch@gwu.edu. Only complete applications will be considered. Review of applications will begin on January 1, 2007, and will continue until the position is filled. The George Washington University is an Equal Opportunity/Affirmative Action Employer and seeks to attract culturally diverse faculty of the highest caliber.

GEORGE WASHINGTON UNIVERSITY

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Suggested uses for classified advertising are positions available, books or lecture notes for sale, books being sought, exchange or rental of houses, and typing services. The 2007 rate is $100 per inch or fraction thereof on a single column (one-inch minimum), calculated from top of headline. Any fractional text of 1/2 inch or more will be charged at the next inch rate. No discounts for multiple ads. Three letter copy is accepted under certain conditions for free publication. Submit to AMS, P.O. Box 6248, Providence, Rhode Island 02940; or call 800-321-4AMS (321-4267) for further information.

Submission: Promotions Department, AMS, P.O. Box 6248, Providence, Rhode Island 02940; or via fax: 401-331-3842; or send email to classifieds@ams.org. AMS location for express delivery packages is 201 Charles Street, Providence, Rhode Island 02904. Advertisers will be billed upon publication.

NOTICES OF THE AMS VOLUME 54, NUMBER 1
professor in an area where the department has strengths: applied mathematics, combinatorics, dynamical systems, logic, and topology. The successful applicant is expected to teach at all undergraduate and graduate levels, excel in research, interact with researchers in mathematics or other disciplines, and become actively involved in the life of the department and the university. Basic Qualifications: Applicants must possess a Ph.D. and good teaching credentials as demonstrated by your teaching approach and either teaching evaluations or letters from peers or supervisors. To Apply: Send a brief cover letter, CV, synopsis of your research plans (not to exceed three pages), and evidence of good teaching (which should include an overview of your teaching approach) to: Professor John B. Conway, Assistant Professor Search T, Mathematics, Old Main, 1922 F Street NW, Washington, DC 20052. Also arrange to have at least three letters of recommendation sent to the same address or to math@ruch@wu.edu. Only complete applications will be considered. Review of applications will begin on January 1, 2007, and will continue until the position is filled. The George Washington University is an Equal Opportunity/Affirmative Action Employer and seeks to attract culturally diverse faculty of the highest caliber.

GEORGIA

GEORGIA INSTITUTE OF TECHNOLOGY
School of Mathematics

The School of Mathematics at Georgia Tech is now in the third year of an ambitious faculty recruitment program—one which will be sustained over a five-year period. During the first two years, eight appointments were made, including four tenured appointments, two of the full professor level and two at the associate professor level. Building on past successes, this recruiting effort is intended to make rapid advances in the scope and quality of our research and graduate education programs. Candidates will be considered at all ranks, with priority given to those candidates who (1) bring exceptional quality research credentials to Georgia Tech; (2) complement existing strengths in the School of Mathematics; (3) reinforce bridges to programs in engineering and the physical, computing and life sciences; (4) have strong potential for external funding; and (5) have a demonstrated commitment to high quality teaching at both the undergraduate and graduate levels. Consistent with these priorities, candidates will be considered in all areas of Pure and Applied Mathematics and Statistics. Candidates should arrange for a resume, at least three letters of reference, and a summary of future research plans to be sent to the Hiring Committee, School of Mathematics, Georgia Institute of Technology, Atlanta, GA, 30332-0160, USA. Candidates for Associate and Full Professor positions should also submit a statement outlining their vision for service as a faculty member at Georgia Tech. Review of applications will begin in September 2006, and the roster of candidates being considered will be updated on a monthly basis. Georgia Tech, an institution of the University System of Georgia, is an Equal Opportunity/Affirmative Action Employer.

GEORGIA WASHINGTON UNIVERSITY

In an effort to increase its research stature and expand its undergraduate and doctoral programs, the Mathematics Department of The George Washington University is recruiting for a three-year (renewable) contract at the level of assistant professor in either applied mathematics or probability. The successful candidate is expected to teach at all undergraduate and graduate levels, do research, and become actively involved in the life of the department and the university. Basic Qualifications: Applicants must possess a Ph.D. and have good research potential as evidenced by strong publications and letters of recommendation, and excellent teaching credentials as demonstrated by your approach to teaching and either teaching evaluations or letters from peers or supervisors. Preferred Qualifications: For those applicants in applied mathematics, preference will be shown those applicants with experience in computing. To Apply: Send a brief cover letter, CV, synopsis of your research plans (not to exceed three pages), and evidence of good teaching (which should include an overview of your teaching approach) to: Professor John B. Conway, Assistant Professor Search T, Mathematics, Old Main, 1922 F Street NW, Washington, DC 20052. Also arrange to have at least three letters of recommendation (which should include an assessment of research potential) sent to the same address or to math@ruch@wu.edu. Only complete applications will be considered. Review of applications will begin on January 1, 2007, and will continue until the position is filled. The George Washington University is an Equal Opportunity/Affirmative Action Employer and seeks to attract culturally diverse faculty of the highest caliber.

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Applications are invited for one tenure-track assistant professor position in commutative algebra/algebraic geometry beginning August 18, 2007. Candidates must have a Ph.D. in math, statistics, or a related field or its requirements completed by August 18, 2007. For complete position announcement go to: http://www.math.ku.edu/jobs or contact kumath@math.ku.edu. Letter of application, detailed vita, research description, teaching statement, completed AMS application form, and at least three recommendation letters (teaching ability must be addressed in at least one letter) should be sent to: Chair of University of Kansas, Lawrence, KS 66045-7523 (or faxed to 785-864-5255). In addition, upon receipt of materials, you will be sent instructions for completing required sections of the Faculty and Academic Staff Applicant Data Form. Deadlines: Review of applications will begin on November 15, 2006, and will continue until the position is filled. EO/AA Employer.

Applications are invited for tenure-track assistant professor positions in statistics beginning August 18, 2007; January 1, 2008; or as negotiated. Candidates must have a Ph.D. in math or a related field or its requirements completed by August 18, 2007. For complete position announcement go to: http://www.math.kn.edu/jobs or contact kumath@math.kn.edu. Letter of application, detailed vita, research description, teaching statement, completed AMS application form, and at least three recommendation letters (teaching ability must be addressed in at least one letter) should be sent to: Chair of University of Kansas, Lawrence, KS 66045-7523 (or faxed to 785-864-5255). In addition, upon receipt of materials, you will be sent instructions for completing required sections of the Faculty and Academic Staff Applicant Data Form. Deadlines: Review of applications will begin on November 15, 2006, and will continue until the position is filled. EO/AA Employer.

Applications are invited for one tenure-track position at the assistant professor level to start in August 2007. Candidates must have a Ph.D. in mathematics at the rank of assistant professor. Visit http://www.higheredjobs.com/or call (906) 227-2020 for job description and requirements. Salary is competitive. Screening will begin January 3, 2007, and will continue until the positions are filled. NMU is an AA/EOE.

Applications are invited for two tenure-track positions in mathematics at the rank of assistant professor. Visit http://www.usna.edu/MathDept/website/Hire.htm for full information. Tel: 410-293-6701; Fax: 410-293-6707; email: ang@usna.edu. The United States Naval Academy is an Affirmative Action/Equal Employment Opportunity Employer and provides reasonable accommodations to applicants with disabilities.

The Department of Mathematics and Computer Science invites applications for two tenure-track positions in mathematics at the rank of assistant professor. Visit http://www.higheredjobs.com/or call (906) 227-2020 for job description and requirements. Salary is competitive. Screening will begin January 3, 2007, and will continue until the positions are filled. NMU is an AA/EOE.

Applications are invited for one tenure-track position at the assistant professor level to start in August 2007. Candidates must have a Ph.D. in mathematics at the rank of assistant professor. Visit http://www.usna.edu/MathDept/website/Hire.htm for full information. Tel: 410-293-6701; Fax: 410-293-6707; email: ang@usna.edu. The United States Naval Academy is an Affirmative Action/Equal Employment Opportunity Employer and provides reasonable accommodations to applicants with disabilities.

Applications are invited for one tenure-track position at the assistant professor level to start in August 2007. Candidates must have a Ph.D. in mathematics at the rank of assistant professor. Visit http://www.usna.edu/MathDept/website/Hire.htm for full information. Tel: 410-293-6701; Fax: 410-293-6707; email: ang@usna.edu. The United States Naval Academy is an Affirmative Action/Equal Employment Opportunity Employer and provides reasonable accommodations to applicants with disabilities.

Applications are invited for a full-time, tenure-track position in applied mathematics at The University of Tulsa, an equal opportunity employer that strongly supports diversity in all aspects of its mission and is an Affirmative Action/Equal Opportunity Employer. Applications from women and minorities are especially encouraged.

Tenure-track and temporary positions Open rank; however appointment at the rank of assistant professor is strongly preferred. Tenure-track in area of numerical analysis/scientific computing to enhance department program. For more information, see http://www.case.edu/artsci/math/employment.htm. The successful tenure-track candidate will hold the Ph.D. or equivalent and have, relative to career stage, a distinguished record of publication, research, service, and teaching. Compensation commensurate with qualifications. Applications will be considered on receipt; applications will be accepted until position is filled. Electronic applications to: James Alexander, math-faculty­position@case.edu, consisting of a letter of application, AMS cover sheet, CV, and three letters of reference sent. Case is a recipient of an NSF ADVANCE institutional transformation grant to increase the participation of women in science and engineering. Case Western Reserve University is committed diversity is an Affirmative Action, Equal Opportunity Employer. Applications from women or minorities are especially encouraged.

Applications are invited for a full-time, tenure-track position in applied mathematics at The University of Tulsa, an equal opportunity employer that strongly supports diversity in all aspects of its mission and is an Affirmative Action/Equal Opportunity Employer. Applications from women and minorities are especially encouraged.

The University of Tulsa invites applications for a full-time, tenure-track position in applied mathematics at the rank of assistant professor, to begin in Fall 2007. Appointment at a higher rank may be considered for exceptional candidates. The Department of Mathematical and Computer Sciences is part of the College of Engineering and Natural Sciences. Preference will be given to candidates working in applied analysis whose research interests match those of the Center for Boundary Integral Methods in the department. Applicants must have a doctorate in mathematics and show a clear commitment to research and to teaching at both undergraduate and graduate levels.

Candidates must submit a letter of application, a full curriculum vitae, a detailed description of research interests, a statement of teaching experience and philosophy, and names, mailing addresses, telephone numbers, and e-mail addresses of at least three references to: Chair of University of Tulsa, Department of Mathematical and Computer Sciences.

The University of Tulsa
Applications will be considered until the position is filled. The University of Tulsa is an Affirmative Action/Equal Opportunity Employer and encourages applications from women and underrepresented minorities.

**TEXAS**

**TEXAS A&M UNIVERSITY, QATAR**

Department of Mathematics

The Department of Mathematics expects to have two or more open positions at its affiliate campus in Doha, Qatar. Texas A&M-Qatar (TAMUQ) is a relatively new university funded by the Qatar Foundation and is operated under the auspices of Texas A&M in College Station, Texas. TAMUQ offers bachelor's degrees in engineering, and the mathematics faculty is expected to provide supporting courses in calculus, differential equations, linear algebra, numerical analysis, mathematical modeling, and other related coursework. The campus has modern facilities that include a 100-node supercomputer and full library services (electronic and loan access). Teaching loads are kept low (approximately two small classes per year) to promote teacher-student mentoring and to allow time for faculty to pursue research. Any level of appointment will be considered depending on the qualifications of the applicant. It is anticipated that most appointments will be non-tenure-accruing, with an initial appointment period of one year, which is renewable for additional years, subject to satisfactory performance. A Ph.D. degree is required for all professorial level appointments (the equivalent of an assistant professor or higher). Applicants with a master's degree and teaching experience will be considered for non-professorial positions (e.g., lecturer) for more elementary instruction (and a higher teaching load). Salary rates are competitive and, in general, average 30% higher than comparable salary rates of similar positions here in the U.S. In addition, summer funding is guaranteed. Liberal allowances for professional travel and for relocation to Qatar are provided. Fringe benefits include free housing, K-12 education for dependents, and a car allowance. General information about TAMUQ is available at their website: http://www.math.tamu.edu/.

Applicants should send the completed "AMS Application Cover Sheet", a vita, and a list of publications to: Professor David A. Stephens, Chair, Department of Mathematics, Texas A&M University, Department of Mathematics, College Station, Texas 77843-3368. Further information and a link to an online application form is available at: http://www.math.tamu.edu. At least one recommendation letter should address the candidate's teaching qualifications. The complete dossier should be received by January 15, 2007. Early applications are encouraged since applications will be reviewed as they are received.

Texas A&M University is an Equal Opportunity Employer. The university is dedicated to the goal of building a culturally diverse and pluralistic faculty and staff committed to teaching and working in a multicultural environment and strongly encourages applications from women, minorities, individuals with disabilities, and veterans. The university is responsive to the needs of dual career couples.

**THE UNIVERSITY OF TEXAS AT SAN ANTONIO**

Department of Mathematics

Chair

The University of Texas at San Antonio (UTSA) is accepting applications for the position of Chair of the Department of Mathematics, starting Fall 2007. The appointment will be at the rank of professor, with tenure. The newly formed department merges the Department of Applied Mathematics, the Department of Science and Mathematics Education, and the core curriculum mathematics program. The combined department will have more than twenty tenure/tenure-track faculty members and offers B.S. and B.A. degrees in mathematics and M.S. degrees in mathematics and applied mathematics. New faculty positions and new Ph.D. programs are planned for the department.

The required qualifications are: an internationally recognized program of research in mathematics, excellence in teaching, experience in directing doctoral dissertations, a record of success in obtaining external funding, and administrative experience.

Responsibilities include a commitment to developing the new UTSA Department of Mathematics, developing new Ph.D. programs in mathematics, teaching, supervising research students at all levels, and maintaining an externally funded research program. Descriptions of current departmental research efforts can be found at: http://math.utsa.edu/. UTSA, the second largest component university of The University of Texas System, has an enrollment in excess of 28,000 students and offers courses at the Loop 1604 and Downtown Campuses.

Screening of completed applications will continue until the position is filled. Applicants who are not U.S. citizens must state their current visa and residency status. Applicants must submit a letter of application, a dated current curriculum vitae, a statement of leadership and administrative philosophy, a description of research, and the names, addresses, and email addresses of three individuals who can provide recommendation letters. Application materials may be sent either by email (mathchairsearch@utsa.edu) or regular mail (Math Chair Search Committee, Office of the Dean, College of Sciences, One UTSA Circle, San Antonio, Texas 78249-0020). Applications will be accepted until a suitable candidate is found. UTSA is an Affirmative Action/Equal Opportunity Employer. Women, minorities, veterans, and individuals with disabilities are encouraged to apply.

**CANADA**

McGILL UNIVERSITY

Department of Mathematics

The Department of Mathematics and Statistics invites applications for a tenure-track position in probability. The department welcomes applications at the assistant professor level, as well as more senior levels.

Candidates must have a doctoral degree at the date of appointment. Candidates are expected to have demonstrated excellence in research. They should also have the potential to contribute to the educational programs of the department at both graduate and undergraduate levels.

Applications with a curriculum vitae, a list of publications; a research outline; an account of teaching experience; a statement on teaching; and the names, phone numbers, and email addresses of at least four references (with one addressing the teaching record) should be sent to: Professor David A. Stephens, Chair, Probability Search Committee, Department of Mathematics and Statistics, McGill University, 805 Sherbrooke Street West, Montreal QC H3A 2K6 Canada.

Candidates must arrange to have the four letters of recommendation sent directly to the above address. Candidates are encouraged to include copies of up to 3 selected reprints or preprints with their applications.

To ensure full consideration, applications must be received by January 31, 2007.

Only those applicants selected for an interview will be contacted. All qualified candidates are encouraged to apply; however, Canadians and permanent residents of Canada will be given priority. McGill University is committed to equity in employment.

**CHILE**

PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE

Departmento de Matematicas

The Department of Mathematics invites applications for two tenure-track positions at the assistant professor level beginning in September 2007. For one of the positions there is a strong preference in applied mathematics and related areas. Applicants should have a Ph.D. in mathematics, proven research potential and a strong commitment to teaching and research. The
Mathematics Advanced Study Semesters (MASS)

Department of Mathematics of the Penn State University runs a yearly semester-long intensive program for undergraduate students seriously interested in pursuing career in mathematics. MASS is held during the fall semester of each year. For most of its participants, the program is a spring board to graduate schools in mathematics. The participants are usually juniors and seniors.

The MASS program consists of three core courses (4 credits each), Seminar (3 credits) and Colloquium (1 credit), fully transferable to the participants' home schools. The core courses offered in 2006 are:

- Computability, unsolvability and randomness (S. Simpson),
- Surfaces: everything you wanted to know about them (A. Katok),
- Topics in probability theory (O. Sarig).

Applications for fall semester of 2007 are accepted now.

Financial arrangements:

Successful applicants are awarded Penn State MASS Fellowship which reduces their tuition to the in-state level. Applicants who are US citizens or permanent residents receive NSF MASS Fellowship which covers room and board, travel to and from Penn State and provides additional stipend. Applicants with outstanding previous record are awarded additional MASS Merit Fellowship. Participants who significantly exceed expectations during the program will be awarded MASS Performance Fellowships at the end of the semester.

For complete information, see http://www/math-psu.edu/mass

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Classified Advertisements

Teaching load for assistant professors consists of three one-semester courses per year. The salary will be $19,000 per year. Please send a letter indicating your main research interests, detailed curriculum vitae, and three letters of recommendation to:

Director
Pontificia Universidad Catolica de Chile
Departamento de Matematicas
Vicuña Mackenna 4860
Santiago-CHILE
fax (56-2) 5523916;
email griera@mat.puc.cl


TAIWAN

NATIONAL CHIAO TUNG UNIVERSITY
Department of Applied Mathematics
Institute of Mathematical Modeling
and Scientific Computing

The Department of Applied Mathematics and the newly established Institute of Mathematical Modeling and Scientific Computing at National Chiao Tung University invite applications for several tenure-track (associate or assistant) or tenured full professorships. Preference will be given to applicants whose research expertise are mathematical modeling, scientific computing, and other related topics with important applications to science. Candidates whose research interests are close to those of the department's faculty members including PDE, dynamical system, discrete mathematics, and probability will also be considered. The appointment will start in August 2007.

A Ph.D. in mathematics/applied mathematics or a related field is required and the successful candidate should have a good record in research and teaching. Interested applicants should arrange a cover letter, a curriculum vitae, a statement of teaching philosophy, a future research plan, and three letters of references to Chih-Wen Shih, Chair, Department of Applied Mathematics, National Chiao Tung University, Hsinchu, 300, Taiwan. Review of applications will begin January 30, 2007, and will continue until the positions are filled.
The 2007 Annual Meeting of the American Association for the Advancement of Science will be February 15-19, in San Francisco, CA. This year’s program features many outstanding expository talks by prominent mathematicians. The theme of the meeting is “Science and Technology for Sustainable Well-Being”, and many of the symposia sponsored by Section A (Mathematics) are interdisciplinary sessions that fit this theme.

The eight symposia sponsored by Section A are:

- The Science and Modeling of Hurricanes (organized by Clint Dawson)
- New Vistas in the Mathematics of Ecology and Evolution (organized by Simon Levin)
- Prime Numbers: New Developments on Ancient Problems (organized by Dan Goldston)
- New Mathematical Methods in the Visual Arts (organized by Dan Rockmore)
- Are We a Democracy? Vote Counting in the United States (organized by Stephanie Singer)
- How Should Elementary Mathematics Be Taught? (organized by Cathy Kessel)
- Controversies in Forest Fire Suppression and Management (organized by John Braun)
- Blockbuster Science: Math & Science Behind Movies & Entertainment (organized by Tony Chan)

Other symposia that will be of interest to the mathematical community include:

- Decision-Making Under Uncertainty: The Challenge of Sustainable Well-Being
- Climate Change: Treatment of Uncertainty in Assessment and Decision-Making
- Numbers and Nerves: Affect and Meaning in Risk Information
- The Digital Promise: Using Advanced Learning Technologies to Revolutionize Education
- Mathematics and America’s Future: A Call to Action
- Examining TIMSS Teaching and Learning through Videos and Assessments
- New Approaches to the Development of the U.S. Computing Work Force
- Internet Searching in 2017

The above symposia are only a few of the 200 or so AAAS program offerings in the physical, life, social, and biological sciences. For further details about the 2007 AAAS program, see the October 20, 2006, issue of Science. (See also www.aaasmeeting.org under “Program and Events”.)

AAAS annual meetings are the showcases of American science, and they encourage participation by mathematicians and mathematics educators. AAAS acknowledges the generous contributions of AMS for travel support and SIAM for support of media awareness.) The AAAS Program Committee is genuinely interested in offering symposia on pure and applied mathematical topics of current interest, and in previous years there have been symposia on subjects such as the changing nature of mathematical proof, models for how insects fly, and mathematical oncology.

The 2008 meeting will be February 14-18, 2008, in Boston. The Steering Committee for Section A seeks organizers and speakers who can present substantial new material in an accessible manner to a large scientific audience. All are invited to attend the Section A Committee business meeting in San Francisco on Friday, February 16, 2007, at 7:45 PM, where we will brainstorm ideas for symposia. In addition, I invite you to send me, and encourage your colleagues to send me, proposals for future AAAS annual meetings.

The following are the members of the Steering Committee for Section A from February 2006 to February 2007:

Chair: Jack Cowan (University of Chicago)
Chair-Elect: Carl Pomerance (Dartmouth College)
Retiring Chair: Barbara Lee Keyfitz (Fields Institute and University of Houston)
Secretary: Edward Aboufadel (Grand Valley State University)
Members at Large:
Tamar Schlick (New York University)
Walter Craig (McMaster University)
Mary Beth Ruskai (Tufts University)
David Isaacson (Rensselaer Polytechnic Institute)

by Edward Aboufadel, Secretary of Section A of the AAAS
aboufade@gvsu.edu
Speakers and Organizers: 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. Although an individual may present only one ten-minute contributed paper at a meeting, any combination of joint authorship may be accepted, provided no individual speaks more than once. An author can speak by invitation in more than one Special Session at the same meeting.

Special Sessions: The number of Special Sessions at an Annual Meeting is limited. Special Sessions at annual meetings are held under the supervision of the Program Committee for National Meetings and, for sectional meetings, under the supervision of each Section Program Committee. They are administered by the associate secretary in charge of that meeting with staff assistance from the Meetings and Conferences Department in Providence. (See the list of associate secretaries on page 183 of this issue.) Each person selected to give an Invited Address is also invited to generate a Special Session, either by personally organizing one or by having it organized by others. Proposals to organize a Special Session are sometimes solicited either by a program committee or by the associate secretary. Other proposals should be submitted to the associate secretary in charge of that meeting (who is an ex officio member of the program committee) at the address listed on page 183. These proposals must be in the hands of the associate secretary at least seven months (for sectional meetings) or nine months (for national meetings) prior to the meeting at which the Special Session is to be held in order that the committee may consider all the proposals for Special Sessions simultaneously. Special Sessions must be announced in the Notices in a timely fashion so that any Society member who so wishes may submit an abstract for consideration for presentation in the Special Session.

Talks in Special Sessions are usually limited to twenty minutes; however, organizers who wish to allocate more time to individual speakers may do so within certain limits. 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 submitted to the AMS prior to the special early deadline for consideration. Contributors should know that there is a limit to the size of a single Special Session, so sometimes all places are filled by invitation. Papers submitted for consideration for inclusion in Special Sessions but not accepted will receive consideration for a contributed paper session, unless specific instructions to the contrary are given.

The Society reserves the right of first refusal for the publication of proceedings of any Special Session. If published by the AMS, these proceedings appear in the book series Contemporary Mathematics. For more detailed information on organizing a Special Session, see www.ams.org/meetings/specialsessionmanual.html.

Contributed Papers: The Society also accepts abstracts for ten-minute contributed papers. These abstracts will be grouped by related Mathematical Reviews subject classifications into sessions to the extent possible. The title and author of each paper accepted and the time of presentation will be listed in the program of the meeting.

Other Sessions: In accordance with policy established by the AMS Committee on Meetings and Conferences, mathematicians interested in organizing a session at an annual or sectional meeting on employment opportunities inside or outside academia for young mathematicians should contact the associate secretary for the meeting with a proposal by the stated deadline. Also, potential organizers for poster sessions on a topic of choice should contact the associate secretary before the deadline.

Abstracts: Abstracts for all papers must be received by the meeting coordinator in Providence by the stated deadline. Unfortunately, late papers cannot be accommodated.

Submission Procedures: Visit the Meetings and Conferences homepage on the Web at http://www.ams.org/meetings and select “Submit an abstract”.

See the inside front cover of Abstracts of Papers Presented to the American Mathematical Society for information on abstracts published by title and not presented at a meeting.

Site Selection for Sectional Meetings

Sectional meeting sites are recommended by the associate secretary for the section and approved by the Secretariat. Recommendations are usually made eighteen to twenty-four months in advance. Host departments supply local information, ten to fifteen rooms with overhead projectors for contributed paper sessions and Special Sessions, an auditorium with twin overhead projectors for invited addresses, space for registration activities and an AMS book exhibit, and registration clerks. The Society partially reimburses for the rental of facilities and equipment and for staffing the registration desk. Most host departments volunteer; to do so, or for more information, contact the associate secretary for the section.
Meetings & Conferences of the AMS

IMPORTANT INFORMATION REGARDING MEETINGS PROGRAMS: AMS Sectional Meeting programs do not appear in the print version of the Notices. However, comprehensive and continually updated meeting and program information with links to the abstract for each talk can be found on the AMS website. See http://www.ams.org/meetings/. Final programs for Sectional Meetings will be archived on the AMS website accessible from the stated URL and in an electronic issue of the Notices as noted below for each meeting.

New Orleans, Louisiana
New Orleans Marriott and Sheraton New Orleans Hotel
January 5-8, 2007
Friday - Monday
Meeting #1023
Joint Mathematics Meetings, including the 113th Annual Meeting of the AMS, 90th Annual Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).
Associate secretary: Susan J. Friedlander
Announcement issue of Notices: October 2006
Program first available on AMS website: November 1, 2006
Program issue of electronic Notices: January 2007
Issue of Abstracts: Volume 28, Issue 1

Deadlines
For organizers: Expired
For consideration of contributed papers in Special Sessions: Expired
For abstracts: Expired

Program Updates

Social Events
Tulane University Department of Mathematics, Friday, 6:30 p.m. to 7:30 p.m. All meeting participants are invited to this reception in recognition of the effort of the U.S. mathematics community on our behalf in the aftermath of Hurricane Katrina, and the support of the Deutsch Mathematiker-Vereinigung and the Deutsch Forschungsgemeinschaft through travel fellowships awarded young mathematicans from Germany.
Institute in the History of Mathematics and Its Use in Teaching (IHMT) Reunion, Saturday, 6:30 p.m. to 8:30 p.m. This was a MAA project funded by the NSF from 1995 to 2001. Although there will not be a formal program, all participants who wish to speak about their IHMT experiences should notify Victor Katz at vkatz@udc.edu. The reunion will include a memorial to Karen Dee Michalowicz, who died in July. All Institute participants, including those who participated in the Historical Modules Project, are welcome to attend. If you are planning to do so, please notify Herb Kasube at hkasube@bmaill.bradley.edu.
The Ohio State University Friends and Alumni Reception, Sunday, 6:00 p.m. to 8:00 p.m.
University of Wisconsin-Madison Department of Mathematics Reception, Saturday, 5:45 p.m. to 7:30 p.m.

Activities of Other Organizations
Association for Women in Mathematics Critical Career Decision Stages: Research and Funding Opportunities, Monday, 1:00 p.m. to 2:15 p.m. This AWM Workshop event
Employment

Joint Mathematics Meetings Registration Fees

Washington University; Kathleen features Claudia Polini, University of Notre Dame as moderator, and panelists Valentina S. Harizanov, The George Washington University; Kathleen O'Hara, Mathematical Sciences Research Institute; Barbara Lee Keyfitz, Fields Institute and University of Houston; and Michelle D. Wagner, National Security Agency.

Registering at the Meetings

Individuals who registered by November 14 and who so elected will have their badge and program book mailed to them before the meetings. All other registrants will pick up their material at the meeting. The information below is to assist those who will register at the meetings and those who registered in advance who either elected not to receive the materials by mail or were not eligible to do so.

Advance and on-site meeting 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 the meetings badge, if so requested. Badges are required to enter the exhibit area and to obtain discounts at the AMS and MAA book sales.

Registration fees may be paid at the meetings in cash, personal or traveler’s check, or credit card (VISA, MasterCard, American Express, or Discover credit cards (not debit cards) are acceptable). Letters verifying attendance at the meetings may be obtained from the cashier or at the Registration Assistance section of the registration desk.

Participants who wish to attend sessions for one day only may take advantage of a one-day fee. These special fees are effective daily, January 5 through 8, and are available at the meetings to both members and nonmembers. One-day fees are not applicable in other categories.

Joint Mathematics Meetings Registration Fees

Member of AMS, ASL, Canadian Mathematical Society, MAA, SIAM

Emeritus Member of AMS, MAA;
Graduate Student; Unemployed;
Librarian; High School Teacher;
Developing Countries Special Rate

Undergraduate Student
Temporarily Employed
Nonmember
High School Student
One-Day Member
of AMS, ASL, CMS, MAA, SIAM
One-Day Nonmember
Nonmathematician Guest

MAA Minicourses

Minicourses #1-6 (computers)
Minicourse #7-10 and 12-16
Minicourse #11 (origami)

Employment Center

Employer (first table, computer or self-scheduled)

Employer (each additional table, computer or self-scheduled)

Applicants (all services)

Applicants (Winter List & message center only)

AMS Short Course

Member of AMS or MAA
Nonmember
Student/Unemployed/Emeritus

MAA Short Course

MAA or AMS Member
Nonmember
Student/Unemployed/Emeritus

Registration Dates, Times, and Locations

AMS and MAA Short Courses

outside the Rhythms Ballrooms, Sheraton
Wednesday, January 3
7:00 p.m. to 8:00 p.m.

Joint Mathematics Meetings and MAA Minicourses

La Galeries 5 & 6, Marriott
Thursday, January 4
3:00 p.m. to 4:30 p.m.

Badge/program pickup only
7:00 p.m. to 8:00 p.m.

Friday, January 5
7:30 a.m. to 4:00 p.m.

Badge/program pickup only
4:00 p.m. to 6:00 p.m.

Saturday, Jan. 6-Monday, Jan. 8
7:30 a.m. to 4:00 p.m.

Employment Center

Preservation Hall, Marriott
Friday, January 5
Registration for scheduled interviews, materials pickup
7:30 a.m. to 4:00 p.m.

Interview Center
9:30 a.m. to 6:00 p.m.

Saturday, January 6
Schedule distribution, interviews
7:00 a.m. to 4:30 p.m.

Interview Center
8:00 a.m. to 7:30 p.m.

Sunday, January 7
Scheduled interviews
8:15 a.m. to 4:40 p.m.

Interview Center
8:00 a.m. to 7:30 p.m.

Monday, January 8
Interview Center only
9:00 a.m. to noon

Employment Center registrants who are participating in the computer-scheduled interviews must register and fill out interview request forms on Friday, January 5. There will be no registration on Saturday and Sunday; only interviews will take place on these days.

Accommodations and Travel

Participants who did not reserve a room during advance registration but who would like to obtain a room at one of the hotels listed on pages 1149-1150 in the October issue of the Notices should call the hotels directly after December 12. However, we regret that after that date the MMSB can no longer guarantee availability of rooms or the special convention rates.

Please see the October issue for special discount fare information on American Airlines.
Davidson, North Carolina

Davidson College

March 3-4, 2007
Saturday - Sunday

Meeting #1024
Southeastern Section
Announcement issue of Notices: January 2007
Program first available on AMS website: January 18, 2007
Program issue of electronic Notices: March 2007
Issue of Abstracts: Volume 28, Issue 2

Deadlines
For organizers: Expired
For consideration of contributed papers in Special Sessions: Expired
For abstracts: January 9, 2007

Invited Addresses
Nigel Boston, University of South Carolina and University of Wisconsin, Madison, Novel applications of algebra to engineering.
Chaim Goodman-Strauss, University of Arkansas at Fayetteville, Growth, aperiodicity, and undecidability.
Andrew J. Granville, University of Montreal, Erdős’s dream and pretentious characters (Erdős Memorial Lecture).
Alex Iosevich, University of Missouri-Columbia, Analysis, combinatorics, and arithmetic of incidence theory.
Shrawan Kumar, University of North Carolina, Eigenvalue problem for Hermitian matrices and its generalization to arbitrary reductive groups.

Special Sessions
Algebraic and Extremal Combinatorics (Code: SS 7A), Gábor Hetyei, University of North Carolina-Charlotte, and László A. Székely, University of South Carolina.
Applicable Algebra (Code: SS 12A), Nigel Boston, University of South Carolina, and Hiren Maharaj, Clemson University.
Between Harmonic Analysis, Number Theory, and Combinatorics (Code: SS 1A), Alex Iosevich, University of Missouri-Columbia, Michael T. Lacey, Georgia Institute of Technology, and Konstantin Oskolkov, University of South Carolina.
Commutative Algebra and Algebraic Geometry (Code: SS 6A), Florian Enescu, Georgia State University, and Andrew R. Kustin and Adela N. Vraciu, University of South Carolina.
Commutative Rings and Monoids (Code: SS 5A), Evan G. Houston and Thomas G. Lucas, University of North Carolina, Charlotte.

Computational Group Theory (Code: SS 3A), Arturo Magidin, University of Louisiana at Lafayette, Luise Charlotte Kappe, Binghamton University, and Robert F. Morse, University of Evansville.
Computational and Combinatorial Aspects of Tilings and Substitutions (Code: SS 14A), Chaim Goodman-Strauss, University of Arkansas, Casey Mann, University of Texas at Tyler, and Edmund O. Harriss, Queen Mary University of London.
Dynamical Systems (Code: SS 10A), Emily B. Gamber, Santa Fe Institute, Donna K. Mollneck, Davidson College, and James S. Wiseman, Agnes Scott College.
Noncommutative Algebra (Code: SS 8A), Ellen E. Kirkman and James J. Kuzmanovich, Wake Forest University, and James Zhang, University of Washington.
Recent Applications of Numerical Linear Algebra (Code: SS 13A), Timothy P. Chartier, Davidson College, and Amy Langville, College of Charleston.

Accommodations
Participants should make their own arrangements directly with a hotel of their choice as early as possible. Special rates have been negotiated with the hotels listed below. Rates quoted do not include sales tax of 15.5%. The AMS is not responsible for rate changes or for the quality of the accommodations. When making a reservation, participants should state that they are with the American Mathematical Society (AMS) Meeting at Davidson College.

Country Suites by Carlson, 16617 Statesville Rd., Huntersville, NC 28078; 704-895-6565 (phone) or 704-895-5456 (fax), US$109/single or double, an all-suites hotel (separate bedroom/parlor) with microwave, refrigerator, coffee maker, complimentary deluxe continental breakfast.
with hot entrees (make your own waffles!), free high-speed Internet, free wireless in lobby; free parking; fitness center, indoor heated pool. Deadline for reservations is February 2, 2007. Be sure to check cancellation and early checkout policies.

Hawthorne Suites, 16905 Caldwell Creek Dr., Huntersville, NC 28078; 704-892-9478 (phone), 704-892-9402 (fax); US$84/single or double in a studio suite (upgrades available at a higher rate); an all-suites hotel with in-room coffee maker, microfridge; outdoor pool, exercise room; complimentary hot breakfast buffet, complimentary wireless access. Deadline for reservations is February 2, 2007. Be sure to check cancellation and early checkout policies.

Quality Inn, 16825 Caldwell Creek Dr., Huntersville, NC 28078; 704-892-6597 (phone), 704-892-1628 (fax); US$69/single or double; complimentary continental breakfast. Deadline for reservations is February 2, 2007. Be sure to check cancellation and early checkout policies.

Food Service
There are numerous restaurants within walking distance of campus:
- Bonsai Grill and Sushi Bar: Extensive à la carte menu; lunch specials US$6-7; entrees US$9-22.
- The Brickhouse Tavern: Large restaurant; American; salads and sandwiches US$6-10; pizzas US$10-14; entrees US$11-22.
- Kudzu on the Green: Eclectic; lunch entrees US$7-9; dinner entrees US$15-23.
- Palermo's Pizza: Slices US$2-3; subs US$6-7; pizzas US$9-16.
- The Soda Shop: Small, historic restaurant; American; sandwiches US$4-7.

A more extensive list, including restaurants near the hotels we have contracted with for sleeping rooms, will be available on site.

Local Information
The university's website is www.davidson.edu; the department of mathematics is at www.davidson.edu/math. The hotels where the AMS has contracted blocks of sleeping rooms are in the Lake Norman area; see www.takenormancvb.org for information about the area.

Other Activities
Book Sales: Examine the newest titles from the AMS! Many of the AMS books will be available at a special 50% discount available only at the meeting. Complimentary coffee will be served courtesy of AMS Membership Services.

AMS Editorial Activity: An acquisitions editor from the AMS book program will be present to speak with prospective authors. If you have a book project that you would like to discuss with the AMS, please stop by the book exhibit.

PARKING
Parking will be available in the visitor parking lot of the Baker Sports Complex, as indicated on the campus map. There is no charge. See the links below for directions.

Registration and Meeting Information
The meeting is on the campus of Davidson College. Sessions and Invited Addresses will take place in the Chambers Building and the Performance Hall of the Knobloch Campus Center. See a campus map at http://www2.davidson.edu/welcome/wel_imgs/g_dcmapcolor03.gif.

The registration desk will be in the Chambers Building and will be open Saturday, March 3, 7:30 a.m. to 4:00 p.m., and Sunday, April 4, 8:00 a.m. to noon. Fees are US$40 for AMS or CMS members, US$60 for nonmembers; and US$5 for students, unemployed mathematicians, and emeritus members. Fees are payable on site by cash, check, or credit card; debit cards are not accepted.

Travel, Campus Map, and Directions
The nearest airport is in Charlotte, NC (CLT) and is about 25 miles from campus. Cabs and shuttles may be found at the curb side of the lower baggage claim level. Shuttles may be reserved with Lake Norman Airport Transportation, 704-892-8879 (office) or 704-506-0788 (cell). The fare for a one-way cab or shuttle trip is about US$50. Driving directions to campus from the airport: Exit onto Josh Birmingham Parkway. At the end of the parkway choose the path to I-85; you will then be traveling north on the Billy Graham Parkway. As you approach the interstate interchange, take the ramp on the right for I-85 north. Continue on and then exit 38 for I-77 north. Davidson College is located at exit 30, while the hotels the AMS has contracted with are located at Exit 25.

For driving directions from major arteries to Davidson and the Baker Sports Complex parking lot see the directions and detailed map that prints nicely at http://www2.davidson.edu/welcome/wel_maps.asp.

Car Rental
Avis is the official car rental company for the sectional meeting in Davidson, North Carolina.

All rates include unlimited free mileage. Weekend daily rates are available from noon Thursday-Monday at 11:59 P.M. Rates for this meeting are effective February 24, 2007-March 11, 2007 and begin at US$25/day (weekend rate). Should a lower qualifying rate become available at the time of booking, Avis is pleased to offer a 5% discount off the lower qualifying rate or the meeting rate, whichever is lowest. Rates do not include any state or local surcharges, tax, optional coverages, or gas refueling charges. Renters must meet Avis' age, driver, and credit requirements. Reservations can be made by calling 800-331-1600 or online at www.avis.com. Meeting Avis Discount Number B159266.
Weather

March temperatures in Davidson range from 40° F. to 60° F. An umbrella may be desirable.

Information for International Participants

Visa regulations are continually changing for travel to the United States. Visa applications may take from three to four months to process and require a personal interview, as well as specific personal information. International participants should view the important information about traveling to the U.S. found at http://www7.nationalacademies.org/visas/Traveling_to_US.html and http://travel.state.gov/visa/index.html. If you need a preliminary conference invitation in order to secure a visa, please send your request to dls@ams.org.

If you discover you do need a visa, the National Academies website (see above) provides these tips for successful visa applications:

* Visa applicants are expected to provide evidence that they are intending to return to their country of residence. Therefore, applicants should provide proof of "binding" or sufficient ties to their home country or permanent residence abroad. This may include documentation of the following:
  - family ties in home country or country of legal permanent residence
  - property ownership
  - bank accounts
  - employment contract or statement from employer stating that the position will continue when the employee returns;

* Visa applications are more likely to be successful if done in a visitor's home country than in a third country;

* Applicants should present their entire trip itinerary, including travel to any countries other than the United States, at the time of their visa application;

* Include a letter of invitation from the meeting organizer or the U.S. host, specifying the subject, location, dates of the activity, and how travel and local expenses will be covered;

* If travel plans will depend on early approval of the visa application, specify this at the time of the application;

* Provide proof of professional scientific and/or educational status (students should provide a university transcript).

This list is not to be considered complete. Please visit the web sites above for the most up-to-date information.

Oxford, Ohio

Miami University

March 16-17, 2007
Friday - Saturday

Meeting #1025

Central Section

Associate secretary: Susan J. Friedlander
Announcement issue of Notices: January 2007
Program first available on AMS website: February 1, 2007
Program issue of electronic Notices: March 2007
Issue of Abstracts: Volume 28, Issue 2

Deadlines

For organizers: Expired
For consideration of contributed papers in Special Sessions: Expired
For abstracts: January 23, 2007

Invited Addresses

Sergey Fomin, University of Michigan, Title to be announced.
Naichung Conan Leung, University of Minnesota, Title to be announced.
Emil J. Straube, Texas A&M University, Title to be announced.
Shouhong Wang, Indiana University, Title to be announced.

Special Sessions

Combinatorial and Geometric Group Theory (Code: SS 5A), John Donnelly, Mount Union College, and Daniel Farley, Mathematisches Institut Einsteinstrasse and Miami University.

Complex Dynamics and Complex Function Theory (Code: SS 9A), Stephanie Edwards, University of Dayton, and Rich Lawrence Stankewitz, Ball State University.

Finite Geometry and Combinatorics (Code: SS 3A), Mark A. Miller, Marietta College.

Geometric Topology (Code: SS 2A), Jean-Francois LaFont, Ohio State University, and Ivonne J. Ortiz, Miami University.

Graph Theory (Code: SS 4A), Tao Jiang, Zevi Miller, and Dan Pritikin, Miami University.

Large Cardinals in Set Theory (Code: SS 1A), Paul B. Larson, Miami University, Justin Tatch Moore, Boise State University, and Ernest Schimmerling, Carnegie Mellon University.

Noncommutative Algebraic Geometry (Code: SS 7A), Dennis S. Keeler, Miami University, Rajesh Shriram Kulkarni, Michigan State University, and Daniel S. Rogalski, University of California San Diego.

Optimization Theory and Applications (Code: SS 11A), Olga Brezhneva and Doug E. Ward, Miami University.
PDE Methods in Several Complex Variables (Code: SS 6A), Jeffery D. McNeal, Ohio State University, and Emil J. Straube, Texas A&M University.

Quantum Topology (Code: SS 13A), Sergei Chmutov and Thomas Kerler, Ohio State University.

Random Matrices and Non-commutative Probability (Code: SS 12A), Wlodzimierz Bryc, University of Cincinnati, and Narcisse J. Randrianantoanina, Miami University.

Spectral Theory, Orbifolds, Symplectic Reduction and Quantization (Code: SS 15A), William Kirwin, University of Notre Dame, and Christopher Seaton, Rhodes College.

Theoretical and Numerical Issues in Fluid Dynamics (Code: SS 14A), Jie Shen, Purdue University, and Shouhong Wang, Indiana University.


Vector Measures, Banach Spaces and Applications (Code: SS 8A), Patrick N. Dowling, Miami University, and Christopher J. Lennard, University of Pittsburgh.

Accommodations

Participants should make their own arrangements directly with the hotel of their choice and state that they will be attending the American Mathematical Society (AMS) meeting at Miami University and use group code AMS. The AMS is not responsible for rate changes or for the quality of the accommodations. Rates quoted do not include taxes. Hotels have varying cancellation or early checkout penalties; be sure to ask for details when making your reservation.


Hampton Inn (one mile from campus), 3056 College Corner Pike, Oxford, OH 45056; Tel: 513-524-0114, Toll Free 800-426-7866; $80/night plus applicable taxes. Includes continental breakfast and free wireless high-speed Internet access. Deadline for reservations is February 15, 2007. For more information please visit http://hamptoninn.hilton.com/en/hp/hotels/index.html?cityCode=OXF0HXX.

Marcum Conference Center & Inn (located on campus), 100 N. Patterson Avenue, Oxford, OH 45056; Tel: 513-529-2104; $84/night plus applicable taxes. Includes continental breakfast and free wireless high-speed Internet access. For more information please visit www.muohio.edu/marcum. Deadline for reservations is February 15, 2007.

Food Service

A list of restaurants will be available at the registration desk.

Local Information


Other Activities

AMS Book Sale: Examine the newest titles from AMS! Complimentary coffee will be served, courtesy of AMS Membership Services. The AMS Book Sale will operate during the same hours as registration. The Book Sale is in Room 118, Bachelor Hall.

AMS Editorial Activity: An acquisitions editor from the AMS Book program will be present to speak with Prospective Authors. If you have a book project that you would like to discuss with the AMS please stop by the book exhibit.

Parking

Visitors to campus should park in the Cook Field parking lot across the street from Bachelor Hall. A temporary visitor parking pass can be obtained at the registration desk.

Registration and Meeting Information

The registration desk will be open 7:30 a.m. to 4:00 p.m. on Friday, and 8:00 a.m. to noon on Saturday in Room 115, Bachelor Hall. Talks will take place in Bachelor and Culler Halls.

Registration fees: (payable on-site only) $40/AMS members; $60/nonmembers; $5/emeritus members, students, or unemployed mathematicians. Fees are payable by cash, check, VISA, Mastercard, Discover, and American Express. Debit cards are not accepted.

Travel

By air: The Cincinnati/Northern Kentucky Airport (approximately an hour south of Oxford in northern Kentucky off I-275), and Dayton International Airport (approximately an hour northeast of Oxford in Vandalia off I-70E) are the two major facilities located within the shortest distance to Oxford (approximately one hour).

There is no regular public transportation from either of these airports to Oxford. The most reliable airport transportation service is provided by appointment only by Bob's Need-A-Ride: 513-523-6840 or 800-891-0064, or e-mail: oxfordlimo@aol.com. Prices vary according to the number of passengers.

By Car: Most persons driving to the campus will come by way of one of the routes below. Should you be coming by a different route please check MapQuest.

Directions to Oxford: State Route 27 and State Route 73 are the main highways to Oxford.
Meetings & Conferences

From the northeast: I-70 to State Route 127 south to State Route 73 west.
From the northwest: I-70 to State Route 27 south.
From the south: I-275 to State Route 27 north.
From the southwest: I-74 to I-275 north/east to State Route 27 north.
From the east and north: I-75 to State Route 129 west to State Route 177 west to State Route 73 west; or I-70 to State Route 127 south to 73 west.

For more travel-related information please visit http://www.miami.muohio.edu/parents/transportation.cfm.

Car Rental
Avis is the official car rental company for the sectional meeting in Oxford, Ohio.

All rates include unlimited free mileage. Weekend daily rates are available from noon Thursday-Monday at 11:59 p.m. and start at US$24 per day. Rates for this meeting are effective March 3, 2007-March 9, 2007. Should a lower qualifying rate become available at the time of booking, Avis is pleased to offer a 5% discount off the lower qualifying rate or the meeting rate, whichever is lowest. Rates do not include any state or local surcharges, tax, optional coverages, or gas refueling charges. Renters must meet Avis’ age, driver, and credit requirements. Reservations can be made by calling 800-331-1600 or online at www.avis.com. Meeting Avis Discount Number B159266.

Weather
Weather conditions in Oxford during mid-March are cool. Temperatures range from around 52°F during the day to around 32°F at night. There is a 40% chance of precipitation.

Information for International Participants
Visa regulations are continually changing for travel to the United States. Visa applications may take from three to four months to process and require a personal interview, as well as specific personal information. International participants should view the important information about traveling to the U.S. found at http://www7.nationalacademies.org/visas/Traveling_to_US.html and http://travel.state.gov/visa/index.html.

If you need a preliminary conference invitation in order to secure a visa, please send your request to dlss@ams.org.

If you discover you do need a visa, the National Academies website (see above) provides these tips for successful visa applications:

* Visa applicants are expected to provide evidence that they are intending to return to their country of residence. Therefore, applicants should provide proof of "binding" or sufficient ties to their home country or permanent residence abroad. This may include documentation of the following:
  - family ties in home country or country of legal permanent residence
  - property ownership
  - bank accounts
  - employment contract or statement from employer stating that the position will continue when the employee returns;
  - Visa applications are more likely to be successful if done in a visitor's home country than in a third country;
  - Applicants should present their entire trip itinerary, including travel to any countries other than the United States, at the time of their visa application;
  - Include a letter of invitation from the meeting organizer or the U.S. host, specifying the subject, location and dates of the activity, and how travel and local expenses will be covered;
  - If travel plans will depend on early approval of the visa application, specify this at the time of the application;
  - Provide proof of professional scientific and/or educational status (students should provide a university transcript).

This list is not to be considered complete. Please visit the web sites above for the most up-to-date information.

Hoboken, New Jersey

Stevens Institute of Technology

April 14-15, 2007
Saturday - Sunday

Meeting #1026
Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of Notices: February 2007
Program first available on AMS website: March 8, 2007
Program issue of electronic Notices: April 2007
Issue of Abstracts: Volume 28, Issue 2

Deadlines
For organizers: Expired
For consideration of contributed papers in Special Sessions: December 26, 2006
For abstracts: February 27, 2007

Invited Addresses
Neal Koblitz, University of Washington, Title to be announced.
Florian Luca, Universidad Nacional Autónoma de México, Title to be announced.
Natasa Pavlovic, Princeton University, Title to be announced.
Elisabeth Werner, Case Western Reserve University, Title to be announced.

Special Sessions
Affine Invariants, Randomness, and Approximation in Convex Geometry (Code: SS 2A), Elisabeth Werner, Case West-
Tucson, Arizona
University of Arizona

April 21-22, 2007
Saturday - Sunday

Meeting #1027
Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of Notices: February 2007
Program first available on AMS website: March 8, 2007
Program issue of electronic Notices: April 2007
Issue of Abstracts: Volume 28, Issue 2

Deadlines
For organizers: Expired
For consideration of contributed papers in Special Sessions:
January 2, 2007
For abstracts: February 27, 2007

Invited Addresses
Liliana Borcea, Rice University, Title to be announced.
James Cushing, University of Arizona, Tucson, Title to be announced.
Hans Lindblad, University of California, San Diego, Title to be announced.
Vinayak Vatsal, University of British Columbia, Vancouver, Title to be announced.

Special Sessions
Advances in Spectral Theory of Operators (Code: SS 12A), Roger Roybal, California State University, Channel Islands, and Michael D. Wills, Weber State University.
Algebraic Combinatorics (Code: SS 14A), Helene Barcelo and Susanna Fishel, Arizona State University.
Automorphisms of Curves (Code: SS 4A), Aaron D. Wootton, University of Portland, Anthony Weaver, Bronx Community College, and S. Allen Broughton, Rose-Hulman Institute of Technology.
Graph Theory and Combinatorics (Code: SS 9A), Sebastian M. Cioaba, University of California at San Diego, and Joshua Cooper, University of South Carolina.
Inverse Problems for Wave Propagation (Code: SS 2A), Liliana Borcea, Rice University.
Moduli Spaces and Invariant Theory (Code: SS 7A), Philip Foth and Yi Hu, University of Arizona.
New Developments and Directions in Random Matrix Theory (Code: SS 13A), Peter David Miller, University of Michigan, and Estelle Basor, California Polytechnic State University.
Number Theory in the Southwest (Code: SS 10A), Dinesh S. Thakur and Douglas L. Ulmer, University of Arizona.
Operator Algebras (Code: SS 6A), Steven P. Kaliszewski, Jack Spielberg, and John C. Quigg, Arizona State University.
Partial Differential Equations and Geometric Analysis (Code: SS 11A), Sunhi Choi, Lennie Friedlander, and David Alan Glickenstein, University of Arizona.
Representations of Algebras (Code: SS 1A), Frauke Maria Bleher, University of Iowa, Birge K. Huisinga-Zimmermann, University of California Santa Barbara, and Dan Zacharia, Syracuse University.
Special Functions and Orthogonal Polynomials (Code: SS 15A), Diego Dominici, State University of New York at New Paltz, and Robert S. Maier, University of Arizona.
Spectral Analysis on Singular and Noncompact Manifolds (Code: SS 8A), Juan Bautista Gil, Pennsylvania State University, and Thomas Krainer, Pennsylvania State University.

Subjects in and Around Fluid Dynamics (Code: SS 5A), Robert Owczarek, Los Alamos National Laboratory, and Mikhail Stepanov, University of Arizona.

Zacatecas, Mexico
Universidad Autónoma de Zacatecas
May 23–26, 2007
Wednesday - Saturday

Meeting #1028
Seventh Joint International Meeting of the AMS and the Sociedad Matematica Mexicana,
Associate secretary: Matthew Miller
Announcement issue of Notices: March 2007
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: To be announced
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Warsaw, Poland
University of Warsaw
July 31 – August 3, 2007
Tuesday – Friday

Meeting #1029
First Joint International Meeting between the AMS and the Polish Mathematical Society,
Associate secretary: Susan J. Friedlander
Announcement issue of Notices: To be announced
Program first available on AMS website: Not applicable
Program issue of electronic Notices: Not applicable
Issue of Abstracts: Not applicable

Deadlines
For organizers: December 31, 2006
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Invited Addresses
Henryk Iwaniec, Rutgers University, Title to be announced.
Tomasz J. Luczak, Adam Mickiewicz University, Title to be announced.

Special Sessions
Complex Dynamics, Robert Devaney, Boston University, Jane N. Hawkins, University of North Carolina, and Janina Kotus, Warsaw University of Technology.
Dynamical Systems, Steven Hurder, University of Illinois at Chicago, Michal Misiurewicz, Indiana University-Purdue University Indianapolis, and Pawel Walczak, University of Lodz.
Geometric Group Theory, Mladen Bestvina, University of Utah, Tadeusz Januszkiewicz, Ohio State University, and Jacek Swiatkowski, University of Wroclaw.
Partial Differential Equations of Evolution Type, Susan J. Friedlander, University of Illinois at Chicago, and Grzegorz A. Karch, University of Wroclaw.

Chicago, Illinois
DePaul University
October 5–6, 2007
Friday – Saturday

Meeting #1030
Central Section
Associate secretary: Susan J. Friedlander
Announcement issue of Notices: August 2007
Program first available on AMS website: August 16, 2007
Program issue of electronic Notices: October 2007
Issue of Abstracts: Volume 28, Issue 3

Deadlines
For organizers: March 6, 2007
For consideration of contributed papers in Special Sessions: June 19, 2007
For abstracts: August 7, 2007

Invited Addresses
Martin Golubitsky, University of Houston, Title to be announced.
Matthew J. Gursky, University of Notre Dame, Title to be announced.
Alex Iosevich, University of Missouri, Title to be announced.
Meetings & Conferences

David E. Radford, University of Illinois at Chicago, Title to be announced.

Special Sessions

Algebraic Combinatorics: Association Schemes and Related Topics (Code: SS 1A), Sung Y. Song, Iowa State University and Paul Terwilliger, University of Wisconsin.

New Brunswick, New Jersey

Rutgers University-New Brunswick, Busch Campus

October 6-7, 2007
Saturday - Sunday

Meeting #1031
Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of Notices: August 2007
Program first available on AMS website: August 16, 2007
Program issue of electronic Notices: October 2007
Issue of Abstracts: Volume 28, Issue 3

Deadlines
For organizers: March 6, 2007
For consideration of contributed papers in Special Sessions: June 19, 2007
For abstracts: August 7, 2007

Invited Addresses
Sir Roger Penrose, University of Oxford, Title to be announced (Einstein Public Lecture in Mathematics).

Special Sessions

Commutative Algebra (Code: SS 4A), Jooyoun Hong, University of California Riverside, and Wolmer V. Vasconcelos, Rutgers University.

Mathematical and Physical Problems in the Foundations of Quantum Mechanics (in Honor of Shelly Goldstein’s 60th Birthday) (Code: SS 3A), Roderich Tumulka and Detlef Dürr, München University, and Nino Zanghi, University of Genova.

Partial Differential Equations in Mathematical Physics (in Honor of Shelly Goldstein’s 60th Birthday) (Code: SS 2A), Sagun Chanillo, Michael K.-H. Kiessling, and Avy Soffer, Rutgers University.

Probability and Combinatorics (Code: SS 1A), Jeffrey N. Kahn and Van Ha Vu, Rutgers University.

Set Theory of the Continuum (Code: SS 5A), Simon R. Thomas, Rutgers University.

Albuquerque, New Mexico

University of New Mexico

October 13-14, 2007
Saturday - Sunday

Meeting #1032
Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of Notices: August 2007
Program first available on AMS website: August 30, 2007
Program issue of electronic Notices: October 2007
Issue of Abstracts: Volume 28, Issue 3

Deadlines
For organizers: March 13, 2007
For consideration of contributed papers in Special Sessions: June 26, 2007
For abstracts: August 21, 2007

Invited Addresses
Emmanuel Candès, California Institute of Technology, Title to be announced.
Alexander Polischuk, University of Oregon, Title to be announced.
Eric Rains, University of California Davis, Title to be announced.
William E. Stein, University of California San Diego, SAGE: Software for Algebra and Geometry Experimentation.

Murfreesboro, Tennessee

Middle Tennessee State University

November 3-4, 2007
Saturday - Sunday

Meeting #1033
Southeastern Section
Associate secretary: Matthew Miller
Announcement issue of Notices: September 2007
Program first available on AMS website: September 20, 2007
Program issue of electronic Notices: November 2007
Issue of Abstracts: Volume 28, Issue 4

Deadlines
For organizers: April 3, 2007
For consideration of contributed papers in Special Sessions: July 17, 2007
For abstracts: September 11, 2007
Invited Addresses
Daniel K. Nakano, University of Georgia, Title to be announced.
Carla D. Savage, North Carolina State University, Title to be announced.
Sergei Tabachnikov, Pennsylvania State University, Title to be announced.

Special Sessions
Advances in Algorithmic Methods for Algebraic Structures (Code: SS 3A), James B. Hart, Middle Tennessee State University.
Applied Partial Differential Equations (Code: SS 4A), Yuri A. Melnikov, Middle Tennessee State University, and Alain J. Kassab, University of Central Florida.
Differential Equations and Dynamical Systems (Code: SS 1A), Wenzhang Huang and Jia Li, University of Alabama, Huntsville, and Zachariah Sinkala, Middle Tennessee State University.
Graph Theory (Code: SS 2A), Rong Luo, Chris Stephens, and Xiaoya Zha, Middle Tennessee State University.

Wellington, New Zealand
To be announced
December 12-15, 2007
Wednesday - Saturday

Meeting #1034
First Joint International Meeting between the AMS and the New Zealand Mathematical Society (NZMS).
Associate secretary: Matthew Miller
Announcement issue of Notices: To be announced
Program first available on AMS website: Not applicable
Program issue of electronic Notices: Not applicable
Issue of Abstracts: Not applicable

Deadlines
For organizers: March 31, 2007
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

AMS Special Sessions
Computability Theory, Rodney G. Downey and Noam Greenberg, Victoria University of Wellington.
Hopf Algebras and Quantum Groups, M. Susan Montgomery, University of Southern California, and Yinhuo Zhang, Victoria University of Wellington.
Infinite-dimensional Groups and Their Actions, Christopher Atkin, Victoria University of Wellington, Greg Hjorth, University of California Los Angeles/University of Melbourne, Alicia Miller, University of Louisville, and Vladimir Pestov, University of Ottawa.


San Diego, California
San Diego Convention Center
January 6-9, 2008
Sunday - Wednesday
Joint Mathematics Meetings, including the 114th Annual Meeting of the AMS, 91st Annual Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).
Associate secretary: Michel L. Lapidus
Announcement issue of Notices: October 2007
Program first available on AMS website: November 1, 2007
Program issue of electronic Notices: January 2008
Issue of Abstracts: Volume 29, Issue 1

Deadlines
For organizers: April 1, 2007
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

New York, New York
Courant Institute of New York University
March 22-23, 2008
Saturday - Sunday
Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: August 22, 2007
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Special Sessions
L-Functions and Automorphic Forms (Code: SS 1A), Alina Bucur, Institute for Advanced Study, Ashay Venkatesh, Courant Institute of Mathematical Sciences, Stephen D.
Meetings & Conferences

Miller, Rutgers University, and Steven J. Miller, Brown University.

Baton Rouge, Louisiana
Louisiana State University, Baton Rouge
March 28–30, 2008
Friday - Sunday
Southeastern Section
Associate secretary: Matthew Miller
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: August 28, 2007
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Bloomington, Indiana
Indiana University
April 4–6, 2008
Friday - Sunday
Central Section
Associate secretary: Susan J. Friedlander
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: September 4, 2007
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Claremont, California
Claremont McKenna College
May 3–4, 2008
Saturday - Sunday
Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: March 9, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Rio de Janeiro, Brazil
Instituto Nacional de Matemática Pura e Aplicada (IMPA)
June 4–7, 2008
Wednesday - Saturday
First Joint International Meeting between the AMS and the Sociedade Brasileira de Matemática.
Associate secretary: Lesley M. Sibner
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: To be announced
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced

Vancouver, Canada
University of British Columbia and the Pacific Institute of Mathematical Sciences (PIMS)
October 4–5, 2008
Saturday - Sunday
Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: March 9, 2008
For consideration of contributed papers in Special Sessions: To be announced
For abstracts: To be announced
Middletown, Connecticut
Wesleyan University
October 11-12, 2008
Saturday - Sunday
Eastern Section
Associate secretary: Lesley M. Sibner
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: March 11, 2008
For consideration of contributed papers in Special Sessions:
To be announced
For abstracts: To be announced

Huntsville, Alabama
University of Alabama, Huntsville
October 24-26, 2008
Friday - Sunday
Southeastern Section
Associate secretary: Matthew Miller
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: March 24, 2008
For consideration of contributed papers in Special Sessions:
To be announced
For abstracts: To be announced

Shanghai, People's Republic of China
Fudan University
December 17-21, 2008
Wednesday - Sunday
First Joint International Meeting Between the AMS and the Shanghai Mathematical Society
Associate secretary: Susan J. Friedlander
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: August 29, 2008
For consideration of contributed papers in Special Sessions:
To be announced
For abstracts: To be announced

Washington, District of Columbia
Marriott Wardman Park Hotel and Omni Shoreham Hotel
January 7-10, 2009
Wednesday - Saturday
Joint Mathematics Meetings, including the 115th Annual Meeting of the AMS, 92nd Annual Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).
Associate secretary: Lesley M. Sibner
Announcement issue of Notices: October 2008
Program first available on AMS website: November 1, 2008
Program issue of electronic Notices: January 2009
Issue of Abstracts: Volume 30, Issue 1

Deadlines
For organizers: April 1, 2008
For consideration of contributed papers in Special Sessions:
To be announced
For abstracts: To be announced

Urbana, Illinois
University of Illinois at Urbana-Champaign
March 27-29, 2009
Friday - Sunday
Southeastern Section
Associate secretary: Susan J. Friedlander
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: August 29, 2008
For consideration of contributed papers in Special Sessions:
To be announced
For abstracts: To be announced
Meetings & Conferences

Raleigh, North Carolina
North Carolina State University
April 4–5, 2009
Saturday – Sunday
Southeastern Section
Associate secretary: Matthew Miller
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: September 4, 2008
For consideration of contributed papers in Special Sessions:
To be announced
For abstracts: To be announced

San Francisco, California
San Francisco State University
April 25–26, 2009
Saturday – Sunday
Western Section
Associate secretary: Michel L. Lapidus
Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines
For organizers: September 25, 2008
For consideration of contributed papers in Special Sessions:
To be announced
For abstracts: To be announced

San Francisco, California
Moscone Center West and the San Francisco Marriott
January 6–9, 2010
Wednesday – Saturday
Joint Mathematics Meetings, including the 116th Annual Meeting of the AMS, 93rd Annual Meeting of the Mathematical Association of America (MAA), annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society of Industrial and Applied Mathematics (SIAM).
Associate secretary: Matthew Miller
Announcement issue of Notices: October 2009
Program first available on AMS website: November 1, 2009
Program issue of electronic Notices: January 2010
Issue of Abstracts: Volume 31, Issue 1

Deadlines
For organizers: April 1, 2009
For consideration of contributed papers in Special Sessions:
To be announced
For abstracts: To be announced

New Orleans, Louisiana
New Orleans Marriott and Sheraton New Orleans Hotel
January 5–8, 2011
Wednesday – Saturday
Joint Mathematics Meetings, including the 117th Annual Meeting of the AMS, 94th Annual Meeting of the Mathematical Association of America, annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).
Associate secretary: Susan J. Friedlander
Announcement issue of Notices: October 2010
Program first available on AMS website: November 1, 2010
Program issue of electronic Notices: January 2011
Issue of Abstracts: Volume 32, Issue 1

Deadlines
For organizers: April 1, 2010
For consideration of contributed papers in Special Sessions:
To be announced
For abstracts: To be announced
Boston, Massachusetts

John B. Hynes Veterans Memorial Convention Center, Boston Marriott Hotel, and Boston Sheraton Hotel

January 4–7, 2012

Wednesday – Saturday

Joint Mathematics Meetings, including the 118th Annual Meeting of the AMS, 95th Annual Meeting of the Mathematical Association of America, annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).

Associate secretary: Michel L. Lapidus

Announcement issue of Notices: October 2011
Program first available on AMS website: November 1, 2011
Program issue of electronic Notices: January 2012
Issue of Abstracts: Volume 33, Issue 1

Deadlines

For organizers: April 1, 2011
For consideration of contributed papers in Special Sessions:
  To be announced
For abstracts: To be announced

San Diego, California

San Diego Convention Center and San Diego Marriott Hotel and Marina

January 9–12, 2013

Wednesday – Saturday

Joint Mathematics Meetings, including the 119th Annual Meeting of the AMS, 96th Annual Meeting of the Mathematical Association of America, annual meetings of the Association for Women in Mathematics (AWM) and the National Association of Mathematicians (NAM), and the winter meeting of the Association for Symbolic Logic (ASL), with sessions contributed by the Society for Industrial and Applied Mathematics (SIAM).

Associate secretary: Lesley M. Sibner

Announcement issue of Notices: To be announced
Program first available on AMS website: To be announced
Program issue of electronic Notices: To be announced
Issue of Abstracts: To be announced

Deadlines

For organizers: April 1, 2012
For consideration of contributed papers in Special Sessions:
  To be announced
For abstracts: To be announced
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Presenters of Papers

New Orleans, Louisiana; January 5-8, 2007

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**NOTICES OF THE AMS**

**New Orleans, LA - Presenters of Papers**

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**Presenters of Papers**

[Note: The list above contains the names of presenters and their respective pages. The list is likely meant to indicate where these presenters' contributions are to be found in the proceedings.]
Program of the Sessions
New Orleans, Louisiana, January 5–8, 2007

Wednesday, January 3

AMS Short Course on Aspects of Statistical Learning, I
8:00 AM - 4:45 PM
Organizers: Cynthia Rudin, Courant Institute, New York University
Miroslav Dudik, Princeton University
8:00 AM Registration.
9:00 AM Opening remarks by Cynthia Rudin and Miroslav Dudik.
(1) Robert E. Schapire, Princeton University
10:30 AM Break.
11:00 AM Occam’s Razor and Generalization Bounds.
(2) Cynthia Rudin*, Center for Neural Science and Courant Institute, New York University, and Miroslav Dudik*, Princeton University
2:00 PM Exact Learning of Boolean Functions and Finite Automata with Queries.
(3) Lisa Hellerstein, Polytechnic University
3:15 PM Break.
3:45 PM Panel Discussion.

MAA Short Course on Leonhard Euler: Looking Back after 300 Years, I
8:00 AM - 4:45 PM
Organizers: Ed Sandifer, Western Connecticut State University
Robert E. Bradley, Adelphi University
8:00 AM Registration.
9:00 AM Introductions.
9:15 AM A mathematical life in the enlightenment.
(4) Ronald S. Calinger, Catholic University of America
10:30 AM Break.
10:45 AM Euler and number theory: A study in mathematical invention.
(5) Jeff Suzuki, Brooklyn College

Thursday, January 4

MAA Board of Governors
8:00 AM - 5:00 PM
AMS Short Course on Aspects of Statistical Learning, II
9:00 AM - 1:00 PM
Organizers: Cynthia Rudin, Courant Institute, New York University
Miroslav Dudik, Princeton University
9:00 AM Online Learning.
(8) Adam Tauman Kalai, Weizmann Institute of Science and Toyota Technological Institute
10:15 AM Break.
10:45 AM Spectral Methods for Visualization and Analysis of High Dimensional Data.
(9) Lawrence Saul, University of California San Diego
NOON Question and answer session.

MAA Short Course on Leonhard Euler: Looking Back after 300 Years, II
9:00 AM - 5:00 PM
Organizers: Ed Sandifer, Western Connecticut State University
Robert E. Bradley, Adelphi University
9:00 AM Questions and answers.

The time limit for each AMS contributed paper in the sessions is ten minutes. The time limit for each MAA contributed paper varies. In the Special Sessions the time limit varies from session to session and within sessions. To maintain the schedule, time limits will be strictly enforced.

For papers with more than one author, an asterisk follows the name of the author who plans to present the paper at the meeting.

Papers flagged with a solid triangle (>) have been designated by the author as being of possible interest to undergraduate students.

Abstracts of papers presented in the sessions are available in Volume 28, Issue 1 of Abstracts of papers presented to the American Mathematical Society, ordered according to the numbers in parentheses following the listings.
Friday, January 5 – Program of the Sessions

9:15 AM  Euler and classical physics.
(10)  Stacy C. Langton, University of San Diego

10:30 AM  Break.

10:45 AM  Elliptic integrals, mechanics, and differential equations.
Lawrence D. D’Antonio, Ramapo College

2:00 PM  Euler’s great theorems.
(12)  Edward Sandifer, Western Connecticut State University

3:15 PM  Break.

3:30 PM  Panel discussion.

AMS Council

1:30 PM – 10:00 PM

Joint Meetings Registration

3:00 PM – 8:00 PM

Full registration will be conducted from 3:00 p.m. to 7:00 p.m. Badge/program pickup for those registered in advance will be open until 8:00 p.m.

Joint Meetings Registration

7:30 AM – 6:00 PM

Full registration will be conducted from 7:30 a.m. to 4:00 p.m. Badge/program pickup for those registered in advance will be open until 6:00 p.m.

Employment Center

7:30 AM – 6:00 PM

AMS-MAA Special Session on Math Circles and Similar Programs for Students and Teachers, I

8:00 AM – 10:55 AM

Organizers: Morris Kalka, Tulane University
Kathleen O’Hara, Mathematical Sciences Research Institute
Hugo Rossi, Mathematical Sciences Research Institute
Tatiana Shubin, San Jose State University
Zvezdelina E. Stankova, Mills College
Daniel H. Ullman, George Washington University
Paul A. Zeitz, University of San Francisco

8:00 AM  Backyard Mathematics.
(13)  Mark Saul, Bronxville Schools (ret.) (1023-97-704)

8:30 AM  The Great Conversation.
(14)  Robert Kaplan* and Ellen Kaplan, The Math Circle (1023-97-914)

9:00 AM  The San Diego Math Circle.
(15)  David Patrick, Art of Problem Solving (1023-97-325)

9:30 AM  Mathematical Circles (Silicon Valley Experience).
(16)  Tatiana Shubin, San Jose State University (1023-97-705)

10:00 AM  University of California, Davis’s Explore Math Program.
Graduate students bringing cutting-edge research into the classroom to share with undergraduate and high school students. Preliminary report.
Brandy S. Wiegers*, Yuan-Juang Yvonne Lai, Sarah A. Williams and Spyridon Michalakakis, University of California, Davis (1023-97-1723)

10:30 AM  Discussion.

AMS-ASL Special Session on Logical Methods in Computational Mathematics, I

8:00 AM – 10:55 AM

Organizers: Saugata Basu, Georgia Institute of Technology
Charles N. Delzell, Louisiana State University

8:00 AM  General logical metatheorems for functional analysis.
Philipp Gerhardy, Department of Philosophy, Carnegie Mellon University (1023-03-1468)

8:30 AM  New effective uniformity results in fixed point theory.
Ulrich Kohlenbach, Darmstadt University of Technology (1023-03-361)

9:00 AM  Proof mining in CAT(0)-spaces and k-trees.
Laurentiu Leustean, TU Darmstadt, Germany and Institute of Mathematics "Simion Stoilow" of the Romanian Academy, Bucharest, Romania (1023-03-1261)

9:30 AM  Model elimination and cut elimination. Preliminary report.
Grigori Mints, Stanford University (1023-03-79)

10:00 AM  Phase transitions in logic and combinatorics.
Andreas Weiermann, Ghent University (1023-03-1102)

Jeffery Zucker, McMaster University, Hamilton, Canada (1023-03-628)

AMS-AWM Special Session on Geometric Group Theory, I

8:00 AM – 10:55 AM

Organizers: Ruth M. Charney, Brandeis University
Karen Vogtmann, Cornell University

8:00 AM  Automorphisms of right-angled groups.
(24)  Adam Piggott* and Mauricio Gutierrez, Tufts University (1023-20-237)

8:30 AM  Quasi-isometric classification of graph manifolds.
(25)  Jason A. Behrstock*, University of Utah, and Walter D. Neumann, Barnard College, Columbia University (1023-20-136)

9:00 AM  Dual presentations for Artin groups. Preliminary report.
(26)  Jon McCammond, U C Santa Barbara (1023-20-476)

9:30 AM  Spaces with nonpositive immersions. Preliminary report.
(27)  Robert W. Bell, Michigan State University (1023-20-1164)

10:00 AM  A geometric perspective on the conjugacy problem in Thompson’s group F. Preliminary report.
(28)  Kai-Uwe Bux* and Dimitriy Sonkin, University of Virginia (1023-20-1088)
AMS Special Session on Fixed Point Theory, Dynamics, and Group Theory, I
8:00 AM - 10:55 AM

Organizers: Michael R. Kelly, Loyola University
            Peter N. Wong, Bates College

8:00AM Quantum Teichmuller Theory. Preliminary report.
    Daniel T. Wise, McGill University

(29) Hilbert space compression of groups. Preliminary report.
    Mark Sapir, Vanderbilt University

(30) The Euler characteristic of the Whitehead automorphism group of a free product.
    Craig A Jensen*, University of New Orleans, Jon McCammond, UC Santa Barbara, and John Meier, Lafayette College

(31) Strong monotonicity for filtered ends of pairs of groups.
    Tom Klein, Binghamton University

(32) Some Topological Invariants of Groups and Actions.
    John Franks*, Northwestern University, Herbert H. Lehman College (CUNY), and Kamlesh Parwani, Univ. of Houston

(33) Rooted and symmetries of pseudo-Anosov.
    Jerome Los*, CNRS, University Aix-Marseille1, and Jerome Fehrenbach, University of Toulouse

(34) Fixed points of abelian group actions on surfaces.
    John Franks*, Northwestern University, Michael Handel, Herbert H. Lehman College (CUNY), and Kamlesh Parwani

(35) From dynamical systems to surface braid groups.
    Daciberg Lima Gonzalez, Universidade de Sao Paulo, and John Guaschi*.

(36) Preliminary report.
    Daciberg Lima Gonzalez, Universidade de Sao Paulo, and John Guaschi*

AMS Special Session on Knots, 3-Manifolds, and Their Invariants, I
8:00 AM - 10:55 AM

Organizers: Oliver T. Dasbach, Louisiana State University
            Xiaosong Lin, University of California Riverside

8:00AM Quantum Teichmuller Theory. Preliminary report.
    Charles D. Frohman*, The University of Iowa, and Adam Sikora, The State University of New York at Buffalo

(37) Nonalternating knots and the Jones polynomial.
    Neil R. Nichelson, The University of Iowa

(38) Dessins d'enfant and Link Invariants. Preliminary report.
    Neal W. Stoltzfus*, Louisiana State University, Xiaosong Lin, UC Riverside, Oliver T. Dasbach, Louisiana State University, Efratia Kalfagianni and David Futer, Michigan State University

(39) New Skein modules of three manifolds (with C. Frohman).
    Marta Asaeda*, Univ. of California Riverside, and Charlie Frohman, University of Iowa

(40) Turaev-Viro Invariants of 3-Manifolds and the Reidemeister torsion.
    Charles D. Frohman, The University of Iowa, and Joanna Kania-Bartoszynska*

AMS Special Session on Coding Theory and Its Applications, I
8:00 AM - 10:55 AM

Organizers: Roxana N. Smarandache, University of Notre Dame and San Diego State University
            Pascal O. Vontobel, Hewlett-Packard Laboratories

8:00AM Pseudocodeword weights of codes from expander graphs.
    Christine A. Kelley, The Fields Institute

(48) LDPC Convolutional Codes: What Are They? How Do They Work? Are They Any Good?
    Daniel J. Costello* and Ali Emre Pusane, Univ. of Notre Dame

(49) Towards explaining decoding errors for LDPC codes.
    Lance C. Perez and Judy L. Walker*, University of Nebraska

(50) A code decomposition theory.
    Navin Kashyap, Queen's University
AMS Special Session on Cohomology and Representation Theory, I

8:00 AM - 10:50 AM

Organizers: Jon F. Carlson, University of Georgia
    Daniel K. Nakano, University of Georgia
    Julia Pevtsova, University of Washington

8:00 AM The centralizer of a nilpotent section.
    (53) George J. McNinch, Tufts University (1023-22-1152)

8:30 AM On Some Nilpotent Orbits and Desingularizations of Their Closures. Preliminary report.
    Terrell L. Hodge*, Western Michigan University (on sabbatical leave 2006-2007 at the University of Virginia), and David C. Murphy, Kalamazoo College (1023-20-884)

9:00 AM Quiver representations with bilinear forms and nilpotent orbits of graded classical Lie algebras. Preliminary report.
    Zongzhao Lin*, Kansas State University, and Bangming Deng, Beijing Normal University (1023-20-1656)

9:30 AM Quantum Group Cohomology.
    (56) Christopher P. Bendel*, University of Wisconsin-Stout, Daniel K. Nakano, University of Georgia, Brian J. Parshall, University of Illinois, and Cornelius Pillen, University of South Alabama (1023-20-627)

10:00 AM Cohomology formulas, old and new. Preliminary report.
    Brian Parshall* and Leonard Scott, University of Virginia (1023-20-904)

10:30 AM Character formulas, old and new.
    (58) Leonard Scott* and Brian Parshall, University of Virginia (1023-20-905)

AMS Special Session on Experimental Mathematics in Action, I

8:00 AM - 10:50 AM

Organizers: Victor H. Moll, Tulane University
    Tewodros Amdeberhan, Tulane University

8:00 AM Experimental discovery of Apéry-type identities for even zeta values.
    Jonathan M. Borwein, Dalhousie University (1023-11-655)

8:30 AM PSLQ Does Functions Too? Preliminary report.
    Marc Chamberland, Grinnell College (1023-11-222)

9:00 AM Isodiometric problems for polygons.
    (61) Michael J. Mossinghoff, Davidson College (1023-52-100)

9:30 AM Fixed Points of Maps on the Space of Rational Functions.
    Edward C. Mosteig, Loyola Marymount University (1023-33-963)

10:00 AM Disturbing the Dyson Conjecture in a "GOOD" Way.
    Andrew V. Sills* and Doron Zeilberger, Rutgers University (1023-05-207)

10:30 AM Computer Algebra for Special Function Inequalities.
    (64) Manuel Kauers, RISC-Linz (1023-05-217)

AMS Special Session on Financial Mathematics, I

8:00 AM - 10:55 AM

Organizers: Jean-Pierre Fouque, University of California Santa Barbara
    Craig A. Nolder, Florida State University
    Knut Solna, University of California Irvine
    Thaleia Zariphopoulou, University of Texas Austin

8:00 AM Indifference prices and convex risk measures in Orlicz spaces.
    Marco Frittelli, Universita degli Studi di Milano, Italy (1023-60-614)

9:00 AM Stability of utility maximization.
    (66) Gordan Zitkovic*, University of Texas at Austin, and Kasper Larsen, Carnegie Mellon University (1023-91-659)

9:30 AM Correspondence between Lifetime Minimum Wealth and Utility of Consumption.
    Erhan Bayraktar, University of Michigan (1023-60-1396)

10:00 AM Asymptotic analysis of utility-based hedging strategies for small number of contingent claims.
    Dmitry Kramkov, Carnegie Mellon University, and Mihai Sirbu*, Columbia University (1023-90-581)

10:30 AM Dynamic monetary risk measures in discrete time.
    (69) Patrick Cheridito*, Princeton University, and Michael Kupper, Technical University Vienna (1023-91-828)

AMS Session on Partial Differential Equations, I

8:00 AM - 10:55 AM

8:00 AM On Fay Identity.
    (70) Iordan P. Miechev, SUNY, Suffolk CC College (1023-35-1013)

8:15 AM A simple direct approach for constructing single solitons of nonlinear wave equations. Preliminary report.
    Guoping Zhang* and Zhijun Qiao, University of Texas-Pan American (1023-35-1316)

    Divya E. Vernerey*, Salisbury University (on leave at Northwestern University), Esteban Urdailes and Vladimir A. Volpert, Northwestern University (1023-35-1329)

8:45 AM On complete rotationally invariant gradient Ricci shrinking solitons.
    Brett L Kotschwar, UC San Diego (1023-35-1330)

9:00 AM The two-point boundary problem for the Euler-Poisson system.
    Wilfrid Gangbo, Tuyen Nguyan and Adrian Tudorascu*, Georgia Institute of Technology (1023-35-1333)

9:15 AM Forced Two Layer Beta Plane Quasi-Geostrophic Flow, Part II: Time and Space Analyticity.
    Constantin Onica*, Indiana University, and Lee R. Panetta, Texas A&M University (1023-35-1483)
AMS Session on Algebra and Number Theory, I

9:30AM Nematic liquid crystals and harmonic maps on polyhedral domains: theory and applications.
A. Majumdar, University of Oxford, J. M. Robbins, University of Bristol, and Maxim Zyskin*, University of Oxford (1023-35-1517)

9:45AM A continuous approach to the lightning discharge.
Beyza Caliskan Aslan* and William W. Hager, University of Florida (1023-35-1521)

10:00AM Grid transformation numerical methods for laser beam propagation in nonhomogeneous media.
James W. Rogers* and Qin Sheng, University of Texas (1023-35-1531)

10:15AM On the use of second order finite difference approximations to determine plate deflections.
Dawn Alisha Lott* and Patrice Danielle Green, Delaware State University (1023-35-1569)

10:30AM An application of a critical points theorem.
Leonard Karshima Shilgba, Abtbi-American University of Nigeria (1023-35-713)

10:45AM Motion of a Vortex Line in an Averaged Velocity Field. Preliminary report.
James P. Peirce, University of Wisconsin - La Crosse (1023-35-827)

AMS Session on Algebra and Group Theory, I

8:00AM - 10:40 AM

8:00AM On Quantum Master Equation of Open-Closed String Theory. Preliminary report.
Eric Harrelson, Alexander Voronov and J. Javier Zuniga*, University of Minnesota (1023-08-12)

8:15AM Addition Theorems of Fuzzy Integers of Linear Triangular Types. Preliminary report.
Chuang Peng, Morehouse College (1023-08-1896)

8:30AM Inte...
Friday, January 5 - Program of the Sessions

MAA Session on Euler in the Classroom
8:00 AM - 10:55 AM
Organizers: Robert E. Bradley, Adelphi University
Amy Shell-Gellasch, Grafenwoer, Germany

8:00 AM Euler Enriches Summer High School Program.
> (123) Preliminary report.
Julia Darby Head* and G. Brock Williams, Texas Tech University (1023-HS-1721)

8:15 AM Mathematics of Euler—Euler Line and Euler’s Formula for Polyhedra.
> (124) Preliminary report.
Jim Fulmer, University of Arkansas at Little Rock (1023-HS-1804)

8:30 AM Investigating Euler’s Polyhedral Formula Using Original Sources.
> (125) Preliminary report.
Lee Stemkoski, Adelphi University (1023-HS-1275)

8:45 AM Euler and Honors Students. Preliminary report.
> (126) Homer S. White, George College, Kentucky (1023-HS-877)

9:00 AM Jospeh Barres’ 1778 portraits of Euler: their provenance, the method of construction and reproduction. Preliminary report.
> (127) D. Florence Fasanelli, American Association for the Advancement of Science (1023-HS-1888)

9:15 AM Napier’s e. Preliminary report.
> (128) Amy E. Shell-Gellasch, Pacific Lutheran University (1023-HS-913)

9:30 AM E29, or Pell’s equation in the number theory classroom.
> (129) Daniel E. Otero, Xavier University (1023-HS-1343)

9:45 AM Euler and the Circular Functions in the Classroom.
> (130) Preliminary report.
Bruce S. Burdick, Roger Williams University (1023-HS-1760)

10:00 AM Functions vs. Equations in Euler’s Work.
> (131) Robert E. Bradley, Adelphi University (1023-HS-1617)

10:15 AM Euler Angles, Rotation Matrices, Euler’s Identity and Quaternions.
> (132) Paul R. Bouthellier, University of Pittsburgh-Titusville (1023-HS-406)

10:30 AM Euler’s Method for Differential Equations.
> (133) Dick Jardine, Keene State College (1023-HS-1084)

MAA Session on Content Courses for the Mathematical Education of Middle School Teachers, I
8:00 AM - 10:55 AM
Organizers: Laurie Burton, Western Oregon University
Maria G. Fung, Western Oregon University
Klay Kruczek, Western Oregon University

8:00 AM What’s for Dessert? An Enrichment Course for Prospective Middle School Mathematics Teachers.
Jerrold W. Grossman, Oakland University, Rochester, Michigan (1023-G1-525)

8:20 AM Meeting the Challenge for the Preparation of Preservice Teachers of Middle School Mathematics: The Fayetteville State University (FSU) Answer.
Genevieve M. Knight and Kimberly Smith Burton*, Fayetteville State University (1023-G1-576)

8:40 AM An Upper Level Series of Mathematics Courses for Prospective Middle School Teachers.
Herbert E. Kasube, Bradley University (1023-G1-563)

9:00 AM What Now? I Understand Why! - Creating Self-Reliance in Mathematical Content through a Problem-Centered Course Sequence. Preliminary report.
Tracie Mclemore Salinas* and Mary Elizabeth Searcy, Appalachian State University (1023-G1-1598)

9:20 AM Making Sense: Developing the Mathematical Understanding of Prospective Middle School Teachers.
Jennifer J. Koskiak, University of Wisconsin - La Crosse (1023-G1-1413)

9:40 AM A Problem Analysis Course for Middle Grades Teachers.
Mary Garner, Kennesaw State University (1023-G1-1587)

10:00 AM Four Content Courses and Activity-Based Materials Designed for Preservice Middle School Teachers and Elementary Mathematics Specialists.
Jen E. Szydlak, University of Wisconsin Oshkosh (1023-G1-429)

Ioana Mihaila* and Patricia Hale, Cal Poly Pomona (1023-G1-684)

10:40 AM Mathematics Materials for Middle School Teachers.
> (122) Preliminary report.
Ira J. Papick, University of Missouri-Columbia (1023-G1-198)
Program of the Sessions - Friday, January 5 (cont'd.)

10:45AM Dancing between continuous and discrete: Euler's summation formula in his own words.
   David J. Pengelley, New Mexico State University (1023-H5-282)

MAA Session on Integrating Mathematics and Biology in Undergraduate Education, I
8:00 AM - 10:55 AM
Organizers: Glenn W. Ledder, University of Nebraska-Lincoln
Yajun Yang, Farmingdale State University of New York
Jack Bookman, Duke University
James P. Fulton, Suffolk County Community College

8:00AM A Bridge Course to Prepare Students for a Biotechnology Program. Preliminary report.
   Mary R. Parker, Austin Community College (1023-K1-1657)
8:20AM From Edge to Center: Reshaping a Math/Bio Course.
   Mary R. Parker, Austin Community College (1023-K1-1112)
8:40AM An Integrated Mathematics Course for Biology Students. Preliminary report.
   Patti Frazer Lock*, St. Lawrence University, Michael Caplan, Bates College (1023-K1-1365)
9:00AM Using the Scientific Method to Integrate Biology into a Precalculus Course.
   James P. Fulton* and Linda Sabatino, Suffolk Community College (1023-K1-1632)
9:20AM Get Rhythm, If You Get to Choose!
   Mike Martin, Johnson County Community College (1023-K1-6299)
   Jennifer Wilson, Eugene Lang College, the New School for Liberal Arts (1023-K1-1665)
10:00AM An Undergraduate Course in Biomathematics with an Accompanying Textbook.
   Raina S. Robeva*, Sweet Briar College, and Michael L. Johnson, University of Virginia School of Medicine (1023-K1-1575)
10:20AM Biology, Differential Equations, and Learning to Read the Research.
   Thomas W. Judson, Harvard University (1023-K1-1757)
10:40AM Mathematical Biology in the Short Term: A Mini Course for a Summer Program.
   Angela Gallegos, Occidental College, Los Angeles, CA (1023-K1-1875)

MAA Session on Teaching Mathematics Courses Online
8:00 AM - 10:55 AM
Organizers: Cheryl Olsen, Shippensburg University
Kate McGivney, Shippensburg University

8:00AM Teaching developmental mathematics with coursecompass.com. Preliminary report.
   Katarzyna Potocka* and Pangyen Weng, Ramapo College of New Jersey (1023-QS-541)
8:20AM On-Line Calculus Courses at Valparaiso University.
   Kenneth H. Luther, Valparaiso University (1023-QS-573)
   Brian H. Felkel, Appalachian State University (1023-QS-1215)
9:00AM Evolution of a Long Distance Education Course for In-Service Middle School Math Teachers. Preliminary report.
   Heidi A. Feller, University of Nebraska-Lincoln (1023-QS-856)
9:20AM Using Camtasia Studio to Teach Mathematics Online.
   Jason A. Aubrey, University of Missouri - Columbia (1023-QS-1881)
9:40AM Integrating Graphing Calculator Emulator Software into Live Webcasts.
   Chris Oehrlein, Oklahoma City Community College (1023-QS-1823)
10:00AM Online Class Experience in Mathematics at the University of Mississippi. Preliminary report.
   Semail Ulgen Yildirim*, Grand Valley State University, and Robert Hunt, University of Mississippi (1023-QS-1774)
10:20AM Teaching mathematics online: The Park University experience.
   Aldo R. Maldonado, Park University (1023-QS-106)
10:40AM Full Speed Ahead with a Tablet PC. Preliminary report.
   Denise J. LeGrand, University of Arkansas at Little Rock (1023-QS-183)

MAA Session on Use of Technology in Abstract Algebra and Number Theory
8:00 AM - 10:55 AM
Organizers: Byungchul Cha, Hendrix College
Bo-Hae Im, Chung-Ang University

8:00AM Laboratory Experiences in Group Theory.
   (153) Eilen J. Maycock, American Mathematical Society (1023-S1-1292)
8:15AM PascCalios IE: Visualizing Group Structures.
   (154) Don Spickler, Salisbury University (1023-S1-1342)
8:30AM Using Pascal’s Triangle modulo n to visualize the Lucas Correspondence Theorem. Preliminary report.
   Kurt E. Ludwick, Salisbury University (1023-S1-1628)
8:45AM Flash Tools for Finite Groups.
   (156) James E. Hamblin, Shippensburg University (1023-S1-669)
9:00AM Teaching Abstract Algebra Using the Software GAP.
   (157) Julianne G. Rainbolt, Saint Louis University (1023-S1-867)
9:15AM Using XGAP to explore the structure of groups.
   (158) Russell D. Blyth, Saint Louis University (1023-S1-723)
9:30AM Visualizing Group Theory with Group Explorer.
   (159) Nathan C. Carter, Bentley College (1023-S1-688)
9:45AM Tell Me What You Can About A Group Of Order n.
   (160) Mike Krebs, Cal State LA (1023-S1-432)
10:00AM An inquiry-based number theory course.
   (161) John Jones*, Arizona State University, and Jeff Holt, University of Virginia (1023-S1-526)
10:15AM Using PARU/CP in a Number Theory Class.
   (162) Benjamin L. Levit, California State University, Chico (1023-S1-1620)
10:30AM Computational Group Theory and Symmetry.
   (163) Jeffrey W. Clark, Elon University (1023-S1-211)
**MAA General Contributed Paper Session, I**

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<thead>
<tr>
<th>Time</th>
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<th>Authors</th>
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<tr>
<td>8:00AM</td>
<td>Mathematical modeling of ferro-antiferromagnet (F-AF) exchange coupled systems</td>
<td>Congxiao Liu*, Min Sun, and Hideo Fujiwara</td>
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<tr>
<td>8:00AM</td>
<td>Put-call parity in the classroom.</td>
<td>Maryam Vulis, Forest Hills, New York</td>
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<td>8:15AM</td>
<td>Using Mapping Software in the Mathematics</td>
<td>Ulises Fernandez and Estuardo Fernandez</td>
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<tr>
<td>9:00AM</td>
<td>Some of My Favorite Calculus Homework Problems.</td>
<td>Fred Worth, Henderson State University</td>
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<td>9:15AM</td>
<td>Some Calculus 2 Students Seem to Prefer Procedural Approaches to Exercises over Conceptual Ones</td>
<td>Mary D. Shepherd, Northwest Missouri State University</td>
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<tr>
<td>10:30AM</td>
<td>An Experimental Study on the Implementation of Online Resources in Pre-Calculus Algebra</td>
<td>Tasha Thrower*, Jan Case, Audria White and Fred Kelley</td>
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<tr>
<td>10:45AM</td>
<td>Mobile-Technology and the College Math Core Curriculum</td>
<td>Marilyn Reba, Clemson University</td>
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**SIAM Minisymposium on Phyllotaxis**

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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>8:00AM</td>
<td>Mathematical models of likely mechanisms for phyllotaxis: Polarized auxin transport, cell growth, and dynamic connectivity.</td>
<td>Eric Mjolsness*, Departments of Computer Science and Mathematics, University of California Irvine, Marcus Heisler, Division of Biology, California Institute of Technology, Henrik Jonsson, Computational Biology &amp; Biological Physics Group, Lund University, Elliot Meyerowitz and Bruce Shapiro, Division of Biology, California Institute of Technology</td>
</tr>
<tr>
<td>9:00AM</td>
<td>Modeling phyllotaxis: from molecules to patterns.</td>
<td>Richard S. Smith, University of Calgary, Soazig Guyomarch, Therese Mandel, Didier Reinhardt, University of Berne, Adam Ramunis, University of Calgary, Cris Kuhlmeier, University of Berne, and Przemyslaw Prusinkiewicz*, University of Calgary</td>
</tr>
<tr>
<td>10:00AM</td>
<td>New Geometric concepts for Phyllotaxis</td>
<td>Pau Atela*, Smith College, Jacques Dumas, Harvard University, Christophe Cole, Smith College, and Scott Hottin, Harvard University</td>
</tr>
<tr>
<td>10:30AM</td>
<td>A new characterization of irregular phyllotactic patterns.</td>
<td>Stephanie Douady, Ecole Normale Superieure, Paris</td>
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**SIAM Minisymposium on Mathematics and Materials Science**

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<th>Time</th>
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<th>Authors</th>
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<tr>
<td>8:00AM</td>
<td>Modeling the Self-Assembly of Quantum Dots in Thin Solid Films.</td>
<td>Margo S. Levine*, Alexander A. Golovin, Stephen H. Davis, Northwestern University, and Peter W. Voorhees, Department of Materials Science, Northwestern University</td>
</tr>
<tr>
<td>8:30AM</td>
<td>Phase of biaxial liquid crystal polymers and particle suspensions in simple flows. Preliminary report.</td>
<td>Sarthok Sirica* and Qi Wang, Florida State University</td>
</tr>
<tr>
<td>9:00AM</td>
<td>Estimates for the principal Dirichlet eigenvalue of anisotropic elliptic operator on a ball and their applications.</td>
<td>Steve Rosencrans*, Xuefeng Wang, Bill Winter, Tulane University, and Shan Zhao, University of Alabama</td>
</tr>
<tr>
<td>9:30AM</td>
<td>Solute transport in porous media.</td>
<td>Guillermo H Goldsztein, Georgia Tech</td>
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<tr>
<td>10:30AM</td>
<td>Nano-rod composites: a flow strategy to control anisotropic percolation.</td>
<td>M. Gregory Forest*, University of North Carolina at Chapel Hill, Xiaoyu Zheng, Kent State University, Richard Vaia, Air Force Research Laboratory, Michael Arlen, University of North Carolina at Chapel Hill, Ruhai Zhou, Old Dominion University, Qi Wang, Florida State University, and Robert Lipton, Louisiana State University</td>
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<tr>
<td>10:30AM</td>
<td>Stability of the normal state of superconductors in the presence of electric currents.</td>
<td>Yaniv Almog, Louisiana State University</td>
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AMS Special Presentation
9:30 AM - 10:55 AM
Report on the findings of the 2005 CBMS survey of undergraduate mathematical and statistical sciences in the U.S.
Moderator: James W. Maxwell, AMS
Presenters: David Lutzer, College of William and Mary
Ellen J. Kirkman, Wake Forest University
Stephen B. Rodi, Austin Community College

MAA-Project NExT-YMN Panel Discussion
9:30 AM - 10:50 AM
Keeping your research alive.
Organizers: Brian Birgen, Wartburg College
William M. Higdon, University of Indianapolis
James E. Hamblin, Shippensburg University
Panelists: Jean Bee Chan, Sonoma State University
Michael J. Dorff, Brigham Young University
Asamoah Nkwanta, Morgan State University

MAA Special Presentation
9:30 AM - 10:50 AM
National Science Foundation programs supporting learning and teaching in the mathematical sciences.
Organizers: Camille McKayle, NSF
Lloyd E. Douglas, NSF
Elizabeth J. Teles, NSF
Lee L. Zia, NSF
David C. Royster, NSF
SIGMAA on the Teaching of Advanced High School Mathematics Panel Discussion

9:30 AM – 10:50 AM
What mathematical content should future mathematics majors learn while in high school?
Organizer: Daniel J. Teague, North Carolina School of Science and Mathematics
Panelists: Benjamin G. Klein, Davidson College
Susan S. Wildstrom, Walt Whitman High School
Daniel J. Teague

AMS Special Presentation

10:00 AM – 10:55 AM
Who wants to be a mathematician?
Organizers: Michael A. Breen, AMS
William T. Butterworth, DePaul University

AMS Invited Address

10:05 AM – 10:55 AM
Diffraction by edges.
Andras Vasy, Stanford University (1023-35-05)

AMS-MAA Invited Address

11:10 AM – NOON
Dynamics of integer sets.
Bryna R. Kra, Northwestern University (1023-37-13)

Exhibits and Book Sales

12:15 PM – 5:30 PM

AMS Colloquium Lecture: Lecture I

1:00 PM – 2:00 PM
Limit shapes, real and imagined, I: Random surfaces around us.
Andrei Okounkov, Princeton University (1023-60-02)

MAA Invited Address

2:15 PM – 3:05 PM
Forming committees.
Penny Haxell, University of Waterloo (1023-A0-19)

AMS-MAA Special Session on Math Circles and Similar Programs for Students and Teachers, II

2:15 PM – 7:00 PM
Organizers: Morris Kalka, Tulane University
Hugo Rossi, Mathematical Sciences Research Institute
Tatiana Shubin, San Jose State University
Zvezdelina E. Stankova, Mills College
Daniel H. Ullman, George Washington University
Paul A. Zeitz, University of San Francisco

Friday, January 5 – Program of the Sessions

2:15 PM Experience with Teaching Algorithmics in a Public School Setting.
Anna Charny, Advanced Math and Science Academy Charter School (1023-97-706)

2:40 PM The San Francisco Math Circle: A teacher-centered math circle for underrepresented student populations.
Paul A. Zeitz, University of San Francisco (1023-97-1222)

3:05 PM Seeking Points of Intersection: High-School Curricula vs. Math Circle Goals.
James S. Tanton, St. Mark’s Institute of Mathematics (1023-97-1007)

3:30 PM How and Why the Hampshire College Summer Studies in Mathematics Works. YF17.
David C. Kelly, Hampshire College (1023-97-763)

3:50 PM Canada/USA Mathcamp: a summer math program for talented high-school students.
Mira Bernstein, Wellesley College (1023-97-1178)

4:10 PM SEE-Math - Summer Educational Enrichment at Texas A&M for Middle School Students.
Philip B. Yasskin, Texas A&M University (1023-97-235)

4:30 PM Circle in a Box.
Sam Vandervelde, Stanford University (1023-97-49)

4:55 PM A Math Circle sponsored by Brigham Young University. Preliminary report.
David G. Wright, Brigham Young University (1023-97-185)

5:20 PM 10 years of the Berkeley Math Circle.
Zvezdelina Entcheva Stankova, Mills College and UC Berkeley (1023-97-711)

Isaac L. Greenspan, Illinois Mathematics and Science Academy (1023-97-791)

6:15 PM Panel discussion moderated by Mark Saul.

AMS-ASL Special Session on Logical Methods in Computational Mathematics, II

2:15 PM Organizers: Saugata Basu, Georgia Institute of Technology
Charles N. Delzell, Louisiana State University

2:15 PM Managing an NP-Complete Problem.
Andrew G. Borden, St. Mary’s University, San Antonio, Texas (1023-68-321)

2:45 PM Computational power of bounded arithmetic from the predicative viewpoint.
Sam Buss, University of California, San Diego (1023-03-604)

3:15 PM Mystery of Point Charges.
Andrei Gabrielov*, Purdue University, Dimitri Novikov, The Weizmann Institute of Science, and Boris Shapiro, Stockholm University (1023-14-756)

3:45 PM Constructing expansions of the real field by restricted transcendental analytic functions with decidable theories. Preliminary report.
Daniel J. Miller, Emporia State University (1023-03-88)

4:15 PM Quantitative results in o-minimal topology.
Thierry Zell, Georgia State University (1023-03-153)
AMS-AWM Special Session on Geometric Group Theory, II

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<tr>
<th>Time</th>
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<tr>
<td>2:15</td>
<td>Systolic spaces: Minimal surfaces, Flat Torus</td>
<td>Tadeusz Januszkiewicz, Ohio State University</td>
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<tr>
<td>2:45</td>
<td>SL₃(𝔽[ι]) is not FPC. Preliminary report</td>
<td>Kai-Uwe Bux, University of Virginia, and Kevin Wortman, Yale University</td>
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<tr>
<td>3:15</td>
<td>Lattices in automorphism groups of polygonal complexes with symmetric links</td>
<td>Anne Thomas, University of Chicago</td>
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<tr>
<td>3:45</td>
<td>Algebraic finiteness for Kleinian and relatively hyperbolic groups. Preliminary report</td>
<td>Ilya Kapovich, University of Illinois at Urbana-Champaign, and Richard Weidmann, Heriot-Watt University</td>
</tr>
<tr>
<td>4:15</td>
<td>Relative hyperbolicity of countable groups. Preliminary report</td>
<td>G. Christopher Hruska, University of Wisconsin-Milwaukee</td>
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<tr>
<td>4:45</td>
<td>The Isomorphism Problem for totally relatively hyperbolic groups.</td>
<td>Daniel P. Groves, California Institute of Technology, and Francois Dahmani, Laboratoire Emile Picard, University Paul Sabatier, Toulouse</td>
</tr>
<tr>
<td>5:15</td>
<td>High dimensional isoperimetric functions of groups.</td>
<td>Noel Brady* and Max Forester, University of Oklahoma</td>
</tr>
<tr>
<td>5:45</td>
<td>High dimensional isoperimetric functions of groups.</td>
<td>Noel Brady* and Max Forester, University of Oklahoma</td>
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AMS Special Session on Knots, 3-Manifolds, and Their Invariants, II

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<tbody>
<tr>
<td>2:15</td>
<td>Volume, twist number, and Jones polynomial of hyperbolic links I.</td>
<td>David Futera, Efstratia Kalfagianni, Michigan State University, and Jessica S. Purcell, University of Texas Austin</td>
</tr>
<tr>
<td>3:15</td>
<td>Volume, twist number and Jones polynomial of hyperbolic links II.</td>
<td>D. Futera, E. Kalfagianni, Michigan State University, and J. Purcell, University of Texas Austin</td>
</tr>
<tr>
<td>3:45</td>
<td>Spanning tree filtration on the reduced Khovanov complex and the associated spectral sequence.</td>
<td>Abhijit Champanerkar, University of South Alabama, and Ilya Kofman, College of Staten Island</td>
</tr>
<tr>
<td>4:15</td>
<td>Khovanov Homology, Twist Number and Surfaces.</td>
<td>Robert G. Todd, University of Iowa</td>
</tr>
<tr>
<td>4:45</td>
<td>SL₂(C) and PSL₂(C) Casson invariants and A-polynomials. Preliminary report.</td>
<td>Hans U. Boden, McMaster University, and Cynthia L. Curtis, The College of New Jersey</td>
</tr>
<tr>
<td>5:15</td>
<td>Knot Concordance and Blanchfield Duality.</td>
<td>Shelly Harvey, Rice University (2023-57-1016)</td>
</tr>
<tr>
<td>5:45</td>
<td>Surgery of type-p and quantum invariants of 3-manifolds.</td>
<td>Patrick M. Gilmer, Louisiana State University (2023-57-1512)</td>
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</tbody>
</table>

AMS Special Session on Fixed Point Theory, Dynamics, and Group Theory, II

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Organizer(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:15</td>
<td>Self-coincidences of mappings between spheres. Preliminary report.</td>
<td>Duane Randall, Loyola University New Orleans</td>
</tr>
<tr>
<td>2:45</td>
<td>The uniqueness of the coincidence index on orientable differentiable manifolds.</td>
<td>P. Christopher Staecker, Messiah College</td>
</tr>
<tr>
<td>3:15</td>
<td>Reidemeister classes for automorphisms of nilpotent groups and applications for Fixed Point Theory. Preliminary report.</td>
<td>Daciberg Lima Gomes, University of Sao Paulo, and Peter Wong, Bates College</td>
</tr>
<tr>
<td>3:45</td>
<td>Fixed points on model solvmanifold pairs.</td>
<td>Aaron A. Reite, California State University Fresno</td>
</tr>
</tbody>
</table>

AMS Special Session on Arrangements and Related Topics, II

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Organizer(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:45</td>
<td>On explosion points and fixed points.</td>
<td>Mohammad Abry, Jan J Dijkstra, and Jan van Mill, Vrije Universiteit Amsterdam (2023-54-30)</td>
</tr>
<tr>
<td>4:45</td>
<td>Antipodal-like theorems and symmetric continua in euclidean spaces.</td>
<td>Jan P. Boronski, Auburn University, and Marian Turzanski, Cardinal Stefan Wyszyński University (2023-26-484)</td>
</tr>
</tbody>
</table>
AMS Special Session on Recent Developments in Analysis and Numerics of Geophysical Fluid Dynamics, II

Friday, January 5 – Program of the Sessions

2:15 PM – 5:40 PM

Organizers: Jie Shen, Purdue University
Shouhong Wang, Indiana University

2:15 PM A Dyadic Model for the Inviscid Fluid Equations. (250) Preliminary report.
Susan Friedlander, University of Illinois-Chicago (1023-35-342)

2:45 PM Exact solutions of a spherical model for the energy-enstrophy theory of a barotropic fluid coupled to rotating massive sphere. (251) Chjan C. Lim, Rensselaer Polytechnic Institute (1023-86-312)

3:15 PM Nonlinear local Lyapunov exponent and predictability. (252) Jianping Li*, and Ruiqiang Ding, LASC, Institute of Atmospheric Physics, Chinese Academy of Sciences (1023-37-202)


4:15 PM The Global Attractor for the Solutions to the 3D Viscous Primitive Equations in $L^2$-space. (254) Ning Ju, Oklahoma State University (1023-35-1141)

4:45 PM Large Prandtl Number Behavior of the Boussinesq System of Rayleigh-Benard Convection. (255) Xiaoming Wang, Florida State University (1023-76-360)

5:15 PM Stability and transitions for the double-diffusive convection. (256) Chun-Hsiung Hsia, University of Illinois at Chicago, Tian Ma, Sichuan University, and Shouhong Wang*, Indiana University (1023-86-1510)

AMS Special Session on Coding Theory and Its Applications, II

2:15 PM – 6:10 PM

Organizers: Roxana N. Smarandache, University of Notre Dame and San Diego State University
Pascal O. Vontobel, Hewlett-Packard Laboratories

2:15 PM Discussion.

2:45 PM Skew Hadamard Designs and Their Codes. (257) Preliminary report.
Jon-Lark Kim, University of Louisville (1023-94-1037)

3:15 PM Rediscovering Our Roots: Coding Theory and Reed Solomon Codes. (258) Henry D. Pfister, Texas A&M University (1023-94-1868)

3:45 PM Algebraic Soft Decision Decoding of Reed Solomon Codes Using Bit-level Soft Information. (259) Jing Jiang and Krishna R Narayan, Texas A&M University (1023-94-1886)

4:15 PM Break.

4:45 PM On the generalized reversal distance. (260) Olgica Milenkovic, University of Colorado, Boulder (1023-05-1849)

5:15 PM String Reconstruction: Putting right what once went wrong. (261) Sampath Kannan and Andrew McGregor, University of Pennsylvania (1023-60-1375)

5:45 PM Discussion.

AMS Special Session on Cohomology and Representation Theory, II

2:15 PM – 6:05 PM

Organizers: Jon F. Carlson, University of Georgia
Daniel K. Nakano, University of Georgia
Julia Pevtsanova, University of Washington

2:15 PM Special bases via positive characteristic. (262) Roman V. Bezrukavnikov, MIT (1023-20-1254)

2:45 PM Tensor categories attached to cells in finite Weyl groups. (263) Victor Ostrik, University of Oregon (1023-20-990)

3:15 PM Injective Modules and Cohomology of Lie Algebras. (264) Jürg Feldvoss, University of South Alabama (1023-17-545)

3:45 PM Cohomology of Category $O$ for the Virasoro algebra. (265) Brian Boe, Daniel Nakano and Emilie Wiesner*, University of Georgia (1023-17-471)

4:15 PM Cohomology for Lie superalgebras. (266) Brian D. Boe*, Jonathan R. Kujawa and Daniel K. Nakano, University of Georgia (1023-17-1201)

4:45 PM Support Varieties for Lie Superalgebras. (267) Jonathan R. Kujawa*, Brian Boe and Daniel K. Nakano, University of Georgia (1023-17-1166)
AMS Special Session on Financial Mathematics, II
2:15 PM - 6:10 PM

Organizers: Jean-Pierre Fouque, University of California Santa Barbara
Craig A. Nolder, Florida State University
Knut Solna, University of California Irvine
Thaleia Zariphopoulou, University of Texas Austin

2:15 PM Arbitrage Bounds for Volatility Derivatives and the Skorokhod embedding Problem.
- Bruno Dupire, Bloomberg (1023-60-1703)

Martin S. Forde, UCBS (1023-60-1404)

Wei Liu, Department of Statistics, East China Normal University, Shanghai, and Weiian Zheng*, University of California Irvine (1023-60-892)

4:45 PM Unified Modeling of Corporate Debt, Credit Derivatives, and Equity Derivatives.
Vadim Linetsky, Northwestern University (1023-60-566)

5:45 PM Pricing credit from the top down with affine point processes.
Kay Giesecke, Stanford University, Department of Management Science and Engineering (1023-60-569)

MAA Minicourse #13: Part A
2:15 PM - 4:15 PM

Teaching a course in the history of mathematics.
Organizers: Victor J. Katz, University of the District of Columbia
V. Frederick Rickey, U.S. Military Academy

MAA Minicourse #14: Part B
2:15 PM - 4:15 PM

Some deterministic models in mathematical biology and their simulations.
Organizers: James F. Selgrade, North Carolina State University
Cammy E. Cole, Meredith College
Huseyin Koçak, University of Miami, Coral Gables

MAA Minicourse #8: Part A
2:15 PM - 4:15 PM

Mathematics and geometry of voting.
Organizer: Donald G. Saari, University of California Irvine

AMS Session on Algebra and Group Theory, II
2:15 PM - 6:10 PM

2:15 PM The Primeness of Just Infinite Algebras.
- Cayley A. Pendergrass*, Albion College, and John Farina, University of California, San Diego (1023-16-490)

2:30 PM Tridiagonal pairs and the q-tetrahedron algebra.
- Preliminary report.
Darren R. Funk-Neubauer, University of Wisconsin-Madison (1023-16-527)

2:45 PM On distributive properties of operations with ideals in an algebra. Preliminary report.
Avraham Goldstein* and Chokri Cherif, BMCC (1023-16-710)

3:00 PM Break.

- (286) Aaron Daniel Wangberg* and Tevian Dray, Oregon State University (1023-17-1743)

3:30 PM Maximal subalgebras of the octonions.
- (287) Stephen Gagola III, Case Western Reserve University (1023-17-1894)

3:45 PM Break.
AMS Session on Partial Differential Equations, II

2:15 PM – 5:55 PM

2:15 PM On the Painlevé Property of certain Partial Differential Equations.
A. Bathi Kasturiarachi, Kent State University, Stark Campus (1023-35-1661)

2:30 PM Minimal action for Lagrangians in the Wasserstein space of probability measures.
Wilfrid Gangbo, Truyen Nguyen and Adrian Tudorascu, Georgia Institute of Technology (1023-35-1725)

2:45 PM Convexity of Level Curves for solutions to
David Finn, Rose-Hulman Institute of Technology (1023-35-1781)

3:00 PM Harmonic maps of polyhedra to a sphere with tangent boundary conditions on faces.
Maxim Zyskin, University of Oxford (1023-35-1782)

3:15 PM Exponential attractors for the Allen-Cahn equation with dynamic boundary conditions. Preliminary report.
Ciprian G. Gal, Morgan State University (1023-35-1876)

3:30 PM Symmetry analysis of a two dimensional diffusion equation with a nonlinear source term.
Danny Arrigo*, University of Central Arkansas, Luis Suazo and Olabode Sule (1023-35-1911)

3:45 PM Hyperbolic Monge-Ampère Equation.
Tamani M. Howard, University Of North Texas (1023-35-229)

4:00 PM Saddle point characterization and computation for strongly indefinite functionals. Preliminary report.
Xianjin Chen* and Jianxin Zhou, Texas A&M University, College Station (1023-35-245)

4:30 PM Conservation laws for fourth order systems in four dimensions.
Tobias Lamm, Max-Planck-Institute for Gravitational Physics (1023-35-374)

4:45 PM Radial solutions for \( \Delta u + f(u) = 0 \) with
\( \lim_{|x| \to 0} u(x) = 0 \). Preliminary report.

5:00 PM Asymptotic behavior of the integrand for free surface elevation in axisymmetric water wave problem.
Dambaru D. Bhatta, The University of Texas-Pan American, Edinburg, TX (1023-35-453)

5:15 PM Localized and Spatially Extended Waves in Bose-Einstein Condensates in Periodic Potentials. Mason A. Porter, California Institute of Technology (1023-35-46)

5:30 PM A system of delay partial differential equations for traffic flow.
Mostafa Ghanehar** and Sia Ardekani, University of Texas at Arlington (1023-35-53)

5:45 PM On explosive solutions of a class of semilinear elliptic equations.
Peng Feng, Florida Gulf Coast University (1023-35-314)

AMS Session on Algebra and Number Theory, II

2:15 PM – 5:55 PM

2:15 PM Going Up of the \( u \)-invariant over Formally Real Fields.
Claus Schubert, University of California, Los Angeles (1023-11-1313)

2:30 PM Sequences of reducible 0,1-polynomials with exponents in arithmetic progression. Preliminary report.
Carrie E. Finch, University of South Carolina (1023-11-1373)

2:45 PM Generalizations of Wild semigroups related to the 3x + 1 problem.
Ana Caraiani, Princeton University (1023-11-1418)

3:00 PM The Triviality and Nontriviality of Tate-Lichtenbaum Self-Pairings.
Susan L. Schmoyer, University of Maryland (1023-11-1490)

3:15 PM The reducible case of Serre's Conjecture.
Spencer Hamblen*, Queen's University, and Ravi Ramakrishna, Cornell University (1023-11-1558)

3:30 PM An improvement on the known bounds of discriminants of number fields.
Jason Worth Martin, James Madison University (1023-11-1580)

3:45 PM A Faster Algorithm for Random Dense Subset Sums.
Andrew Shallue, University of Wisconsin-Madison (1023-68-810)

4:00 PM Atkinson's formula for the mean square of the Riemann zeta function. Preliminary report.
Jennifer Beineke*, Western New England College, and Daniel Bump, Stanford University (1023-11-1595)

Alison Setyadi, Dartmouth College (1023-11-165)
MAA Session on Chaos and Fractals

2:15 PM - 3:45 PM

Organizers: Denny Gulick, University of Maryland
Jon W. Scott, Montgomery College

T. D. Taylor, St. Francis Xavier University,
Antigonish, Nova Scotia, Canada (1023-E5-164)

2:30PM Fractal Forecasting Missing Image Data.
Ning Chen, Shenyang Jianzhu University, and
Clifford Reiter*, Lafayette College (1023-E5-164)

2:45PM Describing Points in Sierpinski-Like Fractals.
Sandra Filbourn* and Joseph Pizzica, Saint Joseph's University (1023-E5-257)

3:00PM The Geometry of the Hausdorff Metric.
Steven Schlicker, Grand Valley State University (1023-E5-269)

3:15PM From Sierpinski Triangle to Fractal Flowers.
Anne M. Burns, Long Island University, C.W. Post Campus (1023-E5-270)

3:30PM Exploring Fractals from Cantor Dust to the Fractal Skewed Web.
Mary Ann Connors, Westfield State College (1023-E5-375)

3:45PM Why Include Fractal Geometry in a Non-Euclidean Geometry Course?
Elaine F. Magee, Shenandoah University (1023-E5-1692)

4:00PM Fractals Based on Iterative Structural Self-Cloning Method. Preliminary report.
Mingjiang Chen, Center for General Education,
National Chiao Tung, Taiwan (1023-E5-1682)

4:15PM Billiards with Mixed Regular and Chaotic Dynamics.
Mason A. Porter, California Institute of Technology (1023-E5-50)

4:30PM An Amazing Bifurcation Diagram Arising from Newton's Method.
Gareth E. Roberts* and Trevor M. O'Brien, College of the Holy Cross (1023-E5-907)

MAA Session on Content Courses for the Mathematical Education of Middle School Teachers, II

2:15 PM - 5:10 PM

Organizers: Laurie Burton, Western Oregon University
Maria G. Fung, Western Oregon University
Klay Kruczek, Western Oregon University

2:15PM Mathematical Courses for Middle School Teachers: The CSUSB Approach.
Robert G. Stein, California State University, San Bernardino (1023-G1-159)

2:35PM Mathematics Content for Middle School Teachers
Design at the University of Louisiana at Lafayette.
Lee E. Price, University of Louisiana at Lafayette (1023-G1-1246)

2:55PM A Problem-Solving Course for Pre-Service Middle School Teachers.
Kathleen D. Lopez, University of Louisiana at Lafayette (1023-G1-1378)

3:15PM Bluffton's Explore and Explain Mathematics Courses for Middle School Teachers.
Donald E. Hooley, Bluffton University (1023-G1-139)

3:35PM Using LOGO to Teach Geometry and Problem Solving To Future Middle School Teachers.
Jerry Dwyer, Gary Harris and G. Brock Williams*, Texas Tech University (1023-G1-1235)

3:55PM Constructivist Integrated Mathematics and Methods for Middle Grades Teachers.
Rebecca K. Walker*, Grand Valley State University, and
Charlene E. Beckmann, Grand Valley State University (1023-G1-1450)

4:15PM Western Oregon University's Middle School Mathematics Focus.
Laurie Burton, Maria Fung and Klay Kruczek*, Western Oregon University (1023-G1-277)
Friday, January 5 - Program of the Sessions

MAA Session on Entertaining with Math
2:15 PM - 5:50 PM
Organizer: Timothy P. Chartier, Davidson College

2:15 PM Concept Videos for Calculus: A Context that Encapsulates a Lesson.
Mike Martin, Johnson County Community College (1023-H1-635)

2:35 PM Better Poker Hands Guaranteed.
Colm Mulcahy, Spelman College (1023-H1-1341)

2:55 PM The value of entertainment in a mathematics course.
Mark John Meyer*, Hilary C. Singer and Artur Elezi, American University (1023-H1-1487)

3:15 PM Mathematical Mentalmanship.
John M. Harris, Furman University (1023-H1-652)

3:35 PM Graphs and juggling.
Gregory S. Warrington, Wake Forest University (1023-H1-1437)

3:55 PM Mathmagic.
J. Alfredo Jimenez, Penn State University Hazleton (1023-H1-1351)

4:15 PM Mathematics in Mime.
Tim Chartier, Davidson College (1023-H1-311)

Akihiro Matsuura, College of Science and Engineering, Tokyo Denki University (1023-H1-1832)

4:55 PM Dancing with Mathematics.
Colin C. Adams*, Williams College, and Mikhail Chkhenkeli, Western New England College (1023-H1-179)

5:15 PM An Amazing Mathematical Card Trick.
Arthur T. Benjamin, Harvey Mudd College (1023-H1-73)

MAA Session on Getting Students to Discuss and to Write about Mathematics, I
2:15 PM - 3:40 PM
Organizers: Martha Ellen (Murphy) Waggner, Simpson College
Charlotte Knotts-Zides, Wofford College
Harrison W. Straley, Wheaton College

David D. Gebhard, Wisconsin Lutheran College (1023-H1-761)

2:30 PM On the Evening News.
Sarah L. Mabrouk, Framingham State College (1023-H1-1184)

2:45 PM Projects that Encourage Students to Talk and Write about Mathematics.
Brian P. Kelly, Roger Williams University (1023-H1-1870)

3:00 PM Writing assessments in a college algebra course.
Aihua Li, Montclair State University (1023-H1-1729)

3:15 PM An Inter-disciplinary Writing Project in a Liberal Arts Mathematics Course.
Rehana Patel, St. John’s University (1023-H1-1864)

3:30 PM Relations... Human Relations. Preliminary report.
Saburo Matsumoto, The Master’s College (1023-H1-326)

MAA Session on Research and Other Mathematical Experiences for Students Outside the Classroom
2:15 PM - 6:00 PM
Organizers: Sarah Spence Adams, Franklin W. Olin College of Engineering
James A. Davis, University of Richmond
Susan E. Morey, Texas State University, San Marcos

2:15 PM Center for Mentoring Undergraduate Research in Mathematics at BYU.
Michael Dorff, Brigham Young University (1023-P1-382)

2:45 PM Research Opportunities for Commuter Students.
Diana M. Thomas* and Michael A. Jones, Montclair State University (1023-P1-1682)

3:00 PM Significance of Using Principal Component Analysis on Large Data Sets. Preliminary report.
Reginald Dorcely*, Frantz Mackenyza Voltaire, Karl C. Clarke, Ujesh P. Nagarkatte and Wilbert Hope, Medgar Evers College-CUNY (1023-P1-768)

Nathaniel Dean, Texas State University-San Marcos (1023-P1-1430)

3:30 PM An International REU Site in Mathematics: Hong Kong.
Graeme Fairweather* and Barbara Moskal, Colorado School of Mines (1023-P1-1438)

Tania M. Lopez, California State University, Northridge (1023-P1-557)

4:00 PM Designing a "Methods of Research" Course.
Preliminary report.
Jacqueline A. Jensen, Sam Houston State University (1023-P1-1318)

4:15 PM The Evolution of an Arts and Sciences Student Symposium.
Jan O. Case, Jacksonville State University (1023-P1-491)

4:30 PM Undergraduate Teaching which Leads to Undergraduate Research.
Sarah-Marie Belcastro, Smith College and Hampshire College Summer Studies in Mathematics (1023-P1-1021)

4:45 PM Initiating A. Sonya Kovelevsky Day. Preliminary report.
Ramona Ranalli* and Jennifer McCloud-Mann, The University of Texas at Tyler (1023-P1-776)
Program of the Sessions – Friday, January 5 (cont’d.)

2:15 PM – 5:55 PM

MAA General Contributed Paper Session, II

Organizers: Eric S. Marland, Appalachian State University
Jay A. Melinholm, Oklahoma State Community College

2:15 PM Valuing and Evaluating Teaching in the Mathematics Faculty Hiring Process.
Derek Bruff, Vanderbilt University (1023-Z1-1709)

2:30 PM Faculty Development: Promoting a College and Cooperative Environment and Preparing New Faculty for Success in the Classroom. Preliminary report.
Barbara S. Melendez* and Gerald C. Kobylski, United States Military Academy (1023-Z1-1209)

2:45 PM On the Transition in Mathematics from High School to College. Preliminary report.
Richard O. Hill* and Jon Star, Michigan State University (1023-Z1-698)

3:00 PM Results of the 2005 AP Statistics Curriculum Survey. Preliminary report.
Tim Jacobbe, Educational Testing Service (1023-Z1-47)

3:15 PM Running a Mathematics Capstone Course in a Small Department. Preliminary report.
J. Alan Alevine, McKendree College (1023-Z1-331)

3:30 PM Exploring the similarities and differences in the use of Computer Algebra Systems in teaching at American and British universities. Preliminary report.
Zsolt Lavicza, Cambridge University (1023-Z1-856)

3:45 PM Moving from objects to process; the case of representations. Preliminary report.
May F. Hamdan, Lebanese American University (1023-Z1-819)

4:00 PM Houston … we have a bug problem. Preliminary report.
Michael R. Bacon, USC Samter (1023-Z1-1551)

Charlotte Simmons, University of Central Oklahoma (1023-Z1-1457)

4:30 PM Euler Converges Euclid. Preliminary report.
Charlie Smith, Park University (1023-Z1-1170)

4:45 PM Everything you want to know about bridge courses except whether they work. Preliminary report.
Michael B. Ward, Western Oregon University (1023-Z1-299)

5:00 PM Quantitative Literacy Topics: The Need for an Industry Standard? Preliminary report.
Eric Gaze, Alfred University (1023-Z1-770)

5:15 PM Quantitative Literacy (QL) in the major at a large University. Preliminary report.
Kimberly M. Vincent, Washington State University (1023-Z1-1684)

Mohammad R. Khadivi, Jackson State University (1023-Z1-1646)

5:45 PM Can Philosophers Learn How to Solve Problems from Mathematicians (Meno 86e-87e)? Preliminary report.
Carlos Bovelli, Mercer County Community College (1023-Z1-1923)

SIAM Minisymposium on Recent Advances in Computational Scattering

2:15 PM – 6:10 PM

Organizer: Jie Shen, Purdue University

2:15 PM Boundary perturbation methods for high-frequency scattering.
David P. Nicholls*, University of Illinois at Chicago, and Fernando Reitich, University of Minnesota (1023-78-1279)

2:45 PM Discontinuous Galerkin Method for PDEs with Dirac sources with applications in Optical Fiber Laser. Preliminary report.
Wei Cai, UNC Charlotte (1023-65-1594)

Nilima Nigam*, McGill University, and D.P. Nicholls, U. Illinois Chicago (1023-65-1577)

3:45 PM Scattering by Open Surfaces. Preliminary report.
Shidong Jiang, New Jersey Institute of Technology (1023-65-479)

Guy Baruch, Gadi Fibich, Tel Aviv University, and Semyon Tsynkov*, North Carolina State University (1023-65-528)

4:45 PM Dispersion analysis of nonconforming finite element methods for the Helmholtz equation. Preliminary report.
Dongwoo Sheen*, Seoul National University and Purdue University, Tae Young Ha, Seoul National University, and Kitak Lee, Samsung SDS (1023-65-1154)

5:15 PM Acceleration of an iterative method for the evaluation of high-frequency multiple scattering effects. Preliminary report.
Yassine Boubendir* and Fernando Reitich, University of Minnesota (1023-65-1734)

Jie Shen, Purdue University (1023-65-564)

SIAM Minisymposium on Environmental Modeling: Challenges in Practical Applications and in Teaching

2:15 PM – 5:55 PM

Organizer: William L. Briggs, University of Colorado at Denver

2:15 PM Hazardous materials modeling and other opportunities for student applied mathematics projects. Preliminary report.
Charles R. Hadlock, Bentley College (1023-97-1670)

Glenn Ledder, University of Nebraska-Lincoln (1023-92-1305)

Holly D. Gaff*, University of Maryland, School of Medicine, and Louis Gross, University of Tennessee, Knoxville (1023-92-1207)
Friday, January 5 – Program of the Sessions

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<tbody>
<tr>
<td>3:45 PM</td>
<td>Undergraduate Mathematical Biology Research at Appalachian State University. Rene A. Salinas, Appalachian State University (1023-92-1203)</td>
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<tr>
<td>4:15 PM</td>
<td>Using integro-difference equations to model the effect of growing season length on the spread of the Eurasian collared dove in North America. Andrew Whittle, Kennesaw State University, Erika Asano, USF St. Petersburg, and Michael Fuller, University of Tennessee (1023-92-1155)</td>
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<td>4:45 PM</td>
<td>A Mathematical Biology Program at the University of Louisiana: Curriculum Development and Research. Azmy S. Ackleh, University of Louisiana at Lafayette (1023-92-767)</td>
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<tr>
<td>5:15 PM</td>
<td>Hurricane modeling and Katrina. T. N. Krishnamurthi, Department of Meteorology, Florida State University (1023-92-1806)</td>
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Math on the Web, I

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<tr>
<td>2:15 PM</td>
<td>MathML 3: Where are we going from here? Patrick Ion, American Mathematical Society</td>
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<td>3:30 PM</td>
<td>Writing questions with randomized parameters in proper mathematical notation for online homework assignments. John Risley, WebAssign</td>
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<td>4:30 PM</td>
<td>Adventures in sustainability: Development, direction, and lessons from PlanetMath. Aaron Krowne, Emory University</td>
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Project NExT-YMN Poster Session

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<td>2:15 PM</td>
<td>Organizers: Kevin E. Charlwood, Washburn University Michael C. Axtell, Wabash College</td>
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MAA Committee on the Profession Panel Discussion

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<td>2:15 PM</td>
<td>Ethics in the mathematical sciences. Susan C. Geller, Texas A&amp;M University Donald L. Bentley, Pomona College John D. Fulton, Clemson University Linda Keen, Herbert H. Lehman College of CUNY Henry Walker, Grinnell University</td>
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MAA Committee on the Undergraduate Program in Mathematics and the SIGMAA on Statistics Education Panel Discussion

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<tr>
<td>2:15 PM</td>
<td>Preparing majors for the nonacademic workforce: Projects and internships in applied mathematics and statistics. Thomas L. Moore, Grinnell College Harriet S. Pollatsek, Mount Holyoke College Matthew P. Richey, St. Olaf College</td>
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MAA Panel Discussion

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<tr>
<td>2:15 PM – 3:35 PM</td>
<td>The role of assessment in helping students learn. Organizers: Catherine M. Murphy, Purdue University Calumet Daniel P. Maki, Indiana University Panelists: Bernard L. Madison, University of Arkansas William A. Marion, Jr, Valparaiso University Barbara Moskal, Colorado School of Mines</td>
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AWM Panel Discussion

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MAA Session on Mathlets for Teaching and Learning Mathematics

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Program of the Sessions – Friday, January 5 (cont’d.)

4:00PM Using Maple and java to Teach Reed-Solomon Codes. Preliminary report.
Richard E. Klima*, Appalachian State University, and Neil P. Sigmon, Radford University
(1023-M5-117)

4:20PM An Applet-Based Presentation of the Chebyshev Equioscillation Theorem.
Robert A. Mayans, Fairleigh Dickinson University (1023-M5-44)

4:40PM The UW Praxis Project.
Jennifer J. Kosiak* and Bob Hoar, University of Wisconsin – La Crosse (1023-M5-1810)

5:00PM Multilingual Maplelets for WebALT Calculus.
Douglas B. Meade*, University of South Carolina, Philip B. Yasskin, Texas A&M University, and Mika Seppala, University of Helsinki (1023-M5-1567)

5:20PM Maplelets for Calculus – Now with Proofs.
Philip B. Yasskin*, Texas A&M University, Douglas B. Meade, University of South Carolina, and Mika Seppala, University of Helsinki (1023-M5-254)

MAA Section Officers
2:30 PM – 5:00 PM

Project NExT Panel Discussion
3:00 PM – 5:00 PM

Becoming a leader in your department.
Organizers: Edwin P. Herman, University of Wisconsin-Stevens Point
J. Lyn Miller, Slippery Rock University
Panelists: Stuart Boersma, Central Washington University
Linda Braddy, East Central University
Duff Campbell, Hendrix College
Jill E. Guerra, University of Arkansas, Fort Smith
Thomas C. Ratliff, Wheaton College
Judy L. Walker, University of Nebraska-Lincoln

MAA Invited Address
3:40 PM – 4:30 PM

(425) Baseball, Shakespeare, and modern statistical theory.
Bradley Efron, Stanford University (1023-A0-20)

AWM Business Meeting
3:45 PM – 4:15 PM

SIGMAA on the History of Mathematics Panel Discussion
3:50 PM – 5:40 PM

The practice of math history.
Organizers: William Branson, St. Cloud State University
Amy E. Shell-Gellasch, Pacific Lutheran University
Panelists: V. Frederick Rickey, U.S. Military Academy
Karen H. Parshall, University of Virginia
Joseph W. Dauben, Herbert H. Lehman College of CUNY

MAA Study Abroad Tours Subcommittee Panel Discussion
3:50 PM – 5:40 PM

Mathematics and mathematicians in emerging nations.
Organizers: M. Leigh Lunsford, Longwood University
Lisa Elaine Marano, West Chester University of Pennsylvania
Panelists: Joel K. Haack, University of Northern Iowa
Alhwa Li, Montclair State University
Kate McGivney, Shippensburg University of Pennsylvania
Claudio H. Morales, University of Alabama, Huntsville
Miranda I. Teboh-Ewungkem, Lafayette College

MAA Committee on Graduate Students-YMN Panel Discussion
3:50 PM – 5:10 PM

How to interview for a job in the mathematical sciences.
Organizer: David C. Manderscheid, University of Iowa
Sharon M. Clarke, Pepperdine University
James H. Freeman, Cornell College
David T. Kung, St. Mary's College of Maryland
David C. Manderscheid

SIGMAA on Environmental Mathematics Annual Meeting and Guest Lecture
4:00 PM – 5:30 PM

Organizer: Ben A. Fusaro, Florida State University

Welcome Reception for Undergraduate Students
4:00 PM – 5:00 PM

AMS Committee on the Profession Presentation
4:30 PM – 6:00 PM

Katrina and its aftermath: institutional survival in New Orleans since the storm.
Organizer: Jim E. Hoste, Pitzer College
Moderator: Jim E. Hoste
Panelists: Kenneth W. Holladay, University of New Orleans
Morris Kalka, Tulane University
Vlajko L. Kocic, Xavier University of Louisiana
Katarzyna Saxton, Loyola University New Orleans

NOTICES OF THE AMS VOLUME 54, NUMBER 1
MAA Minicourse #14: Part A
4:45 PM - 6:45 PM
Contemporary college algebra: A refocused college algebra course.
Organizers: Donald B. Small, U. S. Military Academy
Laurette Foster, Prairie View A&M University

MAA Minicourse #3: Part A
4:45 PM - 6:45 PM
A tool to implement quantitative literacy (QL): Spreadsheets Across the Curriculum.
Organizers: Semra Kilic-Bahi, Colby-Sawyer College
Gary T. Franchy, Davenport University
Cheryl Coolidge, Colby-Sawyer College
William A. Thomas, Colby-Sawyer College

MAA Minicourse #9: Part A
4:45 PM - 6:45 PM
Evaluating student presentations in mathematics.
Organizers: Suzanne Dorée, Augsburg College
Richard J. Jardine, Keene State College
Thomas J. Linton, Central College

MAA Information Session
4:45 PM - 6:45 PM
Current issues in actuarial science education.
Organizers: Robert E. Buck, Slippery Rock University
Bettey Anne Case, Florida State University
Matthew J. Hassett, Arizona State University
Steve Paris, Florida State University

MAA Minicourse #3: Part A
4:45 PM - 6:45 PM
A tool to implement quantitative literacy (QL): Spreadsheets Across the Curriculum.
Organizers: Semra Kilic-Bahi, Colby-Sawyer College
Gary T. Franchy, Davenport University
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Current issues in actuarial science education.
Organizers: Robert E. Buck, Slippery Rock University
Bettey Anne Case, Florida State University
Matthew J. Hassett, Arizona State University
Steve Paris, Florida State University

Reception for Graduate Students and First-Time Participants
5:30 PM - 6:30 PM
The AMS and MAA warmly invite these special groups to meet the leadership of your sponsoring organizations.

SIGMAA on the History of Mathematics Annual Meeting and Guest Lecture
6:00 PM - 7:00 PM
Organizer: Amy E. Shell-Gellasch, Pacific Lutheran University

Saturday, January 6

AMS Josiah Willard Gibbs Lecture
8:30 PM - 9:30 PM
(427) Mathematics and physics.
Peter D. Lax, New York University-Courant Institute (1023-01-10)

Saturday, January 6

MAA Department Liaisons Breakfast Meeting
7:00 AM - 8:30 AM

Joint Meetings Registration
7:30 AM - 4:00 PM

AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates, I
8:00 AM - 11:55 AM
Organizers: Darren A. Narayan, Rochester Institute of Technology
Carl V. Lutzer, Rochester Institute of Technology
Bernard Brooks, Rochester Institute of Technology
Tamas I. Wiandt, Rochester Institute of Technology
Michael J. Fisher, California State University, Fresno

8:00 AM Automorphisms and Lattices of the Heisenberg Group. Preliminary report.
Lisa M. Lackney*, University of Akron, and Rebecca Black, Swarthmore College (1023-20-112)

8:30 AM The Steiner problem on the cone.
Jamie L. Burwood*, Bowdoin College, and Caroline Nelson, University of Southern Utah (1023-51-146)

8:30 AM The 3-point Steiner problem on the projective plane of constant Gaussian curvature.
Timothy Luke Mugg*, University of Nebraska - Lincoln, and Daniel Murphree, Berry College, Georgia (1023-51-151)

9:00 AM Delay differential equations modeling vertically transmitted diseases. Preliminary report.
Jonathan Adler, Worcester Polytechnic Institute, Lynne Erickson, Ursinus College, L. Thomas Hill, Kristen Mazur*, Lafayette College, and Thomas Tyrrell, Boston University (1023-34-209)

10:00 AM A Mathematical Model for the Progression of Idiopathic Pulmonary Fibrosis and its Potential Treatments.
Rahul Bansal, The University of Texas at Austin (1023-92-280)

10:00 AM On Singular and Nonsingular Magic Squares.
Elizabeth L. Love*, Howard University, Elizabeth A. Wascher and Michael Z. Lee, Central Michigan University (1023-15-366)

11:00 AM On the Parameterized Complexity of Independent Set. Preliminary report.
Teruhisha Haruguchi, Lafayette College, Janine LoBue*, Loyola College in Maryland, James Pierce, Illinois Institute of Technology, and David Roberson, North Carolina State University (1023-34-332)

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Saturday, January 6 - Program of the Sessions
### AMS Special Session on Invariant Theory, I

**Organizers:** Mara D. Neusel, Texas Tech University  
Frank D. Grosshans, West Chester University

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<tbody>
<tr>
<td>8:00AM</td>
<td>Modular Invariants of Cyclic 2-groups</td>
<td>H. E. A. Eddy Campbell, Ram I. Shank, University of Kent, Canterbury, and D. L. Wehlau, Royal Military College and Queen's University</td>
<td>University of Kentucky, and Queen's University (1023-13-649)</td>
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<td>8:30AM</td>
<td>Conformal symmetry of the wave equation and the ladder representation of SO(2, n + 1)</td>
<td>Markus Hunziker, Mark R. Sepanski and Ronald J. Stanke, Baylor University (1023-12-639)</td>
<td>Baylor University (1023-12-639)</td>
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<tr>
<td>9:00AM</td>
<td>Linearisation of Multiplicative Group Actions</td>
<td>Nicole Lemire, University of Western Ontario (1023-12-639)</td>
<td>University of Western Ontario (1023-12-639)</td>
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### AMS Special Session on Initial- and Boundary-Value Problems, Solvability, and Stability for some Nonlinear PDEs: Theorem, Computation, and Application, I

**Organizers:** Jerry L. Bona, University of Illinois at Chicago  
Lythuan Luo, New York Institute of Technology

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<td>9:00AM</td>
<td>Remarks on the singular set of the Navier - Stokes equations.</td>
<td>Andrei Biryuk, Walter Craig, Slim Ibrahim, Arizona State University</td>
<td>Arizona State University (1023-35-613)</td>
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<tr>
<td>9:30AM</td>
<td>Two point boundary value problems: the BBM and KdV equations.</td>
<td>Jerry L. Bona, University of Illinois at Chicago, Honggu Chen, University of Memphis, Shuming Sun, Virginia Polytechnic Institute and State University, and Bingyu Zhang, University of New Orleans</td>
<td>University of Illinois at Chicago, University of Memphis, Virginia Polytechnic Institute and State University, and University of New Orleans (1023-35-402)</td>
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### AMS Special Session on Mathematical Techniques in Musical Analysis, I

**Organizers:** Robert W. Peck, Louisiana State University  
Julian Hook, Indiana University-Bloomington  
Rachel W. Hall, Saint Joseph's University

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<td>8:00AM</td>
<td>Introduction to Musical Spaces and Transformations: Preliminary report.</td>
<td>David Clampitt, Yale University (1023-05-516)</td>
<td>Yale University (1023-05-516)</td>
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<td>9:00AM</td>
<td>Musical Intervals and Special Linear Transformations.</td>
<td>Thomas Noll, Escola Superior de Musica de Catalunya (1023-11-1349)</td>
<td>Escola Superior de Musica de Catalunya (1023-11-1349)</td>
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<td>10:00AM</td>
<td>Homometric sets and Z-related chords.</td>
<td>Dmitri Tymoczko, Princeton University (1023-11-1349)</td>
<td>Princeton University (1023-11-1349)</td>
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<td>11:00AM</td>
<td>Chord Quality and Callender-Quinn-Tymoczko Spaces. Preliminary report.</td>
<td>Ian Quinn, Yale University (1023-00-1791)</td>
<td>Yale University (1023-00-1791)</td>
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### AMS Special Session on Radon Transforms, Convex Geometry, and Geometric Analysis, I

**Organizers:** Eric L. Grinberg, University of New Hampshire  
Peter Kuchment, Texas A&M University  
Gestur Olafsson, Louisiana State University  
Eric Todd Quinto, Tufts University

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<td>8:00AM</td>
<td>Rings of Invariants Satisfying the Weak Splitting Principle.</td>
<td>Mara D. Neusel, Texas Tech University (1023-13-443)</td>
<td>Texas Tech University (1023-13-443)</td>
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<td>10:00AM</td>
<td>Invariant Theory, Hochschild Cohomology, and Graded Hecke Algebras.</td>
<td>Anne V. Shepler, University of North Texas, and Sarah Witherspoon, Texas A&amp;M University (1023-16-1195)</td>
<td>University of North Texas, and Texas A&amp;M University (1023-16-1195)</td>
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<td>11:00AM</td>
<td>The Honeycomb Conjecture on the Sphere.</td>
<td>Joseph P. Brennan, North Dakota State University and University of Central Florida, and Robert M. Fossum, University of Illinois at Urbana-Champaign (1023-14-1495)</td>
<td>North Dakota State University and University of Central Florida, and University of Illinois at Urbana-Champaign (1023-14-1495)</td>
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</table>
Saturday, January 6 - Program of the Sessions

AMS Special Session on Microlocal Analysis and Singular Spaces, I

8:00 AM - 11:40 AM
Organizers: Paul A. Loya, Binghamton University
Andras Vasy, Massachusetts Institute of Technology

11:00 AM Analysis on the Lawrence-Doniach Energy for Layered Superconductors.
Patricia Bauman, Purdue University (1023-35-1528)

AMS Special Session on Microlocal Analysis and Singular Spaces, II

8:00 AM - 11:40 AM

AMS Special Session on Cohomology and Representation Theory, III

8:00 AM - 11:50 AM
Organizers: Jon F. Carlson, University of Georgia
Daniel K. Nakano, University of Georgia
Julia Pevtsova, University of Washington

AMS Special Session on Calculus of Variations and Nonlinear PDEs: Theory and Applications, I

8:00 AM - 11:45 AM
Organizers: Marian Bocea, North Dakota State University
Cristina M. Popovici, North Dakota State University
AMS Special Session on Dynamic Programming, I

8:00 AM - 11:45 AM
Organizers: Gerald C. Kobylski, United States Military Academy
Randal Hickman, United States Military Academy

8:00 AM
Population-Based Evolutionary Approaches for Solving Markov Decision Processes.
Michael C. Fu*, University of Maryland, Hyeong Soo Chang, Soyang University, Jiaqiao Hu, SUNY Stonybrook, and Steven Marcus, University of Maryland (1023-49-1187)

9:00 AM
Optimality Equations and Inequalities for Markov Decision Processes with Applications to Inventory Control. Preliminary report.
Mark Lewis, Cornell University (1023-49-1202)

10:00 AM
Dan Maxwell*, Innovative Decisions Inc., Gerald Kobylski, United States Military Academy, Dennis Bueke, Gary Smith, Innovative Decisions Inc., and Brian E. Souhan, United States Military Academy (1023-49-1247)

11:00 AM
Warren Powell, Princeton University (1023-49-1196)

AMS Special Session on Financial Mathematics, III

8:00 AM - 11:55 AM
Organizers: Jean-Pierre Fouque, University of California Santa Barbara
Craig A. Nolder, Florida State University
Knut Solna, University of California Irvine
Thaleia Zariphopoulou, University of Texas Austin

8:00 AM
Pricing and Trading Credit Default Swaps.
Tomasz R. Bielecki*, Illinois Institute of Technology, Monique Jeanblanc, Universite d'Evry Val d'Essonne, and Marek Rutkowski, University of New South Wales (1023-60-1045)

9:00 AM
Markovian Projection in the Problems of Credit Basket Modeling.
Timur Misiripashaev* and Andrei Lopatin, NumerIX LLC (1023-60-426)

9:30 AM
Optimal stopping in regime switching Levy models, with applications to American options and real options.
Svetlana Boyarchenko and Sergei Levendorskii*, The University of Texas at Austin (1023-60-630)

10:00 AM
Option Pricing with Parsimonious Time-inhomogeneous Additive Models.
Mack L. Galloway* and Craig Nolder, Florida State University (1023-60-1051)

10:30 AM
Continuity corrections for certain perpetual American and Bermudan options on multiple assets. Preliminary report.
Frederik S. Herzberg, Universitaet Bonn (1023-91-37)

11:00 AM
Pricing credit default swaps under a Markov-modulated structural model. Preliminary report.
Tak Kuen Siu, Heriot-Watt University, Rogemar Mamon*, University of Western Ontario, and Christina Erwein, Brunel University (1023-91-660)

11:30 AM
The Non-Markovian Approach to the Valuation and Hedging of European Contingent Claims on Power with Scaling Spikes.
Valery A. Khlopin, Middle Tennessee State University (1023-90-933)

MAA Minicourse #4: Part A

8:00 AM - 10:00 AM
Creating visual mathematics applets using flash programming.
Organizers: Douglas E. Ensley, Shippensburg University
Barbara Kaskosz, University of Rhode Island

AMS Session on Analysis and Ordinary Differential Equations, I

8:00 AM - 11:55 AM

8:00 AM
Functional equations associated with some mean value theorems of differential calculus. Preliminary report.
Nasser Dastrange, Buena Vista University (1023-26-1018)

8:15 AM
A Tale of Two Integrals on Graphs and Manifolds. Preliminary report.
Mohammad Javaheri, University of Oregon (1023-28-1390)

8:30 AM
Javad Namazi, Fairleigh Dickinson University (1023-28-859)

8:45 AM
Boundary interpolation problems for finite Blaschke products.
Gunter Semmler, Munich University of Technology (1023-30-1198)

9:00 AM
Stephanie Edwards, University of Dayton (1023-30-1474)

9:15 AM
Counterexamples: Limiting Generalizations of Schwarz’s Lemma.
Dov N. Chelet* and Doug Cahil, DeVry University (1023-30-1722)

9:30 AM
The Dual of a Space Of Cauchy Transforms. Preliminary report.
Yusuf A. Muhanna, American University of Sharjah (1023-30-248)

9:45 AM
Unexpected local extrema for the Sendov conjecture, part 2.
Michael J. Miller, Le Moyne College (1023-30-537)

10:00 AM
Functional equations of meromorphic functions with small function coefficients.
Chung-Chun Yang, Hong Kong Univ. of Sci.&Tech. (1023-30-552)
AMS Session on Dynamical Systems

8:00 AM - 11:55 AM

10:15 AM Fuchsian Differential Equations with Regular Singularities.
David J. Pinchbeck, St. Joseph's College (1023-30-583)

Lucio Prado, BMCC - The City University of New York (1023-31-1574)

10:45 AM Geometric sufficient conditions for compactness of the \( \mathcal{J} \)-Neumann operator. Preliminary report.
Samangi Munasinghe*, College of the Holy Cross, and Emil J. Straube, Texas A&M University (1023-32-1043)

11:00 AM On the growth of vector functions of several complex variables. Preliminary report.
Faruk F. Abi Khuzam, American University of Beirut (1023-32-1078)

Jerry R. Muir, Jr., University of Scranton (1023-32-1193)

11:30 AM Strong \( q \)-Convexity in Uniform Neighborhoods of Subvarieties in Coverings of Complex Spaces. Preliminary report.
Michael Fraboni*, Moravian College, and Terrence Napier, Lehigh University (1023-32-1701)

11:45 AM Solution of Delay Systems by Orthogonal Functions and Taylor Series.
Mohsen Razzaghi, Mississippi State University (1023-49-234)

AMS Session on Geometry and Topology, I

8:00 AM - 11:40 AM

10:15 AM How the Fed Chaotically Distorts the Relationship Between Risk and Return.
James Michael Haley, Point Park University (1023-37-1871)

Rodrigo Trevino*, University of Texas at Austin, and Rafael Frongillo, Cornell University (1023-37-1899)

10:45 AM On ergodic transformations that are simultaneously weakly mixing and uniformly rigid.
Thomas M. Koberda*, University of Chicago, Jennifer James, Kathryn Lindsey, Williams College, Peter Speh, Princeton University, and Cesar E. Silva, Williams College (1023-37-294)

11:00 AM Strong Estimate for Lebesgue Derivatives and Ergodic Averages. Preliminary report.
Chaoyuan Liu, Eastern Kentucky University (1023-37-542)

11:15 AM Lie Symmetries for a Model of Growth-death Kinetics.
Rachelle C. DeCoste, United States Military Academy, West Point (1023-37-686)

11:30 AM A Rodent-Hantavirus Model Structured by Disease, Developmental Stage, and Sex.
Curtis Lawrence Wei*, and Linda J. S. Allen, Texas Tech University (1023-37-806)

11:45 AM Mathematical analysis of an integro-differential equation arising in neuroscience.
Marina Bevzushenko, Boston University (1023-37-814)
AMS Session on Applications of Mathematics, I

8:00AM - 10:40 AM

8:00AM Rigid Body Multiple Impact With the Ground.
   (538) Florin V. Baduă*, Jianzhong Su and Shan Hua, University of Texas at Arlington (1023-70-1706)

9:15AM Saari's Conjecture for the Restricted Three-body Problem.
   (539) Gareth E. Roberts*, College of the Holy Cross, and Lisa Melanson, Northwestern University (1023-70-902)

9:30AM Further results on the critical Rayleigh number $R_n$ and wave number $k_n$ for the planar Bénard problem with asymmetric boundary conditions. Preliminary report.
   (540) Matthew J. Glanski, University at Buffalo (1023-70-1072)

9:45AM Analysis of a Simple sheared Ferro-fluid.
   (541) Arup Mukherjee*, Mark Korle, Bogdan Nita, John Stevens and Philip Yecko, Montclair State University (1023-71-1107)

9:00AM Symplectic Approximation of Euler Flow on a Riemannian Manifold. Preliminary report.
   (542) Steven Benzel, Berry College (1023-76-1162)

9:15AM The inviscid limit of incompressible fluid flow in an annulus.
   (543) Sara E. Frietze*, California State University, Northridge, Robert Gerrity, Pomona College, and Tiago Picon, Universidade Federal de Sao Carlos (1023-75-1299)

   (544) Lyudmyla Barannyk, University of Michigan (1023-76-1616)

   (545) Long H. Le, University of Central Arkansas (1023-76-640)

   (546) Jeongwhan Choi*, Korea University, and Shuming Sun, Virginia Polytech (1023-76-969)

10:15AM An efficient algorithm for the solution of high-frequency scattering by infinite rough surfaces.
   (547) Harun Kurkuç* and Fernando Reitich, University of Minnesota (1023-78-1733)

10:30AM $L_p$ estimates of Maxwell’s Equations in a bounded domain.
   (548) Gang Bao, Ying Li and Zhengfang Zhou, Michigan State University (1023-78-1790)

AMS Session on Algebra and Number Theory, II

8:00AM - 11:55 AM

8:00AM Arf equivalence classes of quadratic number fields.
   (549) Jeonghun Kim, Louisiana State University (1023-11-352)

8:15AM A lower bound on the Weil height in terms of an auxiliary polynomial.
   (550) Charles L. Samuels, The University of Texas at Austin (1023-11-447)

8:30AM Improving the Erdős-Ginzburg-Ziv Theorem For Some Non-Abelian Groups.
   (551) Jared Alexander Bass, Harvard University (1023-11-467)

8:45AM The Lucas-Pratt primality test. Preliminary report.
   (552) Jonathan W. Bayless, Dartmouth College (1023-11-483)

9:00AM Fundamental Units of Norm One in Real Quadratic Number Fields. Preliminary report.
   (553) Thomas C. Palfrey, University of New Orleans (1023-11-496)

9:15AM Polymorphic Variations on a Theme of Sierpiński. Preliminary report.
   (554) Lenny Jones, Shippensburg University (1023-11-591)

9:30AM Martinet Searches and Some Nonexistence Theorems. Preliminary report.
   (555) Sharon Brueggeman, University of Tennessee at Chattanooga (1023-11-664)

9:45AM Zero-free Region for a Hypergeometric zeta function. Preliminary report.
   (556) Abdulkadir Hassen*, Rowan University, and Nguyen D Hieu, Rowan University (1023-11-675)

10:00AM An Identity for Period $k$ Second Order Linear Recurrence Systems.
   (557) Curtis N. Cooper, University of Central Missouri (1023-11-825)

10:15AM Roots of Fibonacci-Coefficient Polynomials.
   (558) Donald D Mills, Rose-Hulman Institute of Technology (1023-11-861)

10:30AM Systems of diagonal forms over $p$-adic fields. Preliminary report.
   (559) Michael P. Knapp, Loyola College (1023-11-890)

10:45AM Annihilation of Class Groups In Abelian Number Field Extensions of Degree $2p$. Preliminary report.
   (560) Barry R. Smith, University of California, San Diego (1023-11-945)

11:00AM Prime Divisibility in the Lucas Numbers.
   (561) Stefan Erickson, Colorado College (1023-11-983)

   (562) Mohammed Tesemma*, Spelman College, and Haozhao Wang, South East Missouri State University (1023-11-1309)
11:30 AM A combinatorial approach to tetrahedral curves. Christopher A. Francisco, University of Missouri (1023-13-822)
11:45 AM Bounding Orders in Rosenfeld-Gröbner algorithm. Oleg Golubitsky, University of Western Ontario, Marina Kondratieva, Moscow State University, Marc Moreno Maza, University of Western Ontario, and Alexey Ovchinnikov, North Carolina State University (1023-13-687)

MAA Session on Mathematics and Biology 2010: Building Connections

8:00 AM - 11:55 AM
Organizers: G. Elton Graves, Rose-Hulman Institute of Technology
Catherine M. Murphy, Purdue University

8:00 AM A Course In DNA Chemistry for Mathematicians at the State University of New York at Geneseo. Wendy K. Pogozelski and Anthony J. Macula, SUNY Geneseo (1023-KS-1624)
8:20 AM Mathematics in Genomic Analysis - A Module for Biology Students. Vera Cherepinsky, Fairfield University (1023-KS-1690)
8:40 AM Designing an Introductory course in Mathematical Biology with Team Teaching. Krishan M. Agrawal, Virginia State University (1023-KS-1458)
9:00 AM A course in computational biology - Reaching out and reaching within. M. Chakrabarti, Grand Valley State University (1023-KS-1834)
9:20 AM Introductory Bioinformatics interdisciplinary Course. Preliminary report. Yana Kortsarts, Widener University, Computer Science Department, and Robert W. Morris, Widener University, Biology Department (1023-KS-264)
9:40 AM A Story of Developing a Course and a Textbook in Mathematical Biology. Raina Robeva and Robin Davies, Sweet Briar College (1023-KS-1796)
10:00 AM The Mother of Invention: From Desperation to Collaboration. Christopher C. Leary, Colin Kremer, Rachel VanCott and Gregg Hartvigsen, SUNY Geneseo (1023-KS-1747)
11:00 AM Building an Interdisciplinary Institute: The Institute for Quantitative Biology at ETSU. Istvan Karsai, Dept. of Biological Sciences, The Institute for Quantitative Biology, East Tennessee State University, and Jeff R. Krisley, The Institute for Quantitative Biology, East Tennessee State University (1023-KS-1441)


MAA Session on Getting Students to Discuss and to Write about Mathematics, II

8:00 AM - 11:55 AM
Organizers: Martha Ellen (Murphy) Waggner, Simpson College
Charlotte Knotts-Zidies, Wofford College
Harrison W. Straley, Wheaton College

8:00 AM Writing, Learning, and Mathematics. (576) Ward E. Canfield, National-Louis University (1023-H-1114)
8:15 AM Concepts in Context: Writing and Reasoning about Quantitative Issues. Tanya Cofer, Northeastern Illinois University, and David C. Jabon, DePaul University, Chicago (1023-H-1124)
8:30 AM Reading and Discussing Mathematics with Peers. (579) Penelope H Dunham, Muhlenberg College (1023-H-1192)
8:45 AM Converting Calculus Students from Showing Work to Explaining. Preliminary report. Feryal Alayont, Grand Valley State University (1023-H-1280)
9:00 AM Getting Math Students to Take Writing Seriously. (580) Preliminary report. Stephen B. Maurer, Swarthmore College (1023-H-1173)
9:15 AM What is an Assignment Like You Doing in a Class Like This? (581) Paula R. Stickles, Millikin University (1023-H-1338)
9:45 AM Using Research Projects to Develop Mathematical Knowledge While Expanding Communication Skills. Elizabeth C. Rogers, Piedmont College (1023-H-1409)
10:00 AM Transitions: Using a Variety of Writing Assignments in a Bridge Course. Preliminary report. Christopher Goff, University of the Pacific (1023-H-1423)
10:30 AM A Problem-Solving Project for a General Education Course. Mike Pinter, Belmont University (1023-H-1497)
10:45 AM Using Mythbusters Episodes to Prompt Discussion in a Mathematical Modeling Course. Jennifer Wightman, Coastal Carolina University (1023-H-1315)
11:00 AM Implementing Problem-Based Learning in Introductory Statistics Courses, a Preliminary Report. Preliminary report. Catherine A. Matos, Clayton State University (1023-H-1780)
11:15 AM Using Group Homework in Calculus to Develop Written and Verbal Communication Skills. Brian J. Birgen, Wartburg College (1023-H-201)
Program of the Sessions - Saturday, January 6 (cont'd.)

MAA Session on Philosophy of Mathematics, I

8:00 AM - 11:55 AM

Organizers: Bonnie Gold, Monmouth University
Charles R. Hampton, The College of Wooster

8:00 AM What Place Does Philosophy Have in Teaching Mathematics? Preliminary report.
Martin E. Flashman, Humboldt State University (1023-N1-1867)

8:40 AM Mathematics as Representational Art. Preliminary report.
Sam Staecker, Trevecca Nazarene University (1023-N1-1392)

9:20 AM From an analysis of definitions to a view of mathematics.
Ruggero Ferro, University of Verona, Italy (1023-N1-637)

10:00 AM Searle's Metaphysics of Computation and Alternative Logics: A Surprising Connection.
Jeff Buechner, Rutgers University/Newark (1023-N1-973)

10:40 AM Why do we all get the same answers? Kitcher's anti-apriorism and the problems of social constructivism.
Carl E. Behrens, Alexandria, VA (1023-N1-882)

Andy D. Martin, University of Kentucky (1023-N1-292)

MAA Session on Innovative and Effective Ways to Teach Linear Algebra, II

8:00 AM - 11:55 AM

Organizers: David Strong, Pepperdine University
Gilbert Strang, Massachusetts Institute of Technology

8:00 AM Introducing Eigenvalues by way of the Resolvent.
Elaine T. Hale* and Steven Cox, Rice University (1023-J1-1663)

8:20 AM Cross Stitching, Graph Theory and a Least Path Problem.
Barbara A. Ashton*, Borough of Manhattan Community College, CUNY, and Kevin L. Dove, Landier University (1023-J1-1758)

8:40 AM A matrix route to Snell's law.
Andrew J. Simpson, King College (1023-J1-259)

9:00 AM Linear Algebra For Everyone: The Arithmetic Portal into Vector-Spaces.
Clyde L. Greeno, The MALEI Mathematics Institute (1023-J1-1805)

9:20 AM Vector spaces and linear functionals in elementary probability.
Arnold Lebow, Yeshiva University (1023-J1-987)

9:40 AM Approximate Contour Image Generation: A Project in Linear Algebra.
Mohamed Allali, Chapman University (1023-J1-1306)

10:00 AM Visually Illustrating Rotations, Reflections and Translations in Flash.
Paul R. Bouthellier, University of Pittsburgh-Titusville (1023-J1-405)

10:20 AM Pedagogy and Visualization: Two Aspects of the Use of a CAS in Linear Algebra.
Russell D. Blyth* and Mike May, S. J., Saint Louis University (1023-J1-170)

Helmer Aslaksen, National University of Singapore (1023-J1-1918)

11:00 AM Using a Markov Matrix Model as a Thread Throughout the First Linear Algebra Course. Preliminary report.
Stephen Hilbert, Ithaca College, Ithaca NY (1023-J1-1600)

11:20 AM Using the discovery learning method in linear algebra.
Petre Ion Ghenciu, University of Wisconsin-Stout (1023-J1-1535)

11:40 AM An Honors First-year Seminar in Linear Algebra.
Stephen B. Maurer, Swarthmore College (1023-J1-174)

MAA Session on Research on the Teaching and Learning of Undergraduate Mathematics

8:00 AM - 11:55 AM

Organizers: David E. Meel, Bowling Green State University
Michael Oehrtman, Arizona State University
Chris Rasmussen, San Diego State University

8:00 AM How your students use their textbook: A preliminary report. Preliminary report.
Bret Benesh*, Harvard University, Tim Boester, University of Wisconsin-Madison, Aaron Weinstein, Ithaca College, and Emilie Wiesner, University of Georgia-Athens (1023-P5-92)

8:20 AM Making Sense of the Infinite: A Study investigating the Learning and Teaching of Infinite Series.
Brian J. Lindaman, University of Kansas (1023-P5-1763)

8:40 AM Examining the Effectiveness of Reading Questions in Introductory University Mathematics Courses.
M. Axtek* and W. Turner, Wabash College (1023-P5-168)

9:00 AM Controlling the work in Solving Initial Value Problems: Contrasting Introductory Calculus Textbooks.
Vilma Mesa, University of Michigan (1023-P5-863)

9:20 AM Diagrammatic Reasoning.
H. A. Dye, U.S. Military Academy (1023-P5-878)

9:40 AM An analysis of equation solving strategies of mathematics professors versus undergraduate mathematics majors and secondary mathematics teachers while using graphing calculators.
James R. Hersberger, Indiana University Purdue University Fort Wayne (1023-P5-1241)

10:00 AM Study of the Cognitive Relation Between an Infinite Decimal and the Real Number It Represents: How Does an Individual Understand the Truth or Falsity of the Relation 0.999... = 1?
Kirk Weller, University of Michigan Flint (1023-P5-1287)
<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors and Affiliations</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:40AM</td>
<td>Mathematics Anxiety: A Multivariate Examination of Gender Differences between Moberly Area Community College and Truman State University Students.</td>
<td>Carolyn M. Dixon, Truman State University (1023-P5-1660)</td>
</tr>
<tr>
<td>11:00AM</td>
<td>A Classroom Study of Undergraduates' Understandings of Limits. Preliminary report.</td>
<td>Timothy C. Boester, University of Wisconsin-Madison (1023-P5-1699)</td>
</tr>
<tr>
<td>11:20AM</td>
<td>Students' Intuitive and Formal Solutions of Calculus Optimization Problems.</td>
<td>Matthew E. DeLong, Taylor University, and Dale J. Winter, University of Michigan (1023-P5-147)</td>
</tr>
<tr>
<td>11:40AM</td>
<td>The Effect of Different College Algebra Courses on Students' Understanding of Linear and Exponential Function Concepts.</td>
<td>Erick Brian Hofacker, University of Wisconsin - River Falls (1023-P5-1852)</td>
</tr>
</tbody>
</table>

**MAA General Contributed Paper Session, III**

8:00 AM - 11:55 AM

Organizers: Eric S. Marland, Appalachian State University
Jay A. Malmstrom, Oklahoma State Community College

8:00AM | The Gibreath Principle in Mathematical Magic. | Card Colm Mulcahy, Spelman College (1023-Z1-1348) |

8:15AM | Uniqueness and Existence for Unbounded Boundary Value Problems. | Aprillya Lanz, Clayton State University, and Jeffrey Ehme, Spelman College (1023-Z1-1772) |


8:45AM | Discrete Mathematics for Middle Level Teachers. Preliminary report. | Cheryl L. Olsen, University of Nebraska-Lincoln (1023-Z1-1752) |

9:00AM | Developing Middle School Teachers' Content Knowledge Through Inquiry in and About Mathematics. | Eden M. Bauterscher, University of Maryland, College Park (1023-Z1-347) |

9:15AM | Enhancing Middle School Teachers' Knowledge of Mathematics. | Gulden Karakok, Tina L. Johnston, Maggie Niess, and Tevian Dray, Oregon State University (1023-Z1-1799) |

9:30AM | Balancing Mathematical Content with Classroom Applications: Experiences from Our Third Year. Preliminary report. | Kimberly J. Presser, Shippensburg University (1023-Z1-474) |

9:45AM | Comparing the K-8 Mathematical Content Knowledge of Future Teachers to College Algebra and Calculus Students: Results of a Pretest-Posttest Study. | Betsy Darken, University of Tennessee at Chattanooga (1023-Z1-349) |

10:00AM | Using Handheld Technology in Teaching Geometry. | Constance C. Edwards, Western Kentucky University (1023-Z1-1486) |

10:15AM | Using non-Euclidean geometry to teach Euclidean geometry to K-12 teachers. Preliminary report. | David Damcke, University of Portland, Tevian Dray, Oregon State University, Maria Fung, Western Oregon University, Dianne Hart, and Lyn Riverstone, Oregon State University (1023-Z1-1828) |

10:30AM | The Integrated Laboratory Program – Guided Discovery in the Education of Teachers. | Jerome S. Epstein, Polytechnic University, Brooklyn, NY (1023-Z1-396) |

10:45AM | Fraction Sets for Basic Digit Sets. Preliminary report. | Darren Wick, Ashland University (1023-Z1-584) |

11:00AM | Factoring (1,6,2) difference sets. | C. Bhattacharya, Randolph-Macon College, and Ken Smith, Central Michigan University (1023-Z1-1417) |


11:30AM | Identifying when computed PageRank scores are accurately ranked. Preliminary report. | Rebecca S. Wills, North Carolina State University (1023-Z1-1484) |

11:45AM | Planarizing Non-Planar Polygons. | Douglas G. Burkholder, Lenoir-Rhyne College (1023-Z1-524) |

**SIAM Minisymposium on Mathematical Modeling of Complex Systems in Biology, I**

8:00 AM - 10:50 AM

Organizer: Lisa J. Fauci, Tulane University

8:00AM | Modeling Biofilm Disinfection: How much is enough? | Nick G. Cogan, Florida State University (1023-92-216) |

8:30AM | A Multiscale Model of Biofilm as a Senescence-Structured Fluid. | Bruce P. Ayati, Southern Methodist University, and Isaac Klapper, Montana State University (1023-92-657) |

9:00AM | Voices from the fringe - How distal synapses make themselves heard. | Steven J. Cox, Rice University, and Kresimir Josic, University of Houston (1023-35-836) |

9:30AM | Alcohol’s Effect on Neuron Firing. | Erika T. Camacho, Loyola Marymount University (1023-92-1421) |

10:00AM | The Method of Regularized Stokeslets for Biological Flows. | Ricardo Cortez, Tulane University (1023-76-1874) |

Program of the Sessions – Saturday, January 6 (cont’d.)

SIAM Minisymposium on Structure and Topology in Graph Theory, I
8:00 AM – 10:55 AM
Organizers: Mark N. Ellingham, Vanderbilt University
Chris Stephens, Middle Tennessee State University
Xiaoya Zha, Middle Tennessee State University
8:00 AM
Infinite 2-walks in 3-connected planar graphs.
Daniel P. Biebighauser*, Concordia College, Moorhead, Minnesota, and Mark N. Ellingham, Vanderbilt University (1023-05-771)
8:30 AM
Circumferences of 3-connected graphs with bounded degrees. Preliminary report.
Guantao Chen*, Georgia State University, Zhicheng Gao, Carleton University, Xinxing Yu*, Georgia Institute of Technology, and Wenan Zang, University of Hong Kong (1023-05-554)
9:00 AM
Alexandrov V. Kostochka and Gexin Yu*, University of Illinois at Urbana-Champaign (1023-05-167)
9:30 AM
On the Reconstruction of Planar Graphs.
Mark Bilinski, Young Soo Kwon and Xinxing Yu*, Georgia Institute of Technology (1023-05-824)
10:00 AM
Spanning subsets of toroidal and Klein bottle embeddings.
D. Christopher Stephens and Xiaoya Zha*, Middle Tennessee State University (1023-05-848)
10:30 AM
Excluding induced subgraphs by degree sequence.
Neil Robertson, Ohio State University (1023-05-1838)

SIGMAA Officers Meeting
8:00 AM – 10:00 AM

AMS Special Session on Free Discontinuity Problems: From Image Processing to Materials Science
8:30 AM – 11:55 AM
Organizers: Blaise Bourdin, Louisiana State University
Christopher J. Larsen, Worcester Polytechnic Institute
8:30 AM
Variational Fracture and Minimality.
Gilles A. Francfort, Université Paris 13, France (1023-49-992)
9:00 AM
Quasistatic evolution in brittle fracture based on a type of strict local energy minimization.
Chris Larsen, WPI (1023-49-1614)
9:30 AM
Quasi static evolution for damage.
Adriana Garroni*, Universita' di Roma "La Sapienza", Italy, and Christopher Larsen, Worcester Polytechnic Institute (1023-49-1317)
10:00 AM
Existence for a model of fracture evolution based on crack fronts.
Christoper J. Larsen, Worcester Polytechnic Institute, Michael Ortiz, California Institute of Technology, and Casey L. Richardson*, Worcester Polytechnic Institute (1023-49-1640)
10:30 AM
Heat Flow of Linear Growth Maps and Color Image Denoising.
Xiaobing Feng, The University of Tennessee (1023-35-1613)
11:00 AM
Fracture energies as limit of non-local damage energies.
Matteo Negri, Universita' di Pavia (1023-49-715)
11:30 AM
Numerical implementation of variational brittle fracture.
Blaise A. Bourdin, Louisiana State University (1023-49-1229)

MAA Panel Discussion
8:30 AM – 9:50 AM
Euler’s continuing influence.
Organizer: Ed Sandifer, Western Connecticut State University
Panelists: William W. Dunham, Muhlenberg College
Charles R. Hampton, College of Wooster
June E. Barrow-Green, The Open University

Project NExT Panel Discussion
8:30 AM – 9:50 AM
Getting your first book published.
Organizers: T. Christine Stevens, St. Louis University
Aparna W. Higgins, University of Dayton
Joseph A. Gallian, University of Minnesota Duluth
Panelists: Thomas C. Hull, Merrimack College
Donald J. Albers, MAA
Laura A. Taalman, James Madison University
Ruth Baruth, W. H. Freeman

AWM Emmy Noether Lecture
9:00 AM – 9:50 AM
Automorphisms of free groups, outer space, and beyond.
Karen Vogtmann, Cornell University (1023-20-27)

MAA Minicourse #10: Part A
9:00 AM – 11:00 AM
A beginner’s guide to the scholarship of teaching and learning in mathematics.
Organizers: Curtis D. Bennett, Loyola Marymount University
Jacqueline M. Dewar, Loyola Marymount University

MAA Minicourse #16: Part A
9:00 AM – 11:00 AM
More music and mathematics.
Organizer: Leon Harkleroad, Wilton, ME

MAA Session on Reconceptualizing Content Courses for Prospective High School Mathematics Teachers, I
9:00 AM – 11:55 AM
Organizers: Jean McGivney-Burelle, University of Hartford
Saturday, January 6 - Program of the Sessions

Effective Mathematics Course Experiences for Prospective High School Mathematics Teachers.

Mary Ann Connors, Westfield State College (1023-NS-1485)

9:00AM  Joint AMS-MAA Committee on Teaching Assistants and Part-Time Instructors Panel Discussion

Preliminary report.

Diane Barrett, St. John Fisher College (1023-NS-54)

9:20AM  Mathematical Explorations as a Gateway to Mathematics Teachers.

Preliminary report.

Maria G. Fung, Western Oregon University (1023-NS-1422)

9:40AM  The History of Mathematics: An Investigation of Particular Course Assignments on Student Conceptions of Its Use in Teaching: Preliminary report.

Douglas A. Lapp, Central Michigan University (1023-NS-1238)

10:00AM  A Multi-Angled Approach to Geometry for Secondary Mathematics Teachers.

Preliminary report.

Diane Barrett, St. John Fisher College (1023-NS-54)


Benjamin J. Sinwell, Montgomery County Public Schools and Park City Mathematics Institute, and Bowen Kerins, Education Development Center, Inc. (1023-NS-1366)

10:40AM  Methods, Math, and Madness.

Preliminary report.

Tom Evitts, Shippensburg University (1023-NS-1278)

11:00AM  Students and Technology: A New Design for Preparing Secondary Mathematics Teachers.

Preliminary report.

Douglas A. Lapp, Central Michigan University (1023-NS-1238)

11:20AM  The History of Mathematics: An Investigation of Particular Course Assignments on Student Conceptions of Its Use in Teaching: Preliminary report.

Kathleen M. Clark, Florida State University (1023-NS-523)

11:40AM  Learning and Teaching to Teach Modern Geometry.

Preliminary report.

Teresa E. Moore*, Ithaca College, and L. Christine Kinsey, Canisius College (1023-NS-1150)

MAA Poster Session on MAA/Tensor Foundation Projects which Increase the Participation of Women in Mathematics

9:00 AM – 11:00 AM

Organizers: Elizabeth G. Yanik, Emporia State University
Jennifer Hontz, Meredith College
Kathleen A. Sullivan, Seattle University

Joint AMS-MAA Committee on Teaching Assistants and Part-Time Instructors Panel Discussion

9:00 AM – 10:20 AM

Strategic thinking about nonladder faculty.

Organizers: Judith L. Baxter, University of Illinois at Chicago
Kevin E. Charlwood, Washburn University
Natasha M. Speer, Michigan State University
Panelists: Charles Hale, California State University, Pomona
Diane L. Herrmann, University of Chicago

MAA Panel Discussion

10:00 AM – 11:20 AM

Using student portfolios for assessment.

Organizers: Alex J. Weidenberg, U.S. Military Academy
Michael D. Phillips, U.S. Military Academy
Panelists: Connie S. Schrock, Emporia State University
Dennis Kern, Texas A&M University at Texarkana
Cathy Liebars, College of New Jersey
Archie Willmer, III, U.S. Military Academy

MAA Committee on Technologies in Mathematics Education and WEBSIGMAA Panel Discussion

10:00 AM – 11:20 AM

Best practices for expository mathematics in the digital age.

Organizer: Kyle T. Siegrist, University of Alabama, Huntsville
Panelists: Thomas E. Leathrum, Jacksonville State University
Douglas E. Ensley, Shippensburg State University
Franklin A. Wattenberg, U.S. Military Academy
1:00 PM - 2:00 PM

Limit shapes, real and imagined, II: Algebraic geometry of random surfaces.
Andrei Okounkov, Princeton University (1023-60-03)

AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates, II

1:00 PM - 4:25 PM

Organizers: Darren A. Narayan, Rochester Institute of Technology
Carl V. Lutzer, Rochester Institute of Technology

AMS Colloquium Lecture: Lecture II

1:00 PM - 2:00 PM

Limit shapes, real and imagined, II: Algebraic geometry of random surfaces.
Andrei Okounkov, Princeton University (1023-60-03)

AMS Session on Logic

11:15 AM - 11:55 AM

Coding a new countable-length sequence.
Natasha Dobrinen, Kurt Goedel Research Center for Mathematical Logic (1023-03-1479)

On the Free Left Distributive Algebra on k-many Generators. Preliminary report.
Sheila K. Miller, University of Colorado, Boulder (1023-03-1555)

On Non-Standard Set Theory Models and the Relativity of Real Numbers.
L. Luo, Beijing Normal University (1023-03-89)

MAA Invited Address

10:05 AM - 10:55 AM

The Bernoulli brothers in the arena of the early calculus.
Jan van Maanen, Utrecht University (1023-A0-21)

MAA Minicourse #5: Part A

10:30 AM - 12:30 PM

Wavelets and applications: A multidisciplinary undergraduate course with emphasis on scientific computing.
Organizer: Patrick J. Van Fleet, University of St. Thomas

MAA Special Presentation

10:30 AM - 11:50 AM

Proposal writing workshop for grant applications to the NSF Division of Undergraduate Education.
Organizers: Elizabeth J. Teles, NSF Division of Undergraduate Education
Lee L. Zia, NSF Division of Undergraduate Education

SIAM Invited Address

11:10 AM - NOON

Geometry in the movies.
Tony DeRose, Pixar Animation Studios (1023-00-14)

AMS Session on Logic

11:15 AM - 11:55 AM

Coding a new countable-length sequence.
Natasha Dobrinen, Kurt Goedel Research Center for Mathematical Logic (1023-03-1479)

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1:00 PM - 2:00 PM

Limit shapes, real and imagined, II: Algebraic geometry of random surfaces.
Andrei Okounkov, Princeton University (1023-60-03)

AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates, II

1:00 PM - 4:25 PM

Organizers: Darren A. Narayan, Rochester Institute of Technology
Carl V. Lutzer, Rochester Institute of Technology

Bernard Brooks, Rochester Institute of Technology
Tamas I. Wiant, Rochester Institute of Technology
Michael J. Fisher, California State University, Fresno

1:00 PM - 2:00 PM

Hye Yon Yi, Rochester Institute of Technology (1023-00-1100)

1:30 PM - 2:30 PM

Colorability of Knots and the Kauffman-Harary Conjecture.
Nicholas E. Dowdall*, Sonoma State University, California, Thomas Mattman, Chico State University, Kevin Meek, Florida State University, and Pablo Solis, MIT (1023-54-805)

2:00 PM - 3:00 PM

Turk's Head Knots and the Kauffman-Harary Conjecture.
Pablo R. Solis, Massachusetts Institute of Technology (1023-54-807)

2:30 PM - 3:30 PM

The Kauffman-Harary Conjecture, Turk's Head Knots and Pell Primes.
Nick Dowdall, Sonoma State University, Kevin Meek*, Florida State University, and Pablo Solis, Massachusetts Institute of Technology (1023-51-1058)

3:00 PM - 4:00 PM

A Compartmental Model for an Activity-Dependent Perforated Synapse.
Olga Yuliana Noris* and Diana W. Verzi, San Diego State University-Imperial Valley Campus (1023-92-1119)

3:30 PM - 4:30 PM

Sam P. Ruth*, Northwestern University, Arran Christopher Hamm, Wake Forest University, and Sarah Renee Bockting, University of Evansville (1023-20-64)

4:00 PM - 5:00 PM

Pricing Convertible Bonds. Preliminary report.
Jinjin Qian* and Lindsay Bryant, Lafayette College (1023-90-1553)

AMS-AWM Special Session on Geometric Group Theory, III

1:00 PM - 3:55 PM

Wicket groups and ring groups.
(688) Tara E. Brendle*, Louisiana State University, and Allen Hatcher, Cornell University (1023-57-1754)

Brownstein-Lee Conjecture.
(689) Craig Jensen*, University of New Orleans, Jon McCammond, UC - Santa Barbara, and John Meier, Lafayette College (1023-20-69)

Core and intersection number in compactified outer space, Part I. Preliminary report.
Michael Handel, Lehman College, CUNY, and Lee Mosher*, Rutgers University, Newark (1023-20-838)

Core and intersection number in compactified outer space, Part II. Preliminary report.
Michael Handel*, Lehman College, CUNY, and Lee Mosher, Rutgers University, Newark (1023-20-839)

James R. Conant, University of Tennessee (1023-20-258)
AMS Special Session on Initial- and Boundary-Value Problems, Solvability, and Stability for some Nonlinear PDEs: Theorem, Computation, and Application, II

1:00 PM – 3:55 PM

1:00PM Initial-boundary-value Problems for a Three-dimensional Model for Surface Water Waves. Preliminary report.
Jerry L. Bona, University of Illinois at Chicago (1023-76-1022)

1:30PM Time Periodic Solution of the Korteweg-de Vries Equation on a Bounded Domain and Its Stability. Preliminary report.
Muhammad Usman and Bing-Yu Zhang*, University of Cincinnati (1023-34-422)

2:00PM Stability of incompressible viscous fluid flows.
Dmitry Pelinovsky, McMaster University (1023-54-442)

2:30PM Fifth-order Korteweg-de Vries type equations in Sobolev spaces with negative indices. Preliminary report.
Jiahong Wu*, Oklahoma State University, Jie Shen, Purdue University, and Juan-Ming Yuan, Providence University, Taiwan (1023-35-641)

3:00PM Approximate and Numerical Solutions of the Initial- and Boundary-Value Problems for (KdV Equation, Mass Postulate, and Satellite Observations.
Samuel S. Shen, San Diego State University (1023-76-400)

Thanasis Fokas, Department of Applied Mathematics and Theoretical Physics, University of Cambridge, and Laihan Luo*, New York Institute of Technology (1023-35-813)

AMS Special Session on Knots, 3-Manifolds, and Their Invariants, III

1:00 PM – 3:55 PM

Organizers: Oliver T. Dasbach, Louisiana State University
Xiao-Song Lin, University of California, Riverside

1:00PM Some applications of the cosine law to surface geometry and 3-manifolds.
Feng Luo, Rutgers University (1023-57-1527)

1:30PM Virtual Homotopy. Preliminary report.
H. A. Dye*, U.S. Military Academy, and Louis H. Kauffman, University of Illinois at Chicago (1023-55-529)

2:00PM Hochschild homology, cones, and combinatorial patterns in Khovanov type graph homology.
Jozef H. Przytycki*, George Washington University, Milena D. Pabiniak and Radmila Saadpanovic, GWU (1023-57-1406)

2:30PM Analyzing torsion in Khovanov-type graph cohomology. Algebra (Z[x]/x\textsuperscript{m}).
Radmila Saadpanovic*, George Washington University, Milena Pabiniak and Jozef H. Przytycki, GWU (1023-57-846)

3:00PM Mahler measures of twisted Alexander polynomials.
Daniel S. Silver and Susan G. Williams*, University of South Alabama (1023-57-1561)

3:30PM The Mahler measure of Jones polynomials and the twist-bracket polynomial.
Abhijit Champanerkar, Univ. of South Alabama, and Ilya Kofman*, College of Staten Island, CUNY (1023-12-262)

AMS Special Session on Arrangements and Related Topics, III

1:00 PM – 3:50 PM

Organizers: Daniel C. Cohen, Louisiana State University
Anne V. Shepler, University of North Texas

1:00PM On the Heavyside functions of arrangements and the impossibility theorem by Kenneth Arrow.
Hiroaki Terao, Hokkaido University (1023-32-1880)

1:30PM The 1 mod k partition poset and graph connectivity. Preliminary report.
John Shareshian, Washington University, and Michelle L. Wachs*, University of Miami (1023-05-1742)

2:00PM Degeneration varieties and Macaulay inverse systems. Preliminary report.
Max D. Wakefield, Hokkaido University (1023-13-1073)

2:30PM Break.

3:00PM The space of n ordered points on the line is cut out by simple quadrics if n is not six.
Benjamin J. Howard*, Institute for Mathematics and its Applications, John Millson, University of Maryland College Park, Andrew Snowden, Princeton University, and Ravi Vakil, Stanford University (1023-14-1068)

3:30PM Freeness of Line-Conic Arrangements in \textit{P}^2.
Stefan O. Tohaneanu* and Hal Schenck, Texas A&M University (1023-52-1402)
AMS Special Session on Mathematical Techniques in Musical Analysis, II

1:00 PM - 3:55 PM

Organizers: Robert W. Peck, Louisiana State University
Julian Hook, Indiana University-Bloomington
Rachel W. Hall, Saint Joseph’s University

1:00 PM
- Yea, Why Try Her Raw Wet Hat?
(714) Robin J. Wilson, The Open University, UK
(1023-00-289)

1:30 PM
- An order 1152 group of triadic transformations and its relevance to music theoretical structures.
(715) Preliminary report
- Robert Peck*, Louisiana State University, and
- Jack Douthett, Albuquerque, New Mexico
(1023-20-1231)

2:00 PM
- Consistent Fingerings for a Continuum of Syntonic Tunings.
(716) William A. Sethares*, University of Wisconsin, Madison, Wisconsin, and
- Andrew Milne, London, UK, and
- Plamondon Jim, Thumtronics Ltd., Busselton, Western Australia
(1023-51-689)

2:30 PM
- A multi-pronged approach to the creating of an interdisciplinary research program in mathematics and computation in music.
(717) Preliminary report
- Elaine Chew, University of Southern California
(1023-00-1757)

3:00 PM
- A Dynamic Programming Approach to the Extraction of Phrase Boundaries from Tempo Variations in Expressive Performances.
(718) Preliminary report
- Ching-Hua Chuan*, Computer Science, University of Southern California, and
- Elaine Chew, Industrial and Systems Engineering, University of Southern California
(1023-69-1756)

3:30 PM
(719) Kathryn R. Elder, New York, NY (1023-62-551)

AMS Special Session on Radon Transforms, Convex Geometry, and Geometric Analysis, II

1:00 PM - 3:55 PM

Organizers: Eric L. Grinberg, University of New Hampshire
- Peter Kuchment, Texas A&M University
- Gestur Olafsson, Louisiana State University
- Eric Todd Quinto, Tufts University
- Boris S. Rubin, Louisiana State University

1:00 PM
- Isospectral metrics on balls, spheres, and other manifolds with different local geometries.
(720) Zoltan I. Szabo, Lehman College and Graduate Center of the City University of New York
(1023-58-510)

1:30 PM
- Some applications of integral geometry to Finsler geometry. Preliminary report.
(721) Juan Carlos Alvarez Paiva*, Université des Sciences et Technologies de Lille, and
- Gautier Berck, Scuola Normale Superiore di Pisa
(1023-44-511)

AMS Special Session on Calculus of Variations and Nonlinear PDEs: Theory and Applications, II

1:00 PM - 3:45 PM

Organizers: Marian Bocea, North Dakota State University
- Cristina M. Popovici, North Dakota State University

1:00 PM
- New exact bounds for effective properties of multicomponent conducting composites and localized polyconvexity. Preliminary report.
(726) Andrej Cherkaev, University of Utah (1023-51-559)

2:00 PM
- Dynamics of steps along a martensitic phase boundary. Preliminary report.
(727) Anna Vainchtein*, University of Pittsburgh, and
- Yubao Zhen, Harbin Institute of Technology
(1023-74-455)

3:00 PM
(728) Andrea Buda, University of Rome, and
- Chris Larsen*, WPI (1023-49-1631)

AMS Special Session on Dynamic Programming, II

1:00 PM - 3:45 PM

Organizers: Gerald C. Kobyliaski, United States Military Academy
- Randal Hickman, United States Military Academy

1:00 PM
(729) David W. Carter*, Draper Laboratory, Cambridge, MA, and
- Steve Tavan, U.S. Army, RDECOM, Natick, MA (1023-49-1182)

1:30 PM
(730) Randal E. Hickman, United States Military Academy (1023-49-1371)

2:00 PM
(731) Darryl K. Ahner, U.S. Army TRADOC Analysis Center, Monterey, CA (1023-49-1227)

3:00 PM
- Assignment Scheduling Capability for UAVs—an Approximate Dynamic Programming Implementation to a Combinatorial Scheduling Problem. Preliminary report.
(732) Arnold Buss, Naval Postgraduate School, Monterey, CA (1023-49-1232)
MAA Minicourse #11: Part A
1:00 PM - 3:00 PM
Origami in undergraduate mathematics courses.
Organizer: Thomas C. Hull, Merrimack College

MAA Minicourse #13: Part B
1:00 PM - 3:00 PM
Teaching a course in the history of mathematics.
Organizers: Victor J. Katz, University of the District of Columbia
V. Frederick Rickey, U. S. Military Academy

MAA Minicourse #6: Part A
1:00 PM - 3:00 PM
WebWork 2: An Internet-based system for generating and delivering homework.
Organizers: Arnold K. Pizer, University of Rochester
Michael E. Gage, University of Rochester
Vicki Roth, University of Rochester

AMS Session on Analysis and Ordinary Differential Equations, II
1:00 PM - 3:55 PM
1:00 PM Heat kernel estimates with applications to several complex variables.
Andrew S. Raich, Texas A&M University (1023-32-397)
1:15 PM Zeros of Generalized Rogers Ramanujan Series.
Tim Huber, University of Illinois at Urbana-Champaign (1023-33-1777)
1:30 PM Conformal Invariant First Order Symmetry Operators of the Laplacian.
Rodrigo Ristow Montes, Washington University in St. Louis (1023-33-330)
1:45 PM Techniques for classifying nonnegatively curved left-invariant metrics on compact Lie groups.
Jack Huizenga, University of Chicago (1023-33-401)
2:00 PM Some Inverse Problem Leading to a Second-Order Linear Functional.
Ridha Sfaxi, Institut Superieur de Gestion de Gabes, Tunisia (1023-33-1556)
2:15 PM Monotone Solutions of Nonlinear Differential Equations.
Bryce Holthouse*, University of Central Missouri, and Lianwen Wang, Department of Mathematics and Computer Science, University of Central Missouri (1023-33-1331)
Zhivko S. Athanassov, Bulgarian Academy of Sciences (1023-33-1433)
2:45 PM Blending Mechanical Engineering with Mathematics to Create Interdisciplinary Lively Application Projects (ILAPs).
Michael R. Huber*, Munhember College, Jonathan L. Paynter and Zachary W. Seidel, United States Military Academy (1023-33-154)
3:00 PM Uniqueness implies existence for nth order boundary value problems.
Jeffrey A. Ehme, Spelman College (1023-33-1635)
3:15 PM Minimal Periods of Closed Curves in $\mathbb{R}^n$.
George R. Grover* and Diana M. Thomas, Montclair State University (1023-33-1676)
John E. Ehrke, Baylor University (1023-33-477)
3:45 PM Analysis of a family of mode quasilinear boundary-value problems.
Matthew Rudd, University of Idaho (1023-33-485)

AMS Session on Geometry and Topology, II
1:00 PM - 4:10 PM
1:00 PM Cheeger Constants of Certain Arithmetic Hyperbolic Three-Manifolds. Preliminary report.
Dominic Lanphier, Western Kentucky University, and Jason Rosenhouse*, James Madison University (1023-33-1726)
1:15 PM Deformations of the gyroid and Lidinoid minimal surfaces.
Adam G. Weyhaupt, Southern Illinois University Edwardsville (1023-33-1839)
1:30 PM A Family of Minimal Tori in the Sphere $S^3$.
Rodrigo Ristow Montes, Washington University in St. Louis (1023-33-330)
Alfredo Villanueva, The University of Iowa (1023-33-1808)
2:00 PM Techniques for classifying nonnegatively curved left-invariant metrics on compact Lie groups.
Jack Huizenga, University of Chicago (1023-33-401)
Amine Fawaz, The University of Texas of the Permian Basin (1023-33-586)
2:30 PM Lie Groups of Automorphisms of Almost r-Paracontact Riemannian Manifolds. Preliminary report.
Andrew Bucki, Langston University (1023-33-917)
2:45 PM Tesselation of Klein Bottle by Congruence (mod 6) and Theorems of Fermat (1640) and Joncourt (1762). Preliminary report.
Okan Gurel*, New York, NY, and Demet Gurel, Touro College (1023-34-1293)
3:00 PM Topological Model of Melodic Clustering of a Musical Score: Theory and Application to Schumann’s Träumerei.
Chantal Buteau, Brock University (1023-34-1605)
Andrzej A. Szymanski, Slippery Rock University of Pennsylvania (1023-34-1650)
3:30 PM A weighted quasimetric for digital topology.
Ralph Kopperman, The City College of CUNY (1023-34-1785)
3:45 PM Preliminary report.
Bojana Pejic* and Paul Gartside, University of Pittsburgh (1023-34-1836)
### AMS Session on Applications of Mathematics, II

**1:00 PM - 4:10 PM**

1:00PM  | Numerical simulations of resonant optics in meta-materials with negative refractive index. Preliminary report.  
Kathryn E. Rasmussen, Rensselaer Polytechnic Institute (1023-78-826)

1:15PM  | Strongly Universal Quantum Turing Machines and Invariance of Kolmogorov Complexity.  
Markus Müller, Technische Universität Berlin, Germany (1023-81-1132)

1:30PM  | Wave-functions of Seba billiards.  
B. Winn, Texas A&M University (1023-81-1748)

1:45PM  | The spectral form factor for quantum graphs with spin-orbit coupling.  
Jonathan Harrison, Texas A&M University (1023-81-1884)

2:00PM  | Mathematical modeling and simulation of texture evolution.  
Maria Emelianeiko, David Kinderlehrer, Shilom Ta'asan, Carnegie Mellon University, and Dmitry Golovaty, University of Akron (1023-92-1901)

2:15PM  | Statistical Equilibrium of Slender Vortex Filaments.  
Timothy D. Andersen and Chjan C. Lim, Rensselaer Polytechnic Institute (1023-82-601)

2:30PM  | Well-Posed Initial-Boundary Value Constrained Evolution Problems.  
Alexander Alekseeenko, California State University Northridge (1023-83-1833)

2:45PM  | Imaging conditions in geophysical depth migration algorithms.  
Boyd G. Nita, Montclair State University (1023-86-295)

3:00PM  | Global Optimization in Model-Based Clustering.  
Jeffrey Heath, Michael Fu and Wolfgang Jank, Univ. of Maryland, College Park (1023-90-1158)

3:15PM  | Discrete OR and continuous vintage capital models.  
Natali Hritonenko, Prairie View A&M University, and Yuri Yatsenko, Houston Baptist University (1023-90-1174)

Shane Drew and Tito Homem-de-Mello, Northwestern University (1023-90-1283)

3:45PM  | General option exercise rules for regime-switching models.  
Svetlana Boyarchenko and Sergei Levendorskii, Department of Economics, The University of Texas at Austin (1023-90-131)

4:00PM  | Portfolio Selection as a Nash Bargaining Game.  
Youngna Choi and Michael A. Jones, Montclair State University (1023-90-1414)

### AMS Session on Algebra and Number Theory, IV

**1:00 PM - 3:55 PM**

1:00PM  | Z2 Homology of Singular Real Toric Varieties. Preliminary report.  
Valerie M. Hower, University of Georgia (1023-14-961)

1:15PM  | Some Results on Jonsson Modules over Commutative Rings with Identity.  
Greg G. Oman, The Ohio State University (1023-13-959)

1:30PM  | Instability of projective reconstruction from 1-view in higher dimension. Preliminary report.  
Marina Bertolini, Universita' degli Studi di Milano, GianMario Besana, DePaul University - CTI, and Cristina Turrini, Universita' degli Studi di Milano (1023-14-118)

1:45PM  | Optimal fennomials bounds from Gale dual polynomial systems.  
Frank Sottile, Texas A&M University, and Frederic Bihan, Universite de Savoie (1023-14-1560)

2:00PM  | Equivalence of Mirror Families Constructed from Toric Degenerations of Flag Varieties. Preliminary report.  
Joseph P. Rusinko, University of Georgia (1023-14-1649)

2:15PM  | Algebraic Geometric Codes on Anticanonical Surfaces.  
Jennifer A. Everson, University of Nebraska-Lincoln (1023-14-1712)

2:30PM  | A generalized Euler integral formula for e-factors of irregular singular connections.  
Christopher L. Bremer, University of Chicago (1023-14-1744)

2:45PM  | A mirror conjecture for projective bundles.  
Artur Elezi, American University (1023-14-1872)

3:00PM  | Break.

3:15PM  | Vanishing theta nulls of algebraic curves with automorphisms. Preliminary report.  
Sujeewa Wijesiri, Oakland University (1023-14-1979)

3:30PM  | Numerical deflation of multiple solution components of systems of polynomial equations.  
Anton Leykin, University of Minnesota, Jan Vorschodil and Ailing Zhao, University of Illinois at Chicago (1023-14-299)

3:45PM  | Surfaces of general type with zero geometric genus. Preliminary report.  
Caryn Werner, Allegheny College (1023-14-876)

### MAA Session on Teaching Innovations in Real Analysis, I

**1:00 PM - 3:55 PM**

Organizers: Robert W. Vallin, Slippery Rock University  
Erik O. Talvila, University College of the Fraser Valley

1:00PM  | A Spoonful of Sugar: Using Just Enough Innovation For Success.  
Karl-Dieter Crisman, Gordon College (1023-Q1-1539)

1:20PM  | Enticing the Reluctant Analyst.  
M. Jean McKemie, St. Edward's University (1023-Q1-1425)

1:40PM  | To Cantor and Beyond.  
Joana Mihaila, Cal Poly Pomona (1023-Q1-662)

2:00PM  | A Constructive Approach to Real Analysis.  
Mark Bridger, Northeastern University (1023-Q1-1776)

David Scott, University of Puget Sound (1023-Q1-381)
MAA Session on Communication Theory in Undergraduate Courses

1:00 PM - 3:35 PM
Organizer: Tim McDevitt, Elizabethtown College

1:00PM Simple Signal Processing in the Engineering Classroom
Jong Chung*, Joseph D. Myers and Sebastien P. Joly, U.S. Military Academy (1023-F5-1213)

1:20PM Fourier Analysis in a Calculus Course Using Student-Generated Sound Waves. Preliminary report.
Phil Gustafson, Mesa State College (1023-F5-1094)

1:40PM Using Frames to Provide Repetitiously Repetitive Redundancy in Signal Processing.
Troy Henderson, United States Military Academy (1023-F5-1582)

2:00PM Using the Complex Spectral Theorem to Introduce the Discrete Fourier Transform.
Michael E. Orrison, Harvey Mudd College (1023-F5-1080)

2:20PM Edge Detection.
Yu-Ju Kuo, Indiana University of Pennsylvania (1023-F5-1662)

2:40PM A Motivational Course in Cryptology and Coding Theory.
Sarah Spence Adams*, Olin College of Engineering, and Gordon Prichett, Babson College (1023-F5-152)

3:00PM A Matlab GUI for Teaching Cryptography and Cryptanalysis.
Robert J. McDevitt, Naval Surface Warfare Center, Dahlgren Division (1023-F5-1008)

Tim McDevitt, Elizabethtown College (1023-F5-1581)

MAA Session on Getting Students to Discuss and to Write about Mathematics, III

1:00 PM - 3:55 PM
Organizers: Martha Ellen (Murphy) Waggoner, Simpson College
Charlotte Knotts-Zides, Wofford College
Harrison W. Straley, Wheaton College

1:00PM Service Learning Projects for Discussing and Writing about Mathematics and Computer Technology: Implementation and Assessments.
Morteza Shafii-Mousavi* and Paul Kochanowski, Indiana University South Bend (1023-11-39)

1:15PM Student Problem Writing Exercises Used to Enhance and Develop Mathematical Exposition. Preliminary report.
Linda McGuire, Muhlenberg College (1023-11-393)

1:30PM Can You Understand Me Now? Mathematics as Another Language.
Jean M. Horn*, NVCC - Woodbridge, and Toni T. Robertson, NVCC-Woodbridge (1023-11-486)

1:45PM Using Groups and Peer Reviews in a Proof Course.
Sharon S. Emerson-Stonstell, Longwood University (1023-11-506)

2:00PM Writing-Intensive Linear Algebra.
Patrick Bahl, University of North Carolina, Asheville (1023-11-611)

Pam Miltenberger Wovchko, West Virginia Wesleyan College (1023-11-620)

2:30PM Are you a Mathematical Maus? Writing Exercises to Explore the Mathematical Self.
Judith L. Gieger* and John C. Nardo, Oglethorpe University (1023-11-674)

2:45PM Involving Students in Their Own Learning: Follow up After the First Implementation.
Rodney X. Sturdivant, Robert E. Burks and Brian E. Souhan*, United States Military Academy (1023-11-769)

3:00PM Writing in a Number Sense Course for Elementary Teachers.
Judith Covington, Louisiana State University Shreveport (1023-11-855)

3:15PM The Mathematics of Politics & Power as an Alternative to Trigonometry.
Carl Lutzer* and Bernard Brooks, Rochester Institute of Technology (1023-11-894)

3:30PM Teaching Writing in a General Education Geometry Course. Preliminary report.
Teresa D. Magnus, Rivier College (1023-11-900)

3:45PM Let's Talk Mathematics.
Melinda Schultetus, Concordia University, Irvine (1023-11-916)

MAA Session on Philosophy of Mathematics, II

1:00 PM - 3:45 PM
Organizers: Bonnie Gold, Monmouth University
Charles R. Hampton, The College of Wooster

1:00PM Why the Universe MUST be Complicated. Preliminary report.
G. Edgar Parker*, James S. Sochacki and David C. Carothers, James Madison University (1023-N1-243)

1:40PM Catching the Tortoise: A Case Study in the Rules of Mathematical Engagement.
James R. Henderson, University of Pittsburgh-Titusville (1023-N1-133)

2:20PM The Philosophical Status of Diagrams in Euclidean Geometry.
Nathaniel Miller, University of Northern Colorado (1023-N1-459)

3:00PM Representations in Knot Classification.
Kenneth Manders, University of Pittsburgh (1023-N1-1387)
Program of the Sessions — Saturday, January 6 (cont'd.)

MAA Session on Reconceptualizing Content Courses for Prospective High School Mathematics Teachers, II

1:00 PM – 3:55 PM

Organizers: Jean McGivney-Burell, University of Hartford
Neil Portnoy, Stony Brook University

1:00 PM
Connecting Postsecondary and Secondary Mathematics: Prospective Teachers' Understanding of Transformational Geometry.
Karen J. Graham*, University of New Hampshire, Todd Grundmeier, California Polytechnic State University, San Luis Obispo, and Neil Portnoy, University of New Hampshire (1023-N5-1515)

1:20 PM
Connecting Postsecondary and Secondary Mathematics: Content for Preservice Teacher Courses.
Steven R. Benson*, Education Development Center, Karen J. Graham, University of New Hampshire, Todd Grundmeier, California Polytechnic State University, San Luis Obispo, and Neil Portnoy, University of New Hampshire (1023-N5-1494)

1:40 PM
The role of professional development resources in generating mathematical discourse.
Karen A. Marrongelle* and Sean Larsen, Portland State University (1023-N5-1822)

2:00 PM
Connections in Abstract Algebra for Teachers: Bridging Theory and Practice.
Tanya Cofer*, Northeastern Illinois University, and Bradford R. Findell, University of Georgia (1023-N5-1360)

2:20 PM
A Senior Capstone Course for Future Secondary Mathematics Teachers.
Mary Garner* and Josip Derado, Kennesaw State University (1023-N5-1536)

2:40 PM
A "reconceptualized" university calculus course—with hands-on applications—designed for prospective and practicing high school teachers.
Pamela Baggett*, New Mexico State University, and Andrzej Ehrenfeucht, University of Colorado at Boulder (1023-N5-1511)

3:00 PM
Facilitating genuine discovery experiences for future high-school mathematics teachers.
Preliminary report.
Greisy Winicki-Landman, Cal Poly State Polytechnic University Pomona (1023-N5-72)

3:20 PM
Changing Math Education Students' Perceptions of the Role of Graphs in Understanding Functions.
Preliminary report.
Christopher J. Yakes* and Jorgen Berglund, California State University, Chico (1023-N5-1379)

3:40 PM
Psychology, pedagogy, and epistemology in context of secondary mathematics: A content course for secondary mathematics teachers.
Debasree Raychaudhuri, California State University at Los Angeles (1023-N5-1891)

MAA General Contributed Paper Session, IV

1:00 PM – 3:40 PM

Organizers: Eric S. Marland, Appalachian State University
Jay A. Malmstrom, Oklahoma State Community College

1:00 PM
Understanding Protein-DNA Binding via Fox.
> (824) Preliminary report.
Junalyn P. Navarra-Madsen* and Angela McMichael, Texas Woman's University (1023-Z1-129)

1:15 PM
Modeling Cell Division in Escherichia coli.
> (833) Preliminary report.
Gretchen A. Koch*, Goucher College, and Donald A. Drew, Rensselaer Polytechnic Institute (1023-Z1-1654)

1:30 PM
Geometric Measures as Brain Shape Descriptors.
> (834) Preliminary report.
Christian Laiag* and Juan B. Gutierrez, Florida State University (1023-Z1-1817)

1:45 PM
A Second Course in Biostatistics at a Liberal Arts College? Preliminary report.
John D. Kloke, Pomona College (1023-Z1-1411)

2:00 PM
Elizabeth L. Martin* and Charles Collins, The University of Tennessee (1023-Z1-1403)
Saturday, January 6 – Program of the Sessions

2:15 PM  Surface segregation and solute trapping during planar film growth.
Xiaoying Han* and Brain Spencer, University at Buffalo, The State University of New York
(1023-Z1-3181)

2:30 PM  Curricula Models for Undergraduate Computational Science Education.
Ignatios E. Vakalis, Computer Science, Cal Poly State Univ. (1023-Z1-3739)

2:45 PM  Louisiana Tech University’s STEM Talent Expansion Program.
Kelly Crittenden*, James D. Nelson and Galen E. Turner III, Louisiana Tech University
(1023-Z1-1956)

3:00 PM  Undergraduate Research Projects using Artificial Neural Networks.
John C. Merkel, Morehouse College (1023-Z1-1892)

3:15 PM  Hybrid Multiscale Landmark and Deformable Image Registration.
Dana C. Paquin*, Doron Levy, Stanford University, and Leil Xing, Stanford University Department of Radiation Oncology (1023-Z1-818)

3:30 PM  Normal Functions of the First Category and the Interaction between Coefficient Conditions and Solution Conditions of Differential Equations in the Unit Disk.
Kari E. Fowler, University of Tampa (1023-Z1-1468)

SIAM Minisymposium on Mathematical Modeling of Complex Systems in Biology, II

1:00 PM – 3:50 PM
Organizer: Lisa J. Fauci, Tulane University

1:00 PM  Mathematical Models for Estimating the Number of People Infected with HIV.
J. Mac Hyman* and Gerardo Chowell, Los Alamos National Laboratory (1023-92-1167)

1:30 PM  Fluid Dynamics and computer simulations of mucociliary transport.
Xingzhou Yang*, Center for Computational Science, Tulane University, Lisa J. Fauci, Tulane University, and Robert H. Dillon, Washington State University (1023-92-1113)

2:00 PM  Parametric inference of biochemical network models.
Abdul S. Jarrah, Reinhard Laubenbacher*, Paola M. Vera-Licona, Virginia Tech, and Bernd Sturmfels, University of California, Berkeley (1023-92-651)

2:30 PM  Towards the Human Genotype.
Peter M. Huggins*, Lior Pachter and Bernd Sturmfels, UC Berkeley (1023-92-1429)

3:00 PM  Modeling Cancer, the Immune System and Treatment.
L. G. de Pillis, Harvey Mudd College (1023-92-362)

3:30 PM  Modeling the Shape and Structure of the Human Brain.
Monica K. Hurdal, Florida State University (1023-92-673)

SIAM Minisymposium on Structure and Topology in Graph Theory, II

1:00 PM – 4:15 PM
Organizers: Mark N. Ellingham, Vanderbilt University
Chris Stephens, Middle Tennessee State University

Xiaoya Zha, Middle Tennessee State University

1:00 PM  I-embedded minors of I-embedded graphs.
(849) Preliminary report.
Bojan Mohar, Simon Fraser University, Burnaby (1023-05-1353)

1:30 PM  An extension of Kuratowski Theorem. Preliminary report.
(850) Guoli Ding, LSU (1023-05-1377)

2:00 PM  Representativity of Cayley Maps.
D. Christopher Stephens*, Middle Tennessee State University, Thomas W. Tucker, Colgate University, and Xiaoya Zha, Middle Tennessee State University (1023-05-1454)

2:30 PM  Progress on Lovász’ Path Removal Conjecture.
(852) Ken-ichi Kawarabayashi, National Institute of Informatics (1023-05-1075)

3:00 PM  Same Remarks on d-critical Graphs.
Zixia Song, University of Central Florida (1023-05-1221)

3:30 PM  Orientable strong embeddings for cubic projective-planar graphs.
Mark Ellingham*, Vanderbilt University, and Xiaoya Zha, Middle Tennessee State University (1023-05-578)

3:55 PM  Degree-Splittability of k-regular graphs.
Jeong Ok Choi*, Lale Ozkahya and Douglas B. West, University of Illinois at Urbana-Champaign (1023-05-1658)

AMS-ASL-MAA Panel Discussion

1:00 PM – 2:30 PM
Contemporary perspectives on Hilbert’s Second Problem and the Gödel Incompleteness Theorems.
Moderator: Akihiro Kanamori, Boston University
Panelists: Harvey M. Friedman, Ohio State University
David E. Marker, University of Illinois at Chicago
Michael Rathjen, University of Leeds

MAA CUPM Subcommittee on Curriculum Renewal Across the First Two Years Panel Discussion

1:00 PM – 2:20 PM
Reshaping undergraduate mathematics for biology-related disciplines: Ideas and innovations.
Organizer: Jenna P. Carpenter, Louisiana Tech University
Panelists: Eric S. Marland, Appalachian State University
Debra L. Hydorn, University of Mary Washington
Ani Radunskaya, Pomona College
Kathy Taylor, Duquesne University

MAA Committee on Two-Year Colleges and Committee on Articulation and Placement Panel Discussion

1:00 PM – 2:20 PM
Placement: Friend or foe?
Organizers: Susan L. Forman, Bronx Community College
Reginald K. U. Luke, Middlesex County College

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NOTICES OF THE AMS 139
2:00 PM
Renewal of College Algebra at South Dakota State University.
Donna Flint*, Becky Hunter and Dan Kemp, South Dakota State University

2:00 PM
A motivational course in cryptology and coding theory.
Sarah Spence Adams*, Franklin W. Olin College of Engineering, and Gordon Prichett, Babson College

2:00 PM
Bridging the Vector Calculus Gap: Episode II.
Tevian Dray* and Corinne Manogue, Oregon State University

2:00 PM
Paradigms in Physics: Multiple Entry Points.
Corinne Manogue, Tevian Dray*, Barbara Edwards, David McIntyre and Emily van Zee, Oregon State University

2:00 PM
Statistics Online Computational Resource for Education (SOCRE).
Annie Che*, Ivo Dinov and Juana Sanchez, University of California at Los Angeles

2:00 PM
WeBWorK, a Web-based Interactive Homework System.
Arnold Pizer*, Michael Gage and Vicki Roth, University of Rochester

2:00 PM
A Comprehensive WeBWorK Problem Library.
John Jones*, Arizona State University, Jeff Holt, University of Virginia, and William Ziemer, California State University, Long Beach

2:00 PM
Adapting and Implementing Guided Discovery Notes in Combinatorics for Large Classes.
Mary Flahive, Oregon State University

2:00 PM
College Algebra in Southeast Louisiana Post Katrina.
Randall Wills*, Sarah Clifton and Ana Wills, Southeastern Louisiana University

2:00 PM
Adapting K-8 Mathematics Curriculum Materials for Pre-Service Teacher Education.
Donna Diaz* and William Moss, Clemson University

2:00 PM
Transforming Science and Mathematics Teacher Preparation.
James Curry*, Richard McCray, Carl Wieman, Valerie Otero and William Wood, University of Colorado at Boulder

2:00 PM
Proof, Functions & Computations (A web-based course as a laboratory for enhanced teaching and learning in logic, mathematics, and computer science).
Wilfried Sieg*, Joseph Ramsey and Klaus Sutner, Carnegie Mellon University

2:00 PM
Math Across the Community College Curriculum.
Rebecca Hartzler*, Seattle Central Community College, Christie Gilliland, Green River Community College, Deann Leoni, Edmonds Community College, Patrick Bibby, Miami Dade College, and Ruth Collins, Delaware Technical and Community College

2:00 PM
Glenn Ledder*, Bo Deng, Robert Gibson, Irakli Loladze and Svata Louda, University of Nebraska-Lincoln

2:00 PM
Phaser: A universal simulator for dynamical systems.
Huseyin Kocak*, Brian Coomes and Burton Rosenberg, University of Miami
Saturday, January 6 - Program of the Sessions

2:00 PM The Next STEP: Integrating STEM Learning Communities.
(Jason Miller*, Maria Nagan and Jennifer Thompson, Truman State University)

2:00 PM Embedding Chemistry Problems in Calculus Courses.
(George Rubel* and Robert Orwell, College of William and Mary)

2:00 PM Real World STEM Application Modules.
(Darren Nathan*, Moises Sudd, Paul Tymann, William Basener and Matthew Coppenbarger, Rochester Institute of Technology)

2:00 PM A Biomathematical Learning Enhancement Network for Diversity (BLEND).
(Dominic Clemence*, Mingxiang Chen, Gregory Goins, Mary Smith, Vinaya Kelkar, Catherine White, Venkateswarlu Divi, Yohang Li and Gelonia Dent, North Carolina A&T State University)

2:00 PM UBM: Foundation in mathematical biology through interdisciplinary research, training, and curriculum development.
(Bala Krishnamoorthy*, Richard Gomulkiewicz, Robert Dillon, Judith McDonald, Martin Morgan and Charlotte Oomo, Washington State University)

2:00 PM History Across the Mathematics Curriculum for Preservice Teachers.
(Gabriela Sanchis, Elizabethtown College)

2:00 PM Interdisciplinary Training of Undergraduates in Biological and Mathematical Sciences with Emphasis on Marine/Coastal Science.
(Tor Kwembe*, Hyung Cho and Zhenbu Zhang, Jackson State University)

2:00 PM CAUSEweb: An Undergraduate Statistics Education Digital Library.
(Ginger Holmes Rowell*, Middle Tennessee State University, Dennis Pearl, The Ohio State University, and Roger Woodard, North Carolina State University)

2:00 PM Inquiry Based Learning in Mathematics.
(Michael Starbird*, Edward Odell, Sarah Simmons and Jennifer Smith, The University of Texas at Austin)

2:00 PM The National Curve Bank Project - A MATH Archive.
(Shirley Gray*, California State University Los Angeles, Bill Austin, University of Tennessee at Martin, Phillip Johnson, Appalachian State University, and Lou Talman, Metropolitan State College of Denver)

2:00 PM Research Experiences in Mathematical Biology.
(Leslie Wilson*, Ann Castlefranco, Steven Robinow and Andrew Taylor, University of Hawaii)

2:00 PM Science Learning Community.
(Mary Kay Abbey, Montgomery College)

2:00 PM Renewal of College Algebra.
(Norma Agras*, Miami Dade College, and J. Michael Pearson, Mathematical Association of America)

2:00 PM Professional Enhancement Program (PREP).
(J. Michael Pearson, Mathematical Association of America, William Haver, Virginia Commonwealth University, Nancy Baxter Hastings, Dickinson College, Nathaniel Dean, Texas State University-San Marcos, and Jon Scott*, Montgomery College)

2:00 PM Equipment and Modules for a Capstone Course in Applied Mathematics.
(Dan Goldman, Michael Booty, Bruce Bukiet, Lou Kondic and Michael Siegel*, New Jersey Institute of Technology)
Program of the Sessions – Saturday, January 6 (cont’d.)

2:00PM Analysis of Stress in Biological Systems.
(B13) Ben Fitzpatrick*, Erika Camacho, Wendy Binder, Kam Dahlquist and Gary Kuleck, Loyola Marymount University

2:00PM ESP: Enhancing Secondary Mathematics Teacher Preparation.
(B14) Beverly K. Michael*, Margaret Smith, Ellen Ansel and Paul Gartsie, University of Pittsburgh

2:00PM Preparing Computational Biologists by Encouraging an Academic Minor.
(B15) Angelean Hendrix*, David Sensenman, Dmitry Gokhman, Kay Robbins, James Bower and Nandini Kannan, University of Texas at San Antonio

2:00PM Teaching College Algebra from a Modeling Perspective.
(B16) Traci Friedman* and Cathy Bonan-Hamada, Mesa State College

2:00PM UBM: Quantitative Systems Biology.
(B17) Guillermo Goldstein*, Mark Borodovsky, Leonid Bunimovich and Jung Choi, Georgia Institute of Technology

2:00PM Revitalizing College Algebra at UNO.
(B18) Richard Millsap* and Katrina Nagel, University of North Dakota

2:00PM Florida Southern College: Experiences with Modeling in College Algebra.
(B19) Susan Serrano*, Daniel Jelsovsky and Kenneth Henderson, Jr, Florida Southern College

2:00PM College Algebra with Data Analysis.
(B20) Tina Deemer*, Elias Toubassi and Ted Laetsch, The University of Arizona

2:00PM Native American-based Materials for Integration into Undergraduate Mathematics Courses.
(B21) Charles Funkhouser*, University of Montana Missoula, A. Duane Porter, University of Wyoming, Armando Martinez-Cruz, California State University-Fullerton, and Miles Pfahl, Turtle Mountain Community College

2:00PM Undergraduate Biomathematical Research Career Initiative at SUNY-Geneseo.
(B22) Anthony Macula*, Christopher Leary, Gregg Hartvigsen and Wendy Pogozelski, SUNY College at Geneseo

2:00PM UBM: Undergraduate Training in Quantitative Environmental Biology.
(B23) David Meredith* and Edward Connor, San Francisco State University

Summer Program for Women in Mathematics (SPWM) Reunion

2:00 PM - 4:00 PM

Participants will describe their experiences from past programs.
Organizer: Murli M. Gupta, George Washington University

AMS Invited Address

2:15 PM - 3:05 PM

(924) Gauss composition and generalizations.
Manjul Bhargava, Princeton University (1023-11-25)

MAA Committee on Technologies in Mathematics Education Panel Discussion

2:30 PM - 3:50 PM

Electronic student assessment systems.
Organizers: Michael D. Hvidsten, Gustavus Adolphus College
Bruce W. Yoshiwara, Los Angeles Pierce College
Panelists: David P. Bell, Florida Community College
Michael E. Gage, University of Rochester
Josie Rhodes, Valencia Community College
Phoebbe B. Rouse, Louisiana State University

SIGMAA on Quantitative Literacy Panel Discussion

2:30 PM - 3:50 PM

Current practices in quantitative literacy: An interdisciplinary perspective.
Organizer: Maura B. Mast, University of Massachusetts, Boston
Panelists: John A. Winn, Jr, SUNY Farmingdale
William O. Martin, North Dakota State University
Dogan Gomez, North Dakota State University
Robert Kantrowitz, Hamilton College
Mary O’Neill, Hamilton College

SIGMAA on Research in Undergraduate Mathematics Education Panel Discussion

2:30 PM - 4:10 PM

Featured presentations from the Ninth Conference on Research in Undergraduate Mathematics Education.
Organizers: Chris Rasmussen, San Diego State University
David E. Meel, Bowling Green State University
Panelists: Michael Oehrtman, Arizona State University
Susan Nickerson, San Diego State University

NOTICES OF THE AMS VOLUME 54, NUMBER 1
Kyeong Hah Roh, Arizona State University

AMS Session on History
3:00 PM - 3:45 PM
3:00PM Did Fermat inspire Euler to discover the Quadratic Reciprocity Law for prime numbers?
David J. Pengelley, New Mexico State University (1023-01-119)
3:15PM Irrationality, incommensurability, and the Euclidean Algorithm.
David A. Steele, University of North Carolina at Asheville (1023-01-1307)
3:30PM Myths of Hypatia. Preliminary report.
William Roger Fuller, Ohio Northern University (1023-01-1370)

AMS Invited Address
3:20 PM - 4:10 PM
(928) A Tale of Three Complexities: the Worst of Times, the Best of Times, the Spring of Hope.
Margaret H. Wright, Courant Institute of Mathematical Sciences, New York University (1023-68-07)

Joint Prize Session
4:25 PM - 5:25 PM

Joint Prize Session Reception
5:25 PM - 6:25 PM

SIGMAA on the History of Mathematics Guest Lecture
5:45 PM - 6:30 PM
(929) The Story of the Euler Story.
C. Edward Sandifer, Western Connecticut State University (1023-A0-492)

SIGMAA on the Philosophy of Mathematics Annual Meeting and Guest Lecture
5:45 PM - 6:15 PM
Organizers: Bonnie Gold, Monmouth University
Kevin M. Iga, Pepperdine University
(930) Does a proof exist if nobody has read it?
Klaus Peters, A K Peters Publishers (1023-A0-1399)

SIGMAA on Business, Industry, and Government Reception
5:45 PM - 6:45 PM

SIGMAA on Quantitative Literacy Annual Business Meeting and Reception
5:45 PM - 6:30 PM
Organizer: Maura B. Mast, University of Massachusetts Boston

SIGMAA on Research in Undergraduate Mathematics Education Business Meeting and Presentation of the 2006 RUME Best Paper Award
5:45 PM - 8:15 PM
Organizers: Chris Rasmussen, San Diego State University
David E. Meel, Bowling Green State University
Michael Oehrtman, Arizona State University

SIGMAA on Mathematical and Computational Biology Business Meeting and Reception
5:45 PM - 7:00 PM
Organizer: Eric S. Marland, Appalachian State University

SIGMAA on Statistics Education Business Meeting
5:45 PM - 7:00 PM
Organizer: Ginger Holmes Rowell, Middle Tennessee State University

MAA Two-Year College Reception
5:45 PM - 7:00 PM

Mathematics in Art Presentation
6:00 PM - 6:45 PM
Tetrahedral variations.
Presenter: Arthur Silverman, New Orleans sculptor

The Institute in the History of Mathematics and Its Use in Teaching (IHMT) Reunion
6:30 PM - 8:30 PM
All former participants of this MAA project (including those from the Historical Modules Project) are invited.

Young Mathematicians Network Town Meeting
7:30 PM - 8:30 PM

Sunday, January 7

MAA Student Chapter Advisors' Breakfast
7:00 AM - 8:00 AM

Joint Meetings Registration
7:30 AM - 4:00 PM

AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates, Ill
8:00 AM - 10:55 AM
Organizers: Darren A. Narayan, Rochester Institute of Technology

Sunday, January 7 - Program of the Sessions

January 2007

 Notices of the AMS

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AMS Special Session on Frames and Wavelets in Harmonic Analysis, Geometry, and Applications, I

8:00 AM - 10:50 AM

Organizers: Palle E. T. Jorgensen, University of Iowa
David R. Larson, Texas A&M University
Peter R. Massopust, Institute of Biomathematics and Biometry, Neuhberg, and Technical University of Munich
Gustav Olafsson, Louisiana State University

AMS Special Session on Group Representations, Ergodic Theory, and Mathematical Physics: Honoring the Memory of George W. Mackey, I

8:00 AM - 10:45 AM

Organizers: Robert S. Doran, Texas Christian University
Calvin C. Moore, University of California Berkeley
Robert J. Zimmer, The University of Chicago

AMS Special Session on Infinite Dimensional Analysis Honoring H.-H. Kuo, I

8:00 AM - 10:50 AM

Organizers: Ambar N. Sengupta, Louisiana State University

Program of the Sessions – Sunday, January 7 (cont’d.)
AMS Special Session on Nonlinear Variational Inclusion Problems and Optimization Theory, I

8:00 AM - 10:45 AM

Organizer: Ram U. Verma, University of Toledo, and International Publications

8:00 AM - 10:45 AM

Differential inclusions Driven by Vector Measures and their Optimal Control.
N. U. Ahmed, SITE and Department of Mathematics, University of Ottawa (1023-49-135)

9:00 AM - 10:45 AM

Necessary and Sufficient Conditions for isolated Local Minima of Nonsmooth Functions.
Elena Constanti, University of Pittsburgh - Johnstown (1023-49-783)

10:00 AM - 10:45 AM

Multivariate Euler Type Identity and Optimal Multivariate Ostrowski Type Inequalities.
Preliminary report.
George A. Anastassiou, University of Memphis (1023-26-184)

AMS Special Session on Numerical Relativity, I

8:00 AM - 10:55 AM

Organizers: Alexander M. Alekseenko, California State University Northridge
Arup Mukherjee, Montclair State University

8:00 AM - 10:55 AM

Generalized Harmonic Evolutions of Binary Black Hole Spacetimes.
Lee Lindblom, Caltech (1023-83-985)

9:00 AM - 10:55 AM

Mingliang Cai, University of Miami, and Jie Qing*, UC Santa Cruz (1023-53-912)

9:30 AM - 10:55 AM

Quantum mechanical healing of classical spacetime singularities.
Deborah A. Konkowski*, U.S. Naval Academy, and Thomas M. Helliwell, Harvey Mudd College (1023-83-666)

10:00 AM - 10:55 AM

Blowup of smooth solutions for relativistic Euler equations.
Ronghua Pan*, Georgia Institute of Technology, and Joel A. Smoller, The University of Michigan (1023-35-1197)

AMS Special Session on Arithmetic of Function Fields, I

8:00 AM - 10:45 AM

Organizers: Allison M. Pacelli, Williams College
John W. Snow*, Sam Houston State University, and Japheth Wood, Bard College

8:00 AM - 10:45 AM

Heegner points and the rank of elliptic curves over large extensions of global fields.
Bo-Hae Im*, Chung-Ang University, Seoul, Korea, and Florian Breuer, University of Stellenbosch (1023-11-1030)

8:30 AM - 10:45 AM

Ranks of abelian varieties in towers of function fields.
Douglas Ulmer, University of Arizona (1023-11-1368)

9:00 AM - 10:45 AM

Families of Twists and Inverse Galois. Preliminary report.
Chris Hall, University of Texas at Austin (1023-11-600)

9:30 AM - 10:45 AM

Euler systems in algebraic function fields over a finite field.
David R. Hayes, University of Massachusetts at Amherst (1023-12-719)

10:00 AM - 10:45 AM

Galois groups of difference equations and algebraic relations among periods of Drinfeld modules. Preliminary report.
Chieh-Yu Chang, National Tsing-Hua University, and Matthew Papanikolas*, Texas A&M University (1023-11-1542)

AMS Special Session on Universal Algebra and Order, I

8:00 AM - 10:40 AM

Organizers: John W. Snow, Sam Houston State University
Japheth Wood, Bard College

8:00 AM - 10:40 AM

Characterizing Lattice Terms. Preliminary report.
John W. Snow*, Sam Houston State University, and Eric J. Martin, University of Waterloo (1023-06-408)

8:30 AM - 10:40 AM

Eliminating Eve's Eavesdropping (or How to Stop a Snoop).
Kristen Meyer, Wisconsin Lutheran College (1023-94-192)

9:00 AM - 10:40 AM

Density and Ordered Algebraic Structures.
George Metcalfe, Vanderbilt University (1023-06-324)

9:30 AM - 10:40 AM

On the automorphisms of the congruence lattice of the semilattice Z^n. Preliminary report.
John W. Snow, Sam Houston State University, and Eric J. Martin*, University of Waterloo (1023-06-399)

10:00 AM - 10:40 AM

Existence theorems for weakly symmetric operations.
Ralph McKenzie, Vanderbilt University (1023-08-186)

AMS Special Session on Microlocal Analysis and Singular Spaces, II

8:00 AM - 10:40 AM

Organizers: Paul A. Loya, Binghamton University
Andras Vasy, Massachusetts Institute of Technology
AMS Session on Combinatorics, I

8:00 AM - 10:55 AM

8:00 AM
Asymptotic Bounds for Permutations Containing Many Different Patterns.
Alison B. Miller, Harvard University (1023-05-1057)

8:15 AM
The Metric Dimension of the Cayley Digraphs of Finite Abelian Groups.
Angela S. Hicks, Furman University (1023-05-1062)

8:30 AM
Alliance Partitions in Graphs. Preliminary report.

AMS Special Session on Continuous and Discrete Integrable Systems and Their Applications, I

8:00 AM - 10:55 AM

Organizers: Wen-Xiu Ma, University of South Florida
Taixi Xu, Southern Polytechnic State University
Bao-Feng Feng, University of Texas-Pan American
Zhijun Qiao, University of Texas-Pan American

8:00 AM
Long time bounds on higher derivatives of nearly integrable equations. Preliminary report.
Jerry L. Bona, University of Illinois at Chicago (1023-35-1019)

8:30 AM
Alexander Tovbis, University of Central Florida (1023-35-775)

9:00 AM
New integrable hierarchies from vertex operators representations of polynomial Lie algebras.
Paolo Casati, Universita' Milano Bicocca (1023-58-841)

9:30 AM
Integrable Couplings and Semi-Direct Sums of Lie Algebras.
Wen-Xiu Ma, University of South Florida (1023-58-1005)

10:00 AM
Stability analysis of persisting periodic solutions to a Complex Ginzburg Landau perturbation of the nonlinear Schrodinger equation.
Stephane Lafortune, College of Charleston (1023-35-1135)

10:30 AM
On an integrable symmetric (2+1)-dimensional Lotka-Volterra equation and the corresponding modified (2+1)-dimensional Lotka-Volterra equation.
H. B. Hu, Institute of Computational Mathematics and Scientific Computing Engineering, AMSS, Chinese Academy of Sciences, C. X. Li*, Tsinghua University, and J. J. C. Nimmo, University of Glasgow (1023-35-1063)

10:15 AM
Forcing hexagons in a hexagonal system.

AMS Session on Analysis and Ordinary Differential Equations, III

8:00 AM - 8:40 AM

8:00 AM
Impact of Travel Between Patches for Spatial Spread of Disease.
Lin Wang, University of British Columbia (1023-34-489)

8:15 AM
Regularization of Simultaneous Binary Collisions and Periodic Solutions with Singularity in the Collinear Four-Body Problem.
Tiancheng Ouyang, Brigham Young University, and Zhifu Xie*, College of William & Mary (1023-34-531)

8:30 AM
Pattern Formation on Growing Square Domains.
Adela Nicoleta Comanici*, Rice University, and Martin Golubitsky, University of Houston (1023-34-549)

AMS General Session

8:00 AM - 8:55 AM

8:00 AM
Computing local L-factors for principal series representations of Sp_4(F) and SP_4(F) over p-adic fields. Preliminary report.
Christian A. Zorn, University of Maryland, College Park (1023-00-1200)
AMS Session on Geometry and Topology, III

8:00 AM - 10:40 AM

8:00 AM Some results on shifts on o-dimensional compacta. Preliminary report.
Minaksundaram Rajagopalan, Tennessee State University (1023-54-246)

Mohammed Yahdi, Ursinus College (1023-54-473)

8:30 AM An Interesting Map on the Hilbert Cube. Preliminary report.
Kailash C. Ghimire, Oregon State University (1023-54-502)

8:45 AM Preimages Under $f^n(z) = z^n$ of Continua in the Complex Plane. Preliminary report.
R. Patrick Vernon, Tulane University (1023-54-521)

9:00 AM Any Hausdorff compactification of $X$ obtained by a semi-Wallman base for $X$. Preliminary report.
Huetsyen J. Wu*, Texas A&M University - Kingsville, and Wan-Hong Wu, Institute for Drug Development, Cancer Therapy & Research Center (1023-54-700)

9:15 AM Break.

Matthew Sean Miller, University of Oregon (1023-55-1225)

9:45 AM Canonical genus and the Whitehead doubles of pretzel knots. Preliminary report.
Mark Brittenham, University of Nebraska - Lincoln, and Jacqueline A. Jensen*, Sam Houston State University (1023-55-1256)

10:00 AM Homotopy classification of a bilinear map related to octonion polynomial multiplications.
Hugo Rodriguez Ordoñez, Colorado State University-Pueblo (1023-55-1314)

10:15 AM Polynomial quandle cocycles and obstructions to embedding disjoint union of tangles.
Kheira Ameur, University of South Florida (1023-55-1407)

10:30 AM Solving Deligne's Conjecture via Polytopes. Preliminary report.
Rachel Schwell, University of Connecticut (1023-55-1445)

AMS Session on Applications of Mathematics, III

8:00 AM - 10:55 AM

8:00 AM Stochastic Metapopulation Models for Patch Occupancy.
Amy J. Drew* and Linda J. S. Allen, Texas Tech University (1023-92-1055)

8:15 AM Uniqueness of an equilibrium for a discrete selection-migration model in population genetics.
James F. Selgrade*, North Carolina State University, and James H. Robers*, USDA Forest Service (1023-92-1230)

8:30 AM Dynamics of Closely Coupled Nephrons.
Saziyey Bayram, SUNY-Buffalo State College (1023-92-1295)

8:45 AM Purinergic Receptor Signaling in the RAW 264.7 Macrophage: Modeling Species-Specific Diacylglycerol Dynamics Following Receptor Activation by Uridine 5'-Diphosphate.
Hannah L. Callender, Vanderbilt University (1023-92-1324)

9:00 AM Asymptotic Profiles of the Steady States for an SIS Epidemic Patch Model.
L. J. S. Allen, Texas Tech University, B. M. Bolker, Department of Biology, University of Florida, Y. Lou, The Ohio State University, and A. L. Neva,E, Mathematical Biosciences Institute, The Ohio State University (1023-92-1364)

9:15 AM Analytically tractable approximation of a forest individual-based simulator.
Nikolay S. Strigul*, Department of Ecology and Evolutionary Biology, Princeton University, Denis Pristinski, Stevens Institute of Technology, and Stephen Pacala, Department of Ecology and Evolutionary Biology, Princeton University, 1023-92-1427

9:30 AM Application of Matrix Tree Theorem in Chinese Medicine.
Najia Bao, University of Georgia (1023-92-148)

9:45 AM Competitive Exclusion and Coexistence in a Nonlinear Refuge-Mediated Selection Model.
Youssef M. Dib, University of Louisiana Lafayette (1023-92-1516)

10:00 AM A Dynamical Model of Influenza A Virus Infection and Its Clinical and Epidemiological Relevance.
Baris Hancioglu*, David Swigon and Gilles Clermont, University of Pittsburgh (1023-92-1523)

Wendy Jacqueline Hernandez-Padilla* and Lih-Iing Wu Roeger, Texas Tech University (1023-92-1544)

10:30 AM Markov process modeling of biochemical reaction kinetics.
Dmitry A. Kondrashov*, Department of Biochemistry, University of Wisconsin - Madison, George N. Phillips, Department of Biochemistry and Computer Science, University of Wisconsin - Madison, and Joseph C. Watkins, University of Arizona (1023-92-1576)

10:45 AM The Effect of Static and Dynamic Spatially Structured Disturbances on a Locally Dispersing Population Model.
David E. Hiebeler, University of Maine, and Benjamin R. Morin*, Oregon State University (1023-92-642)

AMS Session on Education

8:00 AM - 10:25 AM

8:00 AM Making Physiology Significant and Statistics Meaningful.
Mary F. Majerus* and April Collins-Potterfield, Westminster College (1023-97-1012)

8:15 AM Teaching to succeed.
Natali Hivonen* and Edward Mason, Prairie View A&M University (1023-97-1169)

8:30 AM Conceptions of infinitesimals in undergraduate calculus students and in history.
Robert E. Ely, University of Wisconsin-Madison (1023-97-1301)
Program of the Sessions – Sunday, January 7 (cont’d.)

<table>
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<tr>
<th>Time</th>
<th>Session</th>
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<tr>
<td>8:00AM-10:55AM</td>
<td>An Overview of Ohio Northern University’s Mathematical Assessments being used to Satisfy NCATE’s New Guidelines. Preliminary report. Sandy Schroeder, Ohio Northern University (1023-97-1389)</td>
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<tr>
<td>9:00AM</td>
<td>Engaging Students in College Algebra.</td>
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<td>Juli D’Ann Ratheal, West Texas A &amp; M University (1023-97-313)</td>
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<td>Manmohan Kaur, Benedictine University (1023-97-465)</td>
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<tr>
<td>9:45AM</td>
<td>The Reasoning of Bayesian and Empirical Bayesian Analysis in Undergraduate Statistics Education. Zhao Chen, Florida Gulf Coast University (1023-97-677)</td>
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<tr>
<td>10:00AM</td>
<td>The process and impact of implementing performance standards in mathematics. Samuel Obara, Texas State University, San Marcos (1023-97-823)</td>
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<tr>
<td>10:15AM</td>
<td>Girls Can Do Math, But Most Don’t Due to Cultural Factors. Janet E. Mertz, University of Wisconsin – Madison (1023-97-971)</td>
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MAA Session on Building Diversity in Advanced Mathematics: Models that Work, I

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<tr>
<th>Time</th>
<th>Session</th>
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| 8:00AM-10:55AM | Organizers: Patricia Hale, California State Polytechnic University, Pomona  
|       | Abbe H. Herzig, University of Albany, SUNY                                |
|       | Case Study: My Experience Teaching Mathematics to a Student Who is Blind. Richard P. Spindler, Bemidji State University (1023-E1-231) |
| 8:20AM | Improving engineering student retention by enhancing their mathematical preparation in a case study at the University of Michigan. Zsolt Lavizza, University of Cambridge, Darryl M. Koch and Helen Siedel*, University of Michigan (1023-E1-1111) |
| 8:40AM | Summer Undergraduate Research Program at Clayton State University. Aprilya Lanz, Clayton State University (1023-E1-1797) |
| 9:00AM | Bifurcation and Chaos in One-dimensional Discrete Dynamical Systems (8ac). A National Research Experience for Undergraduates Program Attracting a Diverse Group of Mathematics Students. Preliminary report. Mazen Shahin*, Delaware State University, and Elena Surovyatkina, Space Research Institute, Russian Academy of Science, and Delaware State University (1023-E1-365) |
| 9:20AM | Coloring Groups in Jersey City and Park City. Preliminary report.       |
|       | Brian Hopkins* and Stephanie Charles, Saint Peter’s College (1023-E1-1428) |
| 10:00AM | Center for Women in Mathematics at Smith College.  
|       | Ruth Haas* and James Henle, Smith College (1023-E1-764) |
| 10:20AM | Advance Program at NMSU: A Formalized Mentoring for STEM faculty.  
|       | Tiziana Giorgi, New Mexico State University (1023-E1-1217) |
| 10:40AM | The Importance of Community in Supporting Diverse Learners in Mathematics.  
|       | Abbe H. Herzig, University at Albany, State University of New York (1023-E1-481) |

MAA Session on Countering "I Can't Do Math": Strategies For Teaching Under-Prepared, Math-Anxious Students, I

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<tr>
<th>Time</th>
<th>Session</th>
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| 8:00AM-10:55AM | Organizers: Winston Crawley, Shippensburg University  
|       | Kim Presser, Shippensburg University                                    |
|       | Games and Hands-on Activities in Introductory Mathematics Course for Non-Majors.  
|       | Annella R. Kelly, Roger Williams University (1023-GS-1869) |
| 8:20AM | Thinking of Using Software? Why It Works for Us!  
|       | Sue R. Beck, Morehead State University (1023-GS-242) |
| 8:40AM | I Can Prove It!  
|       | J. A. Hall, Longwood University; Farmville, VA (1023-GS-958) |
| 9:00AM | Engaging Students in Quantitative Reasoning: Activities, Real Data, and Relevant Issues. Kay Somers* and Alicia Sevilla, Moravian College (1023-GS-678) |
| 9:20AM | Breaking student math anxiety by doing something different.  
|       | Ed D. Laugbaum, The Ohio State University (1023-GS-799) |
| 9:40AM | Reading, Writing, and How Not to be a Fat Head. Preliminary report.  
|       | Trisha Moller, DeSales University (1023-GS-266) |
| 10:00AM | So They Don't Want to Hear About Math? Tell a Story Instead. Preliminary report.  
|       | Carlos R. Bovell, Mercer County Community College (1023-GS-150) |
| 10:20AM | Overcoming Students’ Anxiety With Translation Problems via Poly.  
|       | Tim Jacobbe, Clemson University (1023-GS-45) |

MAA Session on Teaching Operations Research Research in the Undergraduate Classroom

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<tr>
<th>Time</th>
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| 8:00AM-10:50AM | Organizers: Gerald Kobylski, United States Military Academy  
|       | Steve Horton, United States Military Academy  
|       | Christopher J. Lacke, Rowan University  
|       | William Fox, Francis Marion University |
|       | Bifurcation and Chaos in One-dimensional Discrete Dynamical Systems (8ac). A National Research Experience for Undergraduates Program Attracting a Diverse Group of Mathematics Students. Preliminary report. Mazen Shahin*, Delaware State University, and Elena Surovyatkina, Space Research Institute, Russian Academy of Science, and Delaware State University (1023-E1-365) |
|       | Coloring Groups in Jersey City and Park City. Preliminary report.       |
|       | Brian Hopkins* and Stephanie Charles, Saint Peter’s College (1023-E1-1428) |
Sunday, January 7 - Program of the Sessions

MAA General Contributed Paper Session, V

8:00 AM - 10:55 AM

Organizers: Eric S. Marland, Appalachian State University
           Jay A. Malmstrom, Oklahoma State Community College

- 8:00 AM A Closer Look at the Crease Length Problem.
  - (1068) S. F. Ellermeyer, Kennesaw State University (1023-Z1-213)

- 8:15 AM Visualizing Elastic Wave Interactions with Multiple Interfaces.
  - (1069) Richard J. Marchand, Slippery Rock University (1023-Z1-1448)

- 8:30 AM Double Layers, Solid Angles and Cubic Splines: Fun
  - (1070) With a Well in a Stratified Aquifer. Preliminary report.
  - Kenneth H. Luther, Valparaiso University (1023-Z1-575)

- 8:45 AM Particle Tracking in Three-Dimensional Flows.
  - (1071) Evolution and Refinement of a Smooth Surface.
  - Paul von Dohlen*, William Paterson University, and
  - Patrick Miller, Stevens Institute of Technology (1023-Z1-1339)

- 9:00 AM A Glimpse of Infinite-dimensional Tensegrities.
  - (1072) Preliminary report.
  - Ted Ashton, University of Georgia (1023-Z1-1680)

- 9:15 AM Mathematical Modelling of rumor transmission
  - (1073) during a dialogue.
  - Bernard P. Brooks*, Nicholas DiFonzo and David S. Ross, Rochester
  - Institute of Technology (1023-Z1-1659)

- 9:30 AM Seeing sums of single digit numbers.
  - (1074) Cynthia A. Crumb, University of South Alabama, Mobile, AL (1023-Z1-1334)

- 9:45 AM A Comparison of Online Homework Systems.
  - (1075) Preliminary report.
  - Jessica K. Sklar* and Mei Zhu, Pacific Lutheran University (1023-Z1-127)

- 10:00 AM The Birthday Problem: The Making of a Classic.
  - (1076) Dale K. Hathaway, Olivet Nazarene University (1023-Z1-250)

- 10:15 AM $\pi$ to (hundreds of) thousands of digits, from Vieta's formula.
  - (1077) Rick Kreminski, Texas A&M University - Commerce (1023-Z1-585)

- 10:30 AM Amazing Explorations. Preliminary report.
  - (1078) Dennis P. Walsh, Middle Tennessee State University (1023-Z1-1830)

- 10:45 AM Early Nineteenth Century Elementary Algebra
  - (1079) Textbooks.
  - Andrew B. Perry, Springfield College (1023-Z1-287)

PME Council

8:00 AM - 11:00 AM

MAA Invited Address

9:00 AM - 9:50 AM

- 9:00 AM The Genome Project for Three-Manifolds.
  - Jeffrey F. Brock, Brown University (1023-A0-23)

ASL Invited Address

9:00 AM - 9:50 AM

- 9:00 AM Reducts of Omega-Categorical Theories.
  - Carol S. Wood, Wesleyan University (1023-03-414)
Program of the Sessions – Sunday, January 7 (cont’d.)

MAA Minicourse #12: Part B
9:00 AM – 11:00 AM
Combinatorially thinking.
Organizers: Arthur T. Benjamin, Harvey Mudd College
Jennifer J. Quinn, Association for Women in Mathematics

MAA Minicourse #1: Part B
9:00 AM – 11:00 AM
Introduction to the mathematics of modern cryptography.
Organizers: Colm K. Mulcahy, Spelman College
Jeffrey Ehme, Spelman College

MAA Minicourse #8: Part B
9:00 AM – 11:00 AM
Mathematics and geometry of voting.
Organizer: Donald G. Saari, University of California Irvine

MAA Session on How to Start and Develop Undergraduate Level Financial Mathematics Programs
9:00 AM – 10:20 AM
Organizer: Youngna Choi, Montclair State University

9:00 AM
Financial Mathematics in a Mathematically Accurate but Accessible Way.
Morteza Shafii-Mousavi, Indiana University South Bend (1023-135-28)

9:30 AM
Starting a B.S. in Mathematics-Mathematics of Finance Concentration Track: case of Montclair State University. Preliminary report.
Youngna Choi, Montclair State University (1023-135-1354)

10:00 AM
Youngna Choi and Crystal K Dahlhaus*, Montclair State University (1023-135-1356)

MAA Panel Discussion
9:00 AM – 10:20 AM
The top ten things you should know if you intend to implement the standards of Beyond Crossroads.
Organizer: Richelle Blair, Lakeland Community College

Panelists: Kathy Mowers, Owensboro Community and Technical College
Robert L. Kimball, Jr, Wake Technical Community College
Brad Chin, West Valley College
Richelle Blair

MAA Panel Discussion
9:00 AM – 10:20 AM
Calculus, liberal arts, and quantitative literacy.
Organizer: Richard A. Gillman, Valparaiso University

Panelists: William E. Briggs, University of Colorado, Denver
Deborah Hughes-Hallett, University of Arizona
Michael Starbird, University of Texas at Austin
Richard A. Gillman

Project NExT Panel Discussion
9:00 AM – 10:30 AM
Publishing undergraduate research and expository articles.
Organizers: Chawne M. Kimber, Lafayette College
Kimberly A. Roth, Wheeling Jesuit University

Panelists: Ezra A. Brown, Virginia Polytechnic Institute & State University
Paul J. Campbell, Beloit College
Clifford A. Reiter, Lafayette College
Jody Sorensen, Augsburg College

AMS Special Presentation on Congressional Fellowships
9:30 AM – 10:55 AM
Learn about this program and speak with former Fellows.
Organizer: Samuel M. Rankin, III, AMS
Presenters: David Weinreich, AMS Congressional Fellow 2005-06
Dan Ullman, AMS Congressional Fellow 2006-07

Exhibits and Book Sales
9:30 AM – 5:30 PM

ASL Invited Address
10:00 AM – 10:50 AM
(1085) Almost everywhere domination.
Reed Solomon, University of Connecticut, Storrs (1023-03-413)

Math on the Web, III
10:00 AM – 5:05 PM
0:30 PM The MathFind search engine.
(1086) Robert Miner, Design Science, Inc.
10:00 PM Project CALC on the Web.
(1087) David Smith, Duke University
1:15 PM Interactive math on the Web by Maplesoft.
(1088) Mohamed Bendame, Maplesoft
2:00 PM Online assessment and problem-solving environments: The advantages of using content MathML
(1089) Don DeLand, Integra Technical Publishing Co.
2:45 PM PlanetMath and free mathematics.
(1090) Aaron Krowne, Emory University
3:15 PM Using MathML with Blackboard and WebCT.
(1091) Bob Mathews, Design Science, Inc.
4:00 PM WebALT online courses.
(1092) Mika Seppälä, WebALT
AMS Invited Address

10:05 AM - 10:55 AM

(1093) Extensions of Hilbert's Tenth Problem.
Bjorn Poonen, University of California, Berkeley
(1023-03-06)

AMS-MAA Invited Address

11:10 AM - NOON

(1095) Statistics for smart people who don't know anything about statistics.
Persi W. Diaconis, Stanford University (1023-62-32)

AMS Colloquium Lecture: Lecture III

1:00 PM - 2:00 PM

(1096) Limit shapes, real and imagined, III: Instantons, and how random surfaces count them.
Andrei Okounkov, Princeton University (1023-60-04)

ASL Invited Address

1:00 PM - 1:50 PM

(1097) Independence and equiconsistency results in intuitionistic set theory.
Michael Rathjen, Ohio State University and University of Leeds (1023-04-12)

MAA Student Lecture

1:00 PM - 1:50 PM

Della D. Fenster, University of Richmond (1023-00-24)

AMS Current Events Bulletin

1:00 PM - 4:45 PM

Organizer: David Eisenbud, Mathematical Sciences Research Institute

(1099) Barcodes: The Persistent Topology of Data.
Robert Ghrist, University of Illinois, Urbana-Champaign (1023-55-1038)

Akshay Venkatesh, Courant Institute of Mathematical Sciences (1023-30-728)

(1101) From harmonic analysis to arithmetic combinatorics.
Izabella Laba, UBC (1023-42-1431)

(1102) The structure of error terms in number theory and an introduction to the Sato-Tate Conjecture.
Barry Mazur, Harvard University (1023-10-1245)

AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates, IV

1:00 PM - 5:55 PM

Organizers: Darren A. Narayan, Rochester Institute of Technology

AMS-MAA Special Session on History of Mathematics, II

1:00 PM - 5:55 PM

Organizers: Joseph W. Dauben, Lehman College
Patti Hunter, Westmont College
Victor J. Katz, University of the District of Columbia
Karen H. Parshall, University of Virginia

(1111) Surfaces with Density and their Isoperimetric Regions.
Robin S. Walters, Harvard University (1023-35-898)

(1112) Self-similar periodic tilings of nilpotent Lie groups.
James R. Rohlf, College of Wooster, and William P. Hudelson, University of Notre Dame (1023-2-808)

Carl V. Lutzer, Rochester Institute of Technology
Bernard Brooks, Rochester Institute of Technology
Tamas I. Wiant, Rochester Institute of Technology
Michael J. Fisher, California State University, Fresno

1:00 PM
Computational Efficiency in Weyl Groups:
Preliminary report.
Patricia R. Cahn*, Juan Li, Smith College, and Jeremy Schwartz, Brandeis University (1023-08-1056)

1:30 PM
An equivalent characterization of half-factorial restricted block monoids over \( \mathbb{Z} \) and torsion groups, with applications to factorization in Dedekind domains.
Preliminary report.
R. D. Kravitz, Williams College (1023-13-132)

2:00 PM
Matrix Generation of the Diophantine Solutions to Sums of \( 3 \leq n \leq 9 \) Squares that are Square.
Jordan O. Tirrell* and Clifford A. Reiter, Lafayette College (1023-11-626)

2:30 PM
Looking for Patterns in Multinomial Coefficients.
Igor Konfisaker*, Washington University in St. Louis, and Michael Wijaya, University of Rochester (1023-11-472)

3:00 PM
Number Base Representations in the Gaussian Integers.
Preliminary report.
Heather J. Langdon, St. Mary's College of Maryland (1023-11-854)

3:30 PM
Orders at Infinity of Modular Forms with Heegner Divisors.
Carl Erickson*, Stanford University, Alison Miller, Harvard University, and Aaron Pixton, Princeton University (1023-11-80)

4:00 PM
The number of ways of expressing \( t \) as a binomial coefficient.
Daniel Mertz Kane, Massachusetts Institute of Technology (1023-11-1083)

4:30 PM
Realizations of subspaces of \( L_p, p > 2 \), with norm given by partitions and weights.
Brandon P. Barrette* and Simei Tong, University of Wisconsin-Eau Claire (1023-46-86)

5:00 PM
Surfaces with Density and their Isoperimetric Regions.
Robin S. Walters, Harvard University (1023-35-898)

5:30 PM
Self-similar periodic tilings of nilpotent Lie groups.
Preliminary report.
James R. Rohlf*, College of Wooster, and William P. Hudelson, University of Notre Dame (1023-2-808)

January 2007
AMS Special Session on Frames and Wavelets in Harmonic Analysis, Geometry, and Applications, II

1:00 PM - 5:50 PM

Organizers: Palle E. T. Jorgensen, University of Iowa
David R. Larson, Texas A&M University
Peter R. Massopust, Institute of Biomathematics and Biometry, Neuherberg, and Technical University of Munich
Gestur Olafsson, Louisiana State University

1:00 PM

Pointwise comparison of pulse code and Sigma-Delta modulation.
John J. Benedetto*, Norbert Wiener Center, University of Maryland, College Park, and Onur Oktay, University of Maryland, College Park (1023-42-437)

1:30 PM

Maximally Equiangular Frames and Finite Wigner Distributions.
Matthew Fickus, Air Force Institute of Technology (1023-42-843)

2:00 PM

Causal Relationships Between Frames, Preliminary report.
Troy Henderson*, United States Military Academy, and David R Larson, Texas A&M University (1023-47-978)

2:30 PM

Orthogonal waves centered on an arbitrary knot sequence.
Derek Bruff, Vanderbilt University, Jeffrey Geronimo, Georgia Institute of Technology, and Doug Hardin*, Vanderbilt University (1023-41-1503)

3:00 PM

Texture Identification of Tissues Using Directional Wavelet, Ridgelet and Curvelet Transforms.
Ahmed I. Zayed* and Lucia Dettori, DePaul University (1023-42-320)

3:30 PM

A characteristic equation of semihyperbolic Parseval wavelets. Preliminary report.
Veronika Furst, University of Arizona (1023-43-1566)

4:00 PM

Wavelet Sets with Nonexpanding Dilation Matrices.
Yang Wang*, Georgia Institute of Technology, and Eugene Ionascu, Columbus State University (1023-42-468)

4:30 PM

Surgery and push-outs on frames. Preliminary report.
David R. Larson and Nga Q. Nguyen*, Texas A&M University (1023-46-695)

5:00 PM

Isotropic Multiresolution Analysis.
Simon K. Alexander, Shika Baid, Saurabh Jain, Juan R. Romero and Manos Papadakis*, University of Houston (1023-42-885)

5:30 PM

Gelfand triples and time frequency analysis. Preliminary report.
Jens Gerlach Christensen* and Gestur Olafsson, Louisiana State University (1023-43-1762)

AMS Special Session on Group Representations, Ergodic Theory, and Mathematical Physics: Honoring the Memory of George W. Mackey, II

1:00 PM - 5:45 PM

Organizers: Robert S. Doran, Texas Christian University
Calvin C. Moore, University of California Berkeley
Robert J. Zimmer, The University of Chicago

1:00 PM

Induced Actions.
Robert J. Zimmer, University of Chicago (1023-22-68)

2:00 PM

From Lorentzian dynamics to the decay of matrix coefficients.
Scot Adams, University of Minnesota (1023-37-241)

2:30 PM

Cohomology of measurable cocycles. Preliminary report.
Alex Furman, University of Illinois at Chicago (1023-37-780)

3:00 PM

The Work of G. W. Mackey on Unitary Representations of Group Extensions.
Arlan Ramsay, University of Colorado, Boulder (1023-46-580)

3:30 PM

The Mackey Dichotomy in Classification Problems.
Edward G. Effros, UCLA (1023-46-233)

4:00 PM

MASA's and certain type I closed faces of $C^*$-algebra.
Lawrence G. Brown, Purdue University (1023-46-760)

4:30 PM

Groupoid Methods in Wavelet Analysis.
Marius Ionescu, Dartmouth College, and Paul S. Muhly*, University of Iowa (1023-46-663)

5:00 PM

Quantum Fields and George Mackey.
Arthur Jaffe, Harvard University (1023-00-225)
AMS Special Session on Infinite Dimensional Analysis
Honoring H. H. Kuo, II

1:00 PM - 5:20 PM

Organizers: Ambar N. Sengupta, Louisiana State University
P. Sundar, Louisiana State University

1:00PM Nonlinear maps of Wiener processes.
Leonard Gross, Cornell University (1023-46-1511)

1:30PM Examples of Stochastic Flows in Non-Commutative Manifolds.
Kalyan B. Sinha, J.N.Centre for Advanced Scientific Research, Jakkur, Bangalore, India. (1023-60-1344)

2:00PM Invariant Measures and Kolmogorov Equations for Stochastic PDEs. Preliminary report.
Pao-Liu Chow, Wayne State University (1023-60-937)

2:30PM Nonlinear Filtering Theory of Stochastic Navier-Stokes Equations.
S. S. Sritharan, University of Wyoming (1023-60-274)

3:00PM Empirical graph Laplacian approximation of Laplace-Beltrami operators.
Evarist - Giné, University of Connecticut, and Vladimir Kolchinskii, Georgia Institute of Technology (1023-60-457)

3:30PM Infinite dimensional heat equation of convolution type, solutions and probabilistic interpretation.
Habib Ouerdiane, University of Tunis El Manar, Tunisia (1023-60-670)

4:00PM Best constants in norms of non-gaussian Wick products. Preliminary report.
Aurel Iulian Stan, The Ohio State University at Marion (1023-60-926)

4:30PM White Noise Delta Function for an Affine Subspace.
Jeremy J. Becnel, Stephen F. Austin State University (1023-46-837)

5:00PM Discussion.

AMS Special Session on Nonlinear Variational Inclusion Problems and Optimization Theory, II

1:00 PM - 3:45 PM

Organizer: Ram U. Verma, University of Toledo, and International Publications

1:00PM The Minimax Inequality Inequality and Applications to Fixed Points, Nash Equilibrium Points and Some Links for Problems of Financial Mathematics in the Practice. Preliminary report.
George X. Yuan, Management School, Chinese Academy of Science, Beijing, China (1023-91-137)

2:00PM Sensitivity Analysis for Coercively Monotone Variational Inclusions.
R. N. Mohapatra and Ram U. Verma, University of Central Florida (1023-49-972)

3:00PM Identification of Nonlinearities in Divergence Type Elliptic Boundary Value Problems.
Mircea D. Voicu, The University of Texas - Pan American (1023-49-55)

AMS Special Session on Nonsmooth Analysis in Inverse and Variational Problems, I

1:00 PM - 6:25 PM

Organizers: M. Zuhair Nashed, University of Central Florida
Otmar Scherzer, University of Innsbruck

1:00PM Variational problems for measure-valued Lagrangeans.
Umberto Mosco, Worcester Polytechnic Institute (1023-35-984)

1:30PM Travel Time Tomography and Lens Rigidity.
Gunther Uhlmann, University of Washington (1023-58-1401)

2:00PM Ultrasound Absorption vs. Causality & Hyperbolicity.
Sarah K. Patch, Department of Physics, UW Milwaukee (1023-44-1239)

2:30PM Sparsity- and continuity-promoting seismic image recovery with curvelet frames.
Felix J. Herrmann, EOS, UBC, Vancouver, Canada (1023-86-555)

3:00PM Multi-layer segmentation and application to MRI brain imaging. Preliminary report.
Gimmo Chung and Luminita Aura Vese*, UCLA (1023-35-1914)

3:30PM Parameter Identification in Elliptic Inverse Problems and in Variational and Quasi-variational inequalities.
Akhtar A. Khan, University of Wisconsin-Barron County (1023-49-1858)

4:00PM A segmentation algorithm based on convex duality.
Selim Esedooglu, University of Michigan (1023-49-1898)

4:30PM Regularization of systems of nonlinear ill-posed equations.
Antonio Leitao, Federal Univ of St Catarina (1023-65-929)

5:00PM Modified Back-Projection Methods for Synthetic Aperture Radar Imaging.
Fengshan Liu*, Delaware State University, Guoping Zhang, University of Texas at Pan American, Jingguang Sun and Xiquan Shi, Delaware State University (1023-86-1465)

5:30PM Electrical Impedance Tomography with Interior Measurements.
Alexandru Tamasan, University of Central Florida (1023-35-1655)

6:00PM On Stability of a Class of Nonsmooth Dynamic Systems.
Chao Zhu*, George Yin and Q. S. Song, Wayne State University (1023-93-81)

AMS Special Session on Numerical Relativity, II

1:00 PM - 5:55 PM

Organizers: Alexander M. Alekseenko, California State University Northridge
Arup Mukerjee, Montclair State University

1:00PM Binary Black Hole Simulations and the Hunt for Gravitational Waves.
Pablo Laguna and Deirdre M. Shoemaker, Penn State University (1023-83-1145)

2:00PM A Proposal to Numerically Simulate a Cosmic Shock Wave by Use of a Locally Inertial Glimm Scheme.
Blake Temple, University of California, Davis (1023-65-1882)

2:30PM A minimization problem for the lapse and the initial-boundary value problem for Einstein's field equations.
Gabriel Nagy, University of California at San Diego, and Olivier Sarbach*, Universidad Michoacana de San Nicolas de Hidalgo (1023-83-372)
AMS Special Session on Arithmetic of Function Fields, II

1:00 PM - 5:55 PM

**Organizers:** Allison M. Pacelli, Williams College
Michael J. Rosen, Brown University

1:00 PM

Isogenous elliptic factors in the Jacobians of curves.
Jennifer Paulhus, University of Illinois at Urbana-Champaign (1023-11-1216)

1:30 PM

Special values of equivariant p-adic and global L-functions. Preliminary report.
Cristian D. Popescu, University of California at San Diego (1023-11-1065)

2:00 PM

David M. Goss, Ohio State University (1023-11-451)

2:30 PM

Simultaneous Prime Values of Polynomials in Positive Characteristic.
Paul Pollack, Dartmouth College (1023-11-359)

3:00 PM

Variations of the Sato-Tate Conjecture. Preliminary report.
Ram Murty, Queen’s University, Kingston, Ontario, Canada (1023-11-794)

4:00 PM

Biquadratic Function Fields.
Qingquan Wu, University of Illinois at Urbana-Champaign, and Renate Scheider*, University of Calgary (1023-11-160)

4:30 PM

Approximating Euler Products and Computing the Class Number of an Algebraic Function Field.
Andreas Stein, University of Wyoming (1023-11-1030)

5:00 PM

Galois Theory for the line over finite fields.
Jing Long Hoelscher, University of Pennsylvania (1023-14-893)

5:30 PM

The Euclidean Algorithm and Applications to Hyperbolic Geometry.
Kathleen Petersen, Queen’s University (1023-11-1584)

AMS Special Session on Universal Algebra and Order, II

1:00 PM - 5:50 PM

**Organizers:** John W. Snow, Sam Houston State University
Japheth Wood, Bard College

1:00 PM

Can We Change the Paradigm for Reconstruction?
Bernd S. W. Schroeder, Louisiana Tech University (1023-06-221)

1:30 PM

Aditya K. Nagrah, University of Denver (1023-06-200)

2:00 PM

The Coordination of Generalized Crowns.
Rebecca Garcia, Sam Houston State University (1023-06-428)

2:30 PM

Minimal extensions of bounded distributive lattices. Preliminary report.
M. E. Adams*, State University of New York at New Paltz, and Jürg Schmid, University of Bern (1023-06-785)

3:00 PM

Lyndon’s algebras and the equational complexity of RRA. Preliminary report.
Jeremy F. Alm, Department of Philosophy, Iowa State University (1023-03-305)

3:30 PM

A result on Complete Hausdorffness in topological algebras.
Wolfram Bentz, University of Northern British Columbia (1023-08-434)

4:00 PM

Minimal generating bond semigroups. Preliminary report.
Japheth Wood, Bard College (1023-08-380)

4:30 PM

The free spectrum of the Perkins semigroup is sub-log-exponential.
Steve Seif, University of Louisville (1023-08-385)

5:00 PM

There is no algorithm for deciding whether an equation is compatible with the real line. Preliminary report.
George F. McNulty, University of South Carolina (1023-08-671)

5:30 PM

Full natural dualities.
David M. Clark, SUNY New Paltz, Brian A. Davey, Jane G. Pitkethly, La Trobe University, and Ross D. Willard*, University of Waterloo (1023-09-1355)

AMS Special Session on Microlocal Analysis and Singular Spaces, III

1:00 PM - 4:40 PM

**Organizers:** Paul A. Loya, Binghamton University
Andras Vasy, Massachusetts Institute of Technology

1:00 PM

Elliptic boundary problems on a class of noncompact manifolds.
Thomas Krainer, Penn State Altoona (1023-35-1899)

2:00 PM

On the heat trace for cone operators. Preliminary report.
Juan B. Gil, Penn State Altoona (1023-58-1308)

3:00 PM

Hypopellipticity of $\Delta_b$ and vanishing of cohomology. Preliminary report.
Gerardo A. Mendoza, Temple University (1023-58-685)

4:00 PM

Discussion.
AMS Special Session on Continuous and Discrete Integrable Systems and Their Applications, II

1:00 PM - 6:15 PM

Organizers: Wen-Xiu Ma, University of South Florida
Taixi Xu, Southern Polytechnic State University
Bao-Feng Feng, University of Texas-Pan American
Zhijun Qiao, University of Texas-Pan American

1:00PM
Chaoqi and Periodic Asymptotics for q-Orthogonal Polynomials.
Mourad E. H. Ismail*, University of Central Florida, and Ruiming Zhang, Guangxi Normal University, Guilin City (1023-41-161)

1:30PM
Mizan Rahman, Carleton University (1023-33-386)

2:00PM
A class of superintegrable systems of Calogero-Moser type.
Roman G. Smirnov*, Dalhousie University, and Pavel Winternitz, University of Montreal and Centre de Recherches Mathematiques (CRM) (1023-33-102)

AMS Minicourse #2: Part B

1:00 PM - 3:00 PM

Some deterministic models in mathematical biology and their simulations.
Organizers: James F. Selgrade, North Carolina State University
Cammy E. Cole, Meredith College
Hüseyin Koçak, University of Miami, Coral Gables

AMS Session on Algebra and Group Theory, III

1:00 PM - 5:40 PM

1:00PM
Construction of the irreducible characters of the Heisenberg group and a similar special group.
Mohammed Reza Darafsheh, University of Tehran, Iran, and Manouchehr Misaghian*, Johnson C. Smith University (1023-20-1493)

1:15PM
Graph Braid Groups.
(1205) Daniel S. Farley*, Miami University of Ohio, and Lucas Sabalka, University of California, Davis (1023-20-1518)

2:30PM
On growth series of Coxeter groups.
(1206) Patrick Bahls, University of North Carolina, Asheville (1023-20-1778)

4:30PM
Using Formations to Determine Factorizations.
(1208) Preliminary report.

5:00PM
The Strong Symmetric Genus of the Finite Coxeter Groups.
(1210) Michael A. Jackson, King College (1023-20-371)

MAA Minicourse #7: Part B

1:00 PM - 3:00 PM

Directing undergraduate research.
Organizer: Aparna W. Higgins, University of Dayton

MAA Minicourse #15: Part A

1:00 PM - 3:00 PM

Geometry with history for teaching teachers.
Organizers: David W. Henderson, Cornell University
Daina Taimina, Cornell University

Sunday, January 7 - Program of the Sessions

NOTICES OF THE AMS 155
AMS Session on Combinatorics, II

1:00 PM - 5:40 PM

1:00PM Constructing m-articulate collections of de Bruijn sequences.
Atoshi Chowdhury, Princeton University
(1023-05-1383)

Alison M. Marr, Southern Illinois University
(1023-05-1385)

1:30PM Helly and Radon independence in Clone-Free Multiparatite Tournaments. Preliminary report.
Darren B. Parker*, University of Dayton, Randy F. Westhoff and Marty J. Wolf, Bemidji State University
(1023-05-1469)

1:45PM Minimum cycle bases of direct products of bipartite graphs.
Richard Hammack, Virginia Commonwealth University
(1023-05-1472)

2:00PM Enumeration of Orientable Embeddings of Odd Graphs.
Brent N. Stephens* and Xiaoya Zha, Middle Tennessee State University
(1023-05-1512)

2:15PM Extending the Freiman 3k – 3 Theorem to distinct sets. Preliminary report.
David J. Grynkiewicz*, Oriol Serra, Universitat Politecnica de Catalunya, Spain, and Yahya Hamidoune, Universite de Paris VI
(1023-05-1526)

2:30PM Density Relations in Simple Graphs.
Daniel Felix, University of California, San Diego
(1023-05-1562)

2:45PM Generating tree isomorphisms for pattern-avoiding involutions.
Aaron D. Jaggar*, Tulane University, and Joseph J. Marincel, Washington University
(1023-05-1618)

3:00PM Combinatorial Methods in Coordinate Percolation. Preliminary report.
Elizabeth Moseman, Dartmouth College
(1023-05-1619)

3:15PM Geometric structure of sumsets within their convex hulls.
Jaewoo Lee, Borough of Manhattan Community College, The City University of New York
(1023-05-1412)

AMS Session on Analysis and Functional Analysis, II

1:00 PM - 5:25 PM

1:00PM Rellich type inequality on Carnot Groups.
Ismail Kombe, Oklahoma City University
(1023-43-1180)

Abhay Tadesse, Langston University
(1023-43-336)

1:30PM Transference of Maximal Multiplier Operators on Local Hardy-Lorentz Spaces.
Daning Chen, Jackson State University
(1023-43-873)

1:45PM A Discrepancy Principle for Local Regularization.
Cara D. Brooks* and Patricia K. Lamm, Michigan State University
(1023-45-1622)

2:00PM Local Regularization Methods for Nonlinear Volterra Integral Equations of Hammerstein Type.
Xianyu Luo* and P. K. Lamm, Michigan State University
(1023-45-1685)

2:15PM A Poincaré inequality on the complex sphere in CR setting.
Lijing Sun, Wayne State University
(1023-46-104)

2:30PM Almost Weakly Compact Operators.
Ioana Ghenciu*, University of Wisconsin, River Falls, and Paul Lewis, University of North Texas, TX
(1023-46-1223)

2:45PM A Dynamic Equation on a Time Scale.
Allan C. Peterson*, University of Nebraska-Lincoln
68588-0130, Lynn Erbe, University of Nebraska, and Samir Saker, Mansoura University
(1023-39-748)
AMS Session on Geometry and Topology, IV

1:00 PM - 5:55 PM

1:00 PM The locally finite functor and the Steenrod algebra. Preliminary report.
Hayden Harker, Vassar College (1023-55-1590)

1:15 PM Khovanov Type Categorification for the Tutte Polynomial.

1:30 PM Local Conditions for a 2-dimensional Duality Group. Preliminary report.
Risto Atanasov, Binghamton University (1023-55-1696)

1:45 PM Relative Homotopy Groups of Modules - from a Different Viewpoint.
C. Joanna Su, Providence College (1023-55-1787)

2:00 PM Periodic fold sequences.
Michael W. Chrisman, University of Hawaii at Manoa (1023-55-344)

2:15 PM Rank of the fundamental group of any component of a function space.
Samuel B. Smith, Saint Joseph’s University, and Gregory Lupton, Cleveland State University (1023-55-40)

2:30 PM Comparing self-avoiding walks and polygons on hyperbolic Coxeter groups.
Jason S. Bode, Cornell University (1023-55-795)

3:15 PM On the Rellich inequality.
Ritva M. Hurri-Syrjanen, University of Helsinki and David E. Edmunds, Cardiff University (1023-46-1496)

3:30 PM On Ergodic type theorems for finite Jordan algebras.
Genady Ya. Grabarnik, T. J. Watson IBM Research Center, Alexander A. Katz, St. John’s University, and Laura Swartz, University of South Africa (1023-46-1737)

3:45 PM Isometries on $\mathbb{A}^4$. Preliminary report.
Nadia J. Gal, University of Memphis (1023-46-1897)

4:00 PM On the “Multiple of the Inclusion plus Compact” Problem.
G. Androulakis and F. Sanacory, University of South Carolina (1023-46-212)

4:15 PM On the existence of eigenvalues of Toeplitz operators associated with representing measures on multiply connected planar regions.
Cyrus P. Aryana, Saginaw Valley State University (1023-46-540)

4:30 PM On the properties of endogenous mortgage rates. Preliminary report.
Yeugen Goncharov, Florida State University (1023-46-63)

4:45 PM Flows of weights associated with AFD real factors of type III. Preliminary report.
Shukhrat R. Usmanov, Ashford University (1023-46-812)

5:00 PM The $q$-concavity and $q$-convexity constants in Lorentz spaces.
Anna Kamińska and Anca M. Parrish, University of Memphis (1023-46-895)

5:15 PM On Gelfand-Neimark type theorems for representations of nuclear barrelled locally $C^*$- and locally JB-algebras.
Alexander A. Katz, St. John’s University, Oleg Friedman, University of South Africa, and Roman Kuschnir, St. John’s University (1023-46-980)

MAA Session on Teaching Innovations in Real Analysis, II

1:00 PM - 3:35 PM

Organizers: Robert W. Vallin, Slippery Rock University, Erik O. Talvila, University College of the Fraser Valley

1:00 PM Getting students to prove theorems in analysis.
Erik O. Talvila, University College of the Fraser Valley (1023-Q1-1572)

1:20 PM When I switched from lecturing to using the Moore Method...
Bernd E. Rossa, Xavier University (Cincinnati) (1023-Q1-1127)
**Program of the Sessions – Sunday, January 7 (cont’d.)**

1:40 PM  Facilitating Student Understanding of Concepts in Real Analysis. Preliminary report.
- Michael L. Berry, West Virginia Wesleyan College (1023-Q1-1926)

2:00 PM  Technical Illustration for second semester real analysis.
- Mark McClure, University of North Carolina at Asheville (1023-Q1-844)

2:20 PM  Using History to Understand How To Teach Real Analysis.
- David M. Bressoud, Macalester College (1023-Q1-618)

2:40 PM  Introductory Real Analysis - Let Series be Your Guide.
- Robert Rogers, SUNY Fredonia (1023-Q1-758)

3:00 PM  Using Calculus to Motivate Compactness and Connectedness.
- Michael J. Schramm, Le Moyne College (1023-Q1-1272)

3:20 PM  Using a Laboratory Approach in the Teaching of Real Analysis.
- Kirk Weller, University of Michigan Flint, and Joanne Snow, Saint Mary's College (1023-Q1-1130)

**MAA Session on Mathematics Experiences in Business, Industry and Government**

1:00 PM - 4:30 PM

Organizers: Philip E. Gustafson, Mesa State College; Michael Monticino, University of North Texas.

1:00 PM  Opening Remarks and SIGMAA Announcements.
- (1287) Travis Cogdill and Michael Monticino, University of North Texas (1023-L1-1405)

1:35 PM  Statistics of the Peak Sideline Distribution for Binary Codes. Preliminary report.
- Matthew Ferrara, Michael Kupferschmid, RPI, and Gregory E. Coxson, Technology Service Corporation (1023-L1-1812)

1:55 PM  Fractal measures to quantify agent-based combat with EINSTein.
- David S. Mazel, Technology Service Corporation, and Andy Hachinski, The CNA Corporation (1023-L1-500)

2:15 PM  Characterizing internal stress states in advanced ceramics using fractal analysis. Preliminary report.
- Leigh L. Noble, United States Military Academy & Army Research Lab (1023-L1-1753)

2:35 PM  Number Theory and a New GPS Signal.
- Joseph J. Rushanan, The MITRE Corporation (1023-L1-976)

2:55 PM  Norbert Wiener Center - mission and methods.
- John J. Benedetto and Ioannis Konstandinidis, Norbert Wiener Center, University of Maryland, College Park (1023-L1-1455)

- George W. Heine, Bureau of Land Management (1023-L1-1902)

3:35 PM  Why Consulting Firms Need Mathematicians.
- Carla D. Martin, James Madison University (1023-L1-223)

3:55 PM  My Experiences as a Summer Contract Employee at a Pharmaceutical Company.
- Paul R. Coe, Dominican University (1023-L1-1857)

- Paul H. Schuette, Meredith College (1023-L1-1352)

**MAA Session on Building Diversity in Advanced Mathematics: Models that Work, II**

1:00 PM – 3:55 PM

Organizers: Patricia Hale, California State Polytechnic University, Pomona; Abbe H. Herzig, University of Albany, SUNY

1:00 PM  Successful Practices on Integrating Diversity into the Teaching of General Education Mathematics courses at Northern State University.
- A. S. Elkheder, Northern State University (1023-E1-1211)

1:20 PM  Project SMART III - Characteristics of a Successful NREUP at a Two-Year Institution.
- John J. Morrell, Atlanta Metropolitan College (1023-E1-1636)

1:40 PM  A ' DeVry-Style' REU: The Outcome of a Summer Semester of Undergraduate Research in Probability and Networking at DeVry. Preliminary report.
- Kevin J. Schein, DeVry University (1023-E1-1835)

2:00 PM  Strategies for Inclusion in the UC Davis Math Department.
- Mark J. Sturdivant, University of California, Davis (1023-E1-1739)

2:20 PM  A Diversity Perspective.
- Satish C. Bhatnagar, University of Nevada Las Vegas (1023-E1-283)

2:40 PM  Native American-based Materials for Undergraduate Mathematics Courses.
- Charles Peter Funkhouser, University of Montana Missoula, and A. Duane Porter, University of Wyoming (1023-E1-59)

3:00 PM  The Impact of Departmental Leadership on the Success of Women in Doctoral Level Mathematical Sciences.
- Orpha K. Ongiti and Abbe H. Herzig, University of Albany (1023-E1-804)

3:40 PM  From the Perspective of Lee Lorch.
- Lee Lorch, York University (1023-E1-1552)

**MAA Session on Countering “I Can’t Do Math”: Strategies For Teaching Under-Prepared, Math-Anxious Students, II**

1:00 PM – 5:15 PM

Organizers: Winston Crawley, Shippensburg University; Kim Presser, Shippensburg University

1:00 PM  How Can I Help My Students Enjoy Learning Mathematics Instead of Being Afraid of It? Fostering Positive Mathematics Experiences With Special Needs and English Language Learner Populations.
- Joyce E. Fischer, Texas State University-San Marcos (1023-G5-1312)

1:20 PM  Linking Polynomials to Whole Numbers to Ease the Anxiety of the Under-Prepared Students.
- Murray H. Siegel, SC GSSM (1023-G5-210)

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<th>Time</th>
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| 1:40PM | Engaging Developmental Mathematics Students with Activities: A First Look at Quadratics.  
Gary Simundza*, Wentworth Institute of Technology, and Nancy Crisler, Washington University (1023-GS-66) |
| 2:00PM | How to improve student’s performance in Developmental Mathematics course with the use of computer-aided instruction and a personal touch. Wendiai Sethi, Seton Hall University (1023-GS-1168) |
| 2:20PM | Changing Paradigms: A department in a state of flux leading to technology transitions which affect student learning. Preliminary report.  
Hassan Moore* and Gerald Y. Agbeba, Johnson C. Smith University (1023-GS-1638) |
Carrie Muir, University of Colorado - Boulder (1023-GS-1777) |
| 3:00PM | Improving Student Performance in a College Core Math Program by Emphasizing Fundamental Mathematical Skills. Preliminary report.  
Heather Stevenson* and Gerald Kobylski, United States Military Academy (1023-GS-1714) |
| 3:20PM | The Thrill of Victory: Conquering Anxiety with Mastery Grading.  
Penelope H. Dunham, Muhlenberg College (1023-GS-1113) |
| 3:40PM | Transitioning to College Mathematics - Creating a Program to Help Developmental Level Students Succeed in College Level Mathematics. Preliminary report.  
J. Winston Crawley* and Kimberly J. Presser, Shippensburg University (1023-GS-881) |
| 4:00PM | Strategies for Reaching Under-prepared Math Students.  
Ann C. Hanson, Columbia College (1023-GS-621) |
| 4:20PM | Learning Disabilities and the Post-Secondary Math Student.  
Mary Rack, Johnson County Community College (1023-GS-101) |
Teodora B. Cox, SUNY Fredonia (1023-GS-1759) |
| 5:00PM | For Victims of the Mathematics-Distress Syndrome: A Radical Alternative Curriculum. Preliminary report.  
Clyde Greeno, The MAEI Mathematics Institute (1023-GS-925) |

MAA Session on innovative Examples of Using Graphs in Statistics

1:00 PM – 5:30 PM

Organizers: Christopher J. Lacke, Rowan University  
Ginger Holmes Rowell, Middle Tennessee State University

1:00PM | Statistics Before Your Eyes: Photographs of Statistical Concepts.  
Robert W. Jernigan, American University (1023-JS-834) |

Sheldon P. Gordon, Farmingdale State University of New York, and Florence S. Gordon*, New York Institute of Technology (Retired) (1023-JS-452) |
| 1:50PM | What is R 2 ? Using Dynamic Graphs to Illustrate Ideas in Regression.  
Robin H. Lock, St. Lawrence University (1023-JS-1451) |
| 2:15PM | Using Boxplots and Histograms to Draw Inferences.  
(1322) Kris H. Green, St. John Fisher College (1023-JS-509) |
| 2:40PM | Using Graphs To Assess Normality When Performing a t-Test for a Population Mean.  
Christopher J. Lacke, Rowan University (1023-JS-1459) |
| 3:05PM | Using Dynamic, Interactive Models to Teach Statistical Concepts.  
Michael T. Marsh, Shippensburg University of Pennsylvania (1023-JS-572) |
| 3:30PM | Graphical Methods for Teaching and Assessing the IID Assumption.  
Mark H. Inlow, Rose-Hulman Institute of Technology (1023-JS-1784) |
John D. McKenzie*, Babson College, and Robert N. Goldman, Simmons College (1023-JS-1746) |
| 4:20PM | Graphing Data Badly, or Things I Swear my Statistics Teacher Never Told Me!  
Patricia B. Humphrey, Georgia Southern University (1023-JS-1564) |
| 4:45PM | Examples of Misdisplaying Statistical Graphs in Presentations. Preliminary report.  
Jialing Dai, Dept. of Mathematics, University of the Pacific (1023-JS-1694) |
| 5:10PM | Graphs: Different Faces of Data.  
Madhuri S. Mulekar, University of South Alabama (1023-JS-1627) |

MAA Session on The Mathematics of Sudoku and Other Puzzles, II

Sunday, January 7 – Program of the Sessions

1:00 PM – 3:35 PM

Organizer: Laura A. Taalman, James Madison University

1:00PM | Some Observations on the Sudoku Puzzle.  
(1330) Preliminary report.  
Louis M. Beauprises, Keen University (1023-M1-1824) |
| 1:20PM | Proofs, Equivalence Classes and Groups.  
Preliminary report.  
Sudoku-Style.  
Cynthia J. Woodburn, Pittsburh State University (1023-M1-1460) |
| 1:40PM | One-and-one-third orthogonal Latin squares.  
Preliminary report.  
W. D. Wallis, Southern Illinois University, Carbondale, IL (1023-M1-1905) |
| 2:00PM | Partial Latin Squares with the Sudoku Structure.  
Preliminary report.  
Rommel G. Regis, Cornell University (1023-M1-1795) |
Michael Anthony Pohl, University of Richmond (1023-M1-886) |
| 2:40PM | Two methods for counting small sudoku puzzles.  
John Lorch* and Crystal Lorch, Ball State University (1023-M1-1916) |
Program of the Sessions  -  Sunday, January 7 (cont’d.)

3:00PM  Beaucou de Sudoku.
   ► (1336) Carlos Arcos, Gary Brookfield and Mike Krebs*, California State University, Los Angeles (1023-M1-70)
   ► (1337) Joyce Maxine Music* and Robin Blankenship, Morehead State University (1023-MI-1267)

MAA General Contributed Paper Session, VI
1:00 PM  -  4:55 PM

Organizers:  Eric S. Marland, Appalachian State University
   Jay A. Malmstrom, Oklahoma State Community College

1:00PM  A new proof of a theorem on the closure ordering on nilpotent orbits of algebraic groups of Type A. Preliminary report.
   ► (1338) Joseph A. Fox*, Salem State College, Terrell L. Hodge, Western Michigan University, and Brian J. Parshall, University of Virginia (1023-Z1-1286)
1:15PM  Ideals in Dorroh Extensions of Rings.
   ► (1339) Kent M. Neuerburg* and G. Alan Cannon, Southeastern Louisiana University (1023-Z1-214)
1:30PM  Primes and twin primes near some large numbers.
   ► (1340) Balakrishan Varyath Uckath, Eritrea Institute of Technology (1023-Z1-1586)
1:45PM  The Syllogism Needed to Negate the Definition of a Converging Sequence.
   ► (1341) Chokri Cherif* and Avraham Goldstein, BMCC-City University of New York (1023-Z1-587)
2:00PM  A Note on Weighted Idempotent and Logarithmic Means.
   ► (1342) Kendall C. Richards and Hilari Celeste Tiedeman*, Southwestern University (1023-Z1-522)
2:15PM  Inversion Cosets in Music Theory.
   ► (1343) Craig M. Johnson, Marywood University (1023-Z1-58)
2:30PM  Developing a successful undergraduate colloquium course.
   ► (1344) Darren E. Mason* and David A. Reimann, Albion College (1023-Z1-1695)
2:45PM  Success Stories from a First Semester Seminar for Math Majors.
   ► (1345) Melvin G. Royster, Indiana Wesleyan University (1023-Z1-1171)
3:00PM  Redesigning the first course of differential equations. Preliminary report.
   ► (1346) Pangyen Ben Weng, Ramapo College of New Jersey (1023-Z1-1199)
3:15PM  Writing in the Vector Calculus class.
   ► (1347) Constantia Duministracu*, University of Arizona, Tucson AZ (1023-Z1-1363)
3:30PM  Some Determinants of Student Performance in the Course of introductory Statistics.
   ► (1348) Jen-Ting Wang*, SUNY-Oneonta, NY, and Shu-Yi Tu, University of Michigan – Flint (1023-Z1-1764)
3:45PM  Come on down! Learn about the probability of winning a car on The Price is Right!
   ► (1349) Joe A. Stickles, Jr., Millikin University (1023-Z1-1147)
4:00PM  Developmental Mathematics Program at the University of Maryland: 5 years of Success.
   ► (1350) Denny Gulick, MD (1023-Z1-974)
4:15PM  A team-teaching (Math and CS) approach to a Discrete Mathematics course.
   ► (1351) Rachelle C. DeCoste, United States Military Academy, West Point (1023-Z1-470)
4:30PM  Incorporating Software in College Algebra: Five Years Later.
   ► (1352) Michelle R. DeDeo, Univ. of North Florida (1023-Z1-208)
4:45PM  A π-less Buffon’s Needle Problem.
   ► (1353) David Richeson, Dickinson College (1023-Z1-1121)

NAM Granville-Brown-Haynes Session of Presentations by Recent Doctoral Recipients in the Mathematical Sciences
1:00 PM  -  3:35 PM

Organizer:  Dawn A. Lott, University of Maryland

1:00PM  Elements belonging to 2-element cocircuits in connected matroids.
   ► (1354) Joe Anderson*, Mississippi Valley State University, and Haidong Wu, University of Mississippi (1023-05-648)
1:20PM  Clones and Minors in Matroids.
   ► (1355) Carla D. Cotwright, Wake Forest University (1023-05-690)
1:40PM  Finding Optimal Orbits on Chaotic Systems.
   ► (1356) Angela E. Grant, Northwestern University (1023-37-647)
2:00PM  The Semiparametric Exchangeable Model.
   ► (1357) Stephine L. Keeton*, U.S. Food and Drug Administration, and Hanxiang Peng, The University of Mississippi (1023-00-1606)
   ► (1358) Samuel Obara, Texas State University, San Marcos (1023-97-1179)
2:40PM  Large Circuit Pairs in Matroids.
   ► (1359) Bryan L. Williams, Hampton University (1023-05-646)
3:00PM  Graph Groupoids and their topology.
   ► (1360) Adrian A. Wilson, The University of Mississippi (1023-54-268)
3:20PM  Knots With Infinitely Many Incompressible Seifert Surfaces.
   ► (1361) Robin Todd Wilson, UC Santa Barbara (1023-57-504)

MAA Committee on the Undergraduate Program in Mathematics Panel Discussion
1:00 PM  -  2:20 PM

The “bridge” course.
Organizer:  George R. Exner, Bucknell University
Moderator:  George R. Exner
Panelists:  David M. Bressoud, Macalester College
           Amy Cohen, Rutgers University
           Barbara E. Edwards, Oregon State University
           Annie Selden, New Mexico State University

ASL Contributed Papers
2:00 PM  -  4:50 PM

Organizer:  Marcia Groszek, Dartmouth College

2:00PM  On the failure of Craig interpolation in dynamic logics.
   ► (1362) Katalin Bimbó, Indiana University
2:25 PM Proof theory for admissible rules.
George Metcalfe*, Vanderbilt University, and Rosalie Iemhoff, Utrecht University

2:50 PM Symmetric propositions and logical quantifiers.
R. Gregory Taylor, Manhattan College

3:15 PM Hypersets with a universal set—two axiomatizations for Bi-AFA* set theories.
Stephen Harnish, Bluffton University

3:40 PM The notion of 1-consistency and G"odel polynomials.
Yvon Gauthier, University of Montreal

4:05 PM On computer robots recognizing their own geometric self-consistency.
Dan E. Willard, SUNY Albany

4:30 PM A note on the definition of a multisubset.
Dasharath Singh*, Ahmadu Bello University, and J.N. Singh, Barry University

RMMC Board of Directors
2:15 PM - 4:10 PM

MAA Presentations by Teaching Award Recipients
2:30 PM - 4:00 PM

(1369) My practice of mathematics.
Jennifer J. Quinn, Association for Women in Mathematics (1023-A0-1188)

(1370) Title to be announced.
Michael Starbird, University of Texas at Austin

AMS Committee on Science Policy Panel Discussion
2:30 PM - 4:00 PM

NSF funding for mathematics.
Organizer: De Witt L. Summers, Florida State University.
Panelists: Tony Chan, NSF
Peter March, NSF

MAA Panel Discussion
2:30 PM - 3:50 PM

Attracting underrepresented students to graduate study through research.
Organizers: William Hawkins, Jr, MAA and the University of the District of Columbia
Robert E. Megginson, University of Michigan, Ann Arbor

Panelists: Carlos Castillo-Chavez, Arizona State University
Dennis Davenport, Miami University of Ohio
Lloyd E. Douglas, National Science Foundation
Herbert A. Medina, Loyola Marymount University
Ivelisse M. Rubio, University of Puerto Rico
Michelle D. Wagner, National Security Agency
Robert E. Megginson

MAA Minicourse #14: Part B
3:30 PM - 5:30 PM

Contemporary college algebra: A refocused college algebra course.
Organizers: Donald B. Small, U. S. Military Academy
Laurette Foster, Prairie View A&M University

MAA Minicourse #3: Part B
3:30 PM - 5:30 PM

A tool to implement quantitative literacy (QL): Spreadsheets Across the Curriculum.
Organizers: Semra Kilic-Bahi, Colby-Sawyer College
Gary T. Franchy, Davenport University
Cheryl Coolidge, Colby-Sawyer College
William A. Thomas, Colby-Sawyer College

MAA Minicourse #9: Part B
3:30 PM - 5:30 PM

Evaluating student presentations in mathematics.
Organizers: Suzanne Dorée, Augsburg College
Richard J. Jardine, Keene State College
Thomas J. Linton, Central College

MAA Undergraduate Poster Session
3:30 PM - 5:30 PM

Organizer: Diana M. Thomas, Montclair State University

MAA Session on Integrating Mathematics and Biology in Undergraduate Education, II
4:15 PM - 6:10 PM

Organizers: Glenn W. Ledder, University of Nebraska-Lincoln
Yajun Yang, Farmingdale State University of New York
Jack Bookman, Duke University
James P. Fulton, Suffolk County Community College

4:15 PM Balancing Selection and The Evolution of Color Variation in Pacific Treefrogs (Hyla regilla) - An Interactive Lively Activity Project (ILAP).
Timothy F. Englund* and R. Steven Wagner, Central Washington University (1023-K1-1578)

4:35 PM Using Tic-Tacs to Freshen up Carbon Dating.
(1372) Preliminary report.
Shawnee McMurran, US Military Academy (1023-K1-1733)

(1373) Preliminary report.
Robert E. Burks* and Joseph Lindquist, United States Military Academy (1023-K1-1153)

5:15 PM Discrete Logistic Model in Calculus II.
(1374) Preliminary report.
Talitha M. Washington, University of Evansville (1023-K1-1713)
Monday, January 8

MAA Minority Chairs Breakfast Meeting

7:00 AM - 8:45 AM

Joint Meetings Registration

7:30 AM - 4:00 PM

ASL Invited Address

8:00 AM - 8:50 AM

Countable group actions and hyperfinite equivalence relations.
Su Gao, University of North Texas (1023-03-409)

AMS-MAA-MER Special Session on Mathematics and Education Reform, I

8:00 AM - 10:55 AM

Organizers: William H. Barker, Bowdoin College
Dale R. Oliver, Humboldt State University
Bonnie S. Saunders, University of Illinois at Chicago
Michael Starbird, University of Texas, Austin

Organizers: Joseph W. Dauben, Lehman College
Patti Hunter, Westminster College
Victor J. Katz, University of the District of Columbia
Karen H. Parshall, University of Virginia

AMS-MAA Special Session on History of Mathematics, III

8:00 AM - 10:55 AM

Organizers: Joseph W. Dauben, Lehman College
Patti Hunter, Westminster College
Victor J. Katz, University of the District of Columbia
Karen H. Parshall, University of Virginia

Proof (without Words) in 17th-18th Century China.
Jiang-Ping Jeff Chen, St. Cloud State University (1023-01-335)

Cramer's Paradox from Euler to Bézout.
Robert E. Bradley, Adelphi University (1023-01-694)

Publishing Mathematics in 18th-Century France.
Robin L. Rider, University of Wisconsin-Madison (1023-01-801)

Elisso J. Atzema, University of Maine (1023-01-262)

John McCleary, Vassar College (1023-01-762)

A Delicate Collaboration: A. Adrian Albert and Helmut Hasse and the Principal Theorem in Division Algebras in the Early 1930's.
Della D. Fenster*, University of Richmond, and Joachim Schwermer, University of Vienna (1023-01-922)
AMS Special Session on Group Representations, Ergodic Theory, and Mathematical Physics: Honoring the Memory of George W. Mackey, III

8:00 AM – 10:55 AM

Organizers: Robert S. Doran, Texas Christian University
Calvin C. Moore, University of California Berkeley
Robert J. Zimmer, The University of Chicago

8:00 AM Recent Applications of Induced Representations.
(1391) Roger Howe, Yale University (1023-22-62)

9:00 AM Broken symmetry.
(1392) Palle E. T. Jorgensen, University of Iowa (1023-47-29)

9:30 AM Complex methods in harmonic analysis on symmetric spaces.
Gustur Olafsson, Louisiana State University (1023-22-981)

10:00 AM Projective representations and the Mackey obstruction. Preliminary report.
Judith A. Packer, University of Colorado, Boulder (1023-22-918)

10:30 AM Inducing Primitive Ideals.
Siegfried Echterhoff, Westfalische Wilhelms-Universitat Muenster, and Dana P. Williams*, Dartmouth College (1023-46-338)

AMS Special Session on Mapping Class Groups and Handlebodies, I

8:00 AM – 10:55 AM

Organizers: Tara E. Brendle, Louisiana State University
William R. Vautaw, Southeastern Louisiana University

8:00 AM Injective Simplicial Maps of the Arc Complex.
(1396) Elmas Irmak, Bowling Green State University, and John D. McCarthy*, Michigan State University (1023-57-1146)

8:30 AM Automorphisms of the disk complex.
(1397) Saul Schleimer, Rutgers – New Brunswick (1023-57-997)

9:00 AM Infinite Presentations of the Torelli Group.
Andrew Putnam, University of Chicago (1023-57-1230)

9:30 AM Comparing bridge surfaces.
(1399) Martin Scharlemann, University of California, Santa Barbara, and Maggy Tomova*, University of Iowa (1023-57-1388)

10:00 AM Dimension of Torelli groups.
(1400) Mladen Bestvina, University of Utah, Kai-Uwe Bux, University of Virginia, and Dan Margalit*, University of Utah (1023-20-533)

10:30 AM Applications of the disk complex of the genus-2 handlebody to knot theory. Preliminary report.
Sangbun Cho and Darryl McCullough*, University of Oklahoma (1023-57-301)

AMS Special Session on Recent Advances in Mathematical Biology, Ecology, and Epidemiology, I

8:00 AM – 10:55 AM

Organizers: Lih-Iing Roeger, Texas Tech University
Linda J. Allen, Texas Tech University

8:00 AM Multiple attractors and non-equilibrium competitive coexistence.
J. M. Cushing*, University of Arizona, Shandelle M. Henson, Andrews University, Lih-Iing Roeger, Texas Tech University, and Chantel C. Blackburn, University of Arizona (1023-92-908)

Azmy S. Ackleh*, University of Louisiana at Lafayette, and Kazufumi Ito, North Carolina State University (1023-92-772)

9:00 AM On a nonlocal reaction-diffusion population model.
(1404) Kai Deng, University of Louisiana at Lafayette (1023-35-792)

9:30 AM Attractors in nonautonomous systems and Applications to population models. Preliminary report.
Saber N. Elaydi, Trinity University (1023-39-1704)

10:00 AM Numerical Integration of Population Models Satisfying Conservation Laws: NSFD Methods.
Ronald E. Mickens, Clark Atlanta University (1023-92-329)

John E. Franke*, North Carolina State University, and Abdul-Aziz Yakubu, Howard University (1023-92-941)

AMS Special Session on Recent Developments in Floer Homology, I

8:00 AM – 10:55 AM

Organizers: Scott J. Baldridge, Louisiana State University
Ronald A. Pintuschel, Michigan State University
Thomas E. Mark, Southeastern Louisiana University
Brendan E. Owens, Louisiana State University

8:00 AM Singular Relative Gromov-Witten Invariants.
(1408) Joshua R. Davis, Duke University (1023-53-1332)

8:30 AM Construction of new symplectic cohomology $S^2 \times S^2$.
(1409) Preliminary report.

9:00 AM Torsion in Heegaard Floer homology.
(1410) Stanislaw Jabuka*, University of Nevada Reno, and Thomas Mark, University of Virginia (1023-57-1205)

9:30 AM A combinatorial description to some Heegaard Floer homologies.
Jiajun Wang, UC Berkeley & Columbia Univ (1023-51-179)

10:00 AM Knot Floer homology detects fibreed knots.
(1412) Yi Ni, Princeton University (1023-57-425)

10:30 AM The SU(3) Casson invariant and spliced sums.
(1413) Preliminary report.
Hans U. Boden*, McMaster University, and Benjamin Himpel, University of Bonn (1023-57-1249)

January 2007 Notices of the AMS 163
AMS Special Session on Structure Theory for Matroids and Graphs, I

8:00 AM - 10:55 AM

Organizers: Joseph P. Kung, University of North Texas
Bogdan S. Oporowski, Louisiana State University
James G. Oxley, Louisiana State University

8:00 AM  Distinguishability of Locally Finite Trees.
(1414) Xiangqian Zhou*, the University of Mississippi, and
Mark Watkins, Syracuse University (1023-05-687)

8:30 AM  Stabilizers for matroids over finite fields.
(1413) Sandra Kingan, Clayton State University
(2023-05-1090)

9:00 AM  Coloring graphs on surfaces with all faces even.
(1416) Preliminary report.
Daniel Kral, Charles University, Czech Republic, and
Robin Thomas*, Georgia Institute of Technology (2023-05-1125)

10:00 AM  Negative correlations for spanning forests of graphs.
(1417) David G. Wagner, University of Waterloo
(2023-05-327)

10:30 AM  Unavoidable Minors in Graphs. Preliminary report.
(1418) Carolyn Chun*, Guoli Ding, Bogdan Oporowski
and Dirk Vertigan, Louisiana State University
(2023-05-1321)

AMS Special Session on Time Scales: Dynamic Equations with Applications, I

8:00 AM - 10:55 AM

Organizers: Martin J. Bohner, University of Missouri-Rolla
Allan C. Peterson, University of Nebraska-Lincoln

8:00 AM  Delay Dynamic Equations. Preliminary report.
(1419) Lynn H. Erbe* and Allan C. Peterson, University of Nebraska, Lincoln, Nebraska (2023-39-888)

8:30 AM  Fractional q-calculus on a time scale.
(1420) Ferhan M. Atici, Western Kentucky University, and
Paul W. Eloe*, University of Dayton (2023-39-441)

9:00 AM  A generalized upper and lower solution method for
singlar boundary value problems for the
one-dimensional p-Laplacian on time scales.
(1421) Preliminary report.
Elvan Akin-Bohner*, University of Missouri-Rolla, and
Ravi Agarwal, Florida Institute of Technology
(2023-34-1234)

9:30 AM  Solvability of some nonlinear boundary value problems.
(1422) Christopher C. Tisdell, The University of New South Wales
(2023-34-433)

10:00 AM  Convergence of Solutions of Dynamic Equations on
Time Scales.
(1423) Bonita A. Lawrence and Ralph W. Oberste-Vorth*,
Marshall University (2023-34-1298)

10:30 AM  Feasible Approximations of Hybrid Dynamic
Derivatives on Time Scales. Preliminary report.
(1424) Qin Sheng, Baylor University
(2023-39-979)

AMS Special Session on Arithmetic Geometry, I

8:00 AM - 10:55 AM

Organizers: Matthew H. Baker, Georgia Institute of Technology

8:00 AM  Improvements on the index of Cyclotomic Units.
(1425) Mairéad Greene, University of Massachusetts
(2023-11-109)

8:30 AM  Finding large Selmer groups over Galois extensions
of number fields.
(1426) Barry Mazur, Harvard University, and Karl Rubin*,
UC Irvine (2023-11-1011)

9:00 AM  Bounds for torsion in class groups.
(1427) Jordan S. Ellenberg*, University of Wisconsin, and
Akshay Venkatesh, New York University
(2023-11-423)

9:30 AM  There exist infinitely many rational Diophantine
(1428) 6-tuples - almost. Preliminary report.
Edray Herber Goins, Purdue University
(2023-11-456)

10:00 AM  Galois Covers of the Open p-adic Disc. Preliminary report.
(1429) Scott Corry, University of Pennsylvania
(2023-12-103)

10:30 AM  On uniqueness of p-adic period morphisms.
(1430) Wiesława Niziol, University of Utah (2023-11-1789)

AMS Special Session on Computational Algebraic and Analytic Geometry for Low-Dimensional Varieties, I

8:00 AM - 10:55 AM

Organizers: Mika K. Seppälä, Florida State University
Tanush T. Shaska, Oakland University
Emil J. Volcheck, Association for Computing Machinery

8:00 AM  The p-torsion of hyperelliptic curves with extra
automorphisms.
(1431) Darren B. Glass, Gettysburg College
(2023-14-1337)

8:30 AM  Cantor Versus NUCOMP on Hyperelliptic Curves.
(1432) Michael J. Jacobson Jr., Renate Scheidler*,
University of Calgary, and Andreas Stein,
University of Wyoming (2023-11-1191)

9:00 AM  What is NUCOMP? Preliminary report.
(1433) Andreas Stein*, University of Wyoming, Michael J.
Jacobson and Renate Scheidler, University of Calgary
(2023-11-1042)

9:30 AM  Genus calculations for towers of function fields
arising from equations of C3b curves.
(1434) Caleb M. Shor, Bates College (2023-14-953)

10:00 AM  Endomorphism algebras of hyperelliptic Jacobians.
(1435) Arsen Elkin*, Colorado State University, and
Yuri Zarhin, Pennsylvania State University
(2023-14-1175)

10:30 AM  Bernstein Sato polynomial in low dimension.
(1436) Darren Salven Tapp, Purdue University
(2023-14-942)

AMS Special Session on Commutative Algebra and Algebraic Geometry, I

8:00 AM - 10:55 AM

Organizers: Paul C. Roberts, University of Utah
Anurag K. Singh, University of Utah
Oana Veliche, University of Utah

8:00 AM  The Newton Polytope of the Implicit Equation.
(1437) Bernd Sturmfels, UC Berkeley, Jenia Tevelev,
University of Massachusetts, Amherst, and
Josephine Yu*, UC Berkeley (2023-14-285)
AMS Session on Probability and Statistics, I

8:00 AM – 10:55 AM

8:00 AM
Convergence in Distribution of Random Compact Sets in Polish Spaces.
Hussain Elalountali*, Tuskegee University, and Lisa D. Peterson, Auburn, Alabama (1023-60-1285)

8:15 AM
On the compact support property of solutions of hyperbolic SPDE.
Hassan Allouba and Oleksiy Ignyatyev*, Kent State University (1023-60-1319)

8:30 AM
A New Look at Stopping Times Related to Trading Techniques.
Vilen Abramov*, and Kazim M. Khan, Kent State University (1023-60-1328)

8:45 AM
On the Replicator Dynamics behavior under Stratovitch type random perturbations.
R. Khasminskii and N. Potepun*, Wayne State University (1023-60-1394)

9:00 AM
Using the pmf of the time of to reach a subset of states in an irreducible finite Markov chain for clustering. Preliminary report.
Maxim J. Goldberg*, Ramapo College of NJ, and Seonja Kim, Fairleigh Dickinson University (1023-60-1400)

9:15 AM
From Random Matrices to Stochastic Operators.
Brian D. Sutton*, Randolph-Macon College, and Alan Edelman, Massachusetts Institute of Technology (1023-60-149)

9:30 AM
George A. Khachatryan, University of Chicago (1023-60-1568)

9:45 AM
Evaluation formulas for conditional functional space integrals II.
Seung Jun Chang, Dankook University, Jae Gil Chol, Dankook University, Cheonan, Korea, and David L. Skoug*, University of Nebraska-Lincoln (1023-60-1674)

10:00 AM
Maximum queue length for a Gaussian queuing model.
Yasong Jin* and Tyrone E. Duncan, University of Kansas (1023-60-171)

10:15 AM
Corina D. Constantinescu* and Enrique A. Thomann, Oregon State University (1023-60-1765)

10:30 AM
Fractional Stability Of Functional CLT.
Yuri V. Kolomens, Kent State University (1023-60-1769)

10:45 AM
On the relationship between Spearman's rho and Kendall's tau for continuous random variables.
Gregory A. Fredricks and Roger B. Nelsen*, Lewis & Clark College (1023-62-144)

AMS Session on Numerical Analysis and Computer Science

8:00 AM – 10:55 AM

8:00 AM
A W-Cycle Multigrid Algorithm for a New NIPG Method.
Susanne C. Brenner, Louisiana State University and the University of South Carolina, and Luke N. Owens*, University of South Carolina (1023-65-1049)

8:15 AM
Binomial tau-leap Spatial Stochastic Simulation Algorithm.
Tatiana T Marquez-Lago* and Kevin Burrage, Advanced Computational Modelling Centre, University of Queensland (1023-65-1066)

8:30 AM
Is syplectic-energy-momentum integration well-posed?
Yosi Shibberu, Rose-Hulman Institute of Technology (1023-65-1367)

8:45 AM
Erin M. Kiley* and Dena Feldman, WPI Center for Industrial Mathematics and Statistics (1023-65-1513)

9:00 AM
Solving polynomial systems by parallel polyhedral homotopies.
Jan Verschelde, University of Illinois at Chicago, and Yan Zhuang*, UIC (1023-65-1520)

9:15 AM
High-order, compact difference schemes of heat-conducting problems. Preliminary report.
Jennifer Zhao*, University of Michigan-Dearborn, Weizhong Dai and Suyang Zhang, Louisiana Tech. University (1023-65-1541)

9:30 AM
Restarted Nonsymmetric Lanczos and Two-Sided Arnoldi. Preliminary report.
Dywayne A. Nicely, Baylor University (1023-65-1603)

9:45 AM
The quality of approximation bases for the Helmholtz equation. Preliminary report.
Timo Betcke, TU Braunschweig (1023-65-166)

10:00 AM
Mathematical Modeling of Elastic Snap Through.
Preliminary report.
Mark S. Korkele, Montclair State University (1023-65-1699)

10:15 AM
John B. Bell, Center for Computational Science and Engineering, Lawrence Berkeley National Laboratory, Sarah A. Williams*, Graduate Group in Applied Mathematics, University of California, Davis, and Alejandro L. Garcia, Department of Physics, San Jose State University (1023-65-1702)

10:30 AM
Global multiscale finite element methods for elliptic equations.
Lijian Jiang, Texas A&M University (1023-65-1893)

10:45 AM
A Cayley transformed Lanczos-Schur algorithm for large unitary eigenproblems.
Rodion J. A. David, Washington State University (1023-65-784)
MAA Session on Applications of Discrete Mathematics, I

8:00 AM – 10:55 AM

Organizers: Thomas Koshy, Framingham State College
          Thomas Moore, Bridgewater State College

8:00AM Community Structure in the United States Congress.
     Mason A. Porter, California Institute of Technology (1023-D1-48)

8:20AM Computer Science, Strong Induction and Pile-Splitting.
     Bill Marion, Valparaiso University (1023-D1-52)

8:40AM Matching Columns in a Cyclically Repeated Pattern of 3 Colors.
     Ashish K. Srivastava* and Steve Szabo, Ohio University (1023-D1-98)

9:00AM Network Flow Problems with Path Capacities.
     Preliminary report.
     Maren Martens* and Martin Skutella, Dortmund University

     Yana Kortsarts, Widener University, Computer Science Department (1023-D1-128)

9:40AM Discrete Approximation to a Steady-State Temperature Distribution.
     Jenny Svitkys*, Gordon Safely and Anh Tran, Cal Poly Pomona (1023-D1-353)

10:00AM Integrating Programming into Discrete Mathematics. Preliminary report.
     Keith E. Howard, Mercer University (1023-D1-439)

10:20AM Jacobsthal Compositions.
     Ralph P. Grimaldi, Rose-Hulman Institute of Technology (1023-D1-488)

     Jason J. Muliterno, Sacred Heart University (1023-D1-561)

MAA Session on Assessment of Student Learning in Undergraduate Mathematics, I

8:00 AM – 10:55 AM

Organizers: William Martin, North Dakota State University
          Bernard L. Madison, University of Arkansas

8:00AM Assessing Student Attitudes On the Value of Introductory Statistics. Preliminary report.
     Milo Schield, Augsburg College (1023-D5-76)

8:15AM Assessment as a Vehicle for Change.
     Jill Shahverdian, Quinnipiac University (1023-D5-1361)

8:30AM Building an Assessment Program for a Liberal Arts Math Major from Scratch.
     Sarah Hutcheson Jahn and Robert J. Krueger*, Concordia University, St. Paul (1023-D5-592)

8:45AM Programmatic Assessment of Proof Writing.
     Karen Batt Stanish, Keene State College (1023-D5-1686)

9:00AM Implementing Assessment Plans for Programs in Mathematics and Computer Science: What We Have Learned through Two Cycles.
     Ken Luther* and Bill Marion, Valparaiso University (1023-D5-511)

9:15AM The Calculus Concept Inventory, Validation and Analysis of Results Correlated with Teaching Methodology.
     Jerome S. Epstein, Polytechnic University (1023-D5-394)

     Edward J. Conjura* and Cathy Liebers, The College of New Jersey (1023-D5-701)

9:45AM The Mathematics Core: A Question of Fairness.
     Barbara M. Moskal*, Scott Strong and Graeme Fairweather, Colorado School of Mines (1023-D5-717)

10:00AM Assessment of the Major Made Simple.
     Pamela B. Pierce* and James L. Hartman, The College of Wooster (1023-D5-1519)

10:15AM Teaching to the Test (or how I stopped worrying and learned to love the Major Field Achievement Test).
     William P. Abrams* and Jeffery Peden, Longwood University (1023-D5-354)

10:30AM Undergraduate Assessment in Mathematics at a Four-Year Comprehensive University. Preliminary report.
     Kevin E. Charwood, Washburn University (1023-D5-415)

10:45AM A Follow-up on Using Portfolios in Mathematics Education Programs to Assess Content and Connect to Future Practice.
     Janet A. White* and Dorothee J. Blum, Millersville University of PA (1023-D5-427)

MAA Session on College Algebra: Concepts, Data, and Models, II

8:00 AM – 10:55 AM

Organizers: Florence S. Gordon, New York Institute of Technology
          Mary Robinson, University of New Mexico Valencia Campus
          Norma Agras, Miami Dade Community College
          Laurette Foster, Prairie View A&M University

8:00AM Integrating Applications, Modeling, and Technology in a College Algebra Course.
     Ronald J. Harshbarger*, University of South Carolina Beaufort, and Lisa S. Yocco, Georgia Southern University (1023-F1-497)

8:15AM “Search for Meaning” in a College Algebra Course.
     Preliminary report.
     Kyong-Hee M. Lee, Colby-Sawyer College (1023-F1-120)

8:30AM Designing, Teaching, and Researching Contemporary Based College Algebra Courses.
     Erick Brian Hofacker, University of Wisconsin - River Falls (1023-F1-1855)

8:45AM Data Exploration and Modeling in a College Algebra Course: Use of Heart Rate Data to Investigate Recovery Time of Athletes.
     Erica Slate Young, United States Military Academy at West Point (1023-F1-1718)
Monday, January 8 - Program of the Sessions

MAA General Contributed Paper Session, VII

8:00 AM - 10:55 AM

Organizers: Eric S. Marland, Appalachian State University
Jay A. Malmstrom, Oklahoma State Community College

8:00 AM
Perfect Matchings in Pruned Grid Graphs.
- (1500) David R. Guichard, Whitman College (1023-Z1-697)

8:15 AM
Disjunctive Radial Numbers for a pair of Schur Like Equations.
- (1501) Dusty E. Sabo*, Southern Oregon University, Daniel Schaal, South Dakota State University, and Jacent Tokaz, National Security Agency (1023-Z1-336)

8:30 AM
Cantor's Set and the Continuum Hypothesis.
- (1502) H. Vic Dannon, California (1023-Z1-17)

8:45 AM
Computational Exercises on Carmichael Numbers and Pollard Rho Factorization.
- (1503) William R. Harris, Georgetown College (1023-Z1-507)

9:00 AM
An Explicit Plancherel Formula for Certain Completely Solvable Homogeneous Spaces.
- (1504) Katrina Ashford Cunningham, Southern University and A&M College (1023-Z1-140)

9:15 AM
Natural Parameterizations of a Region.
- (1505) William Freed, Concordia University College of Alberta (1023-Z1-387)

9:30 AM
An Introduction to Product Calculus.
- (1506) Michael Z. Spivey, University of Puget Sound (1023-Z1-303)

9:45 AM
When Is the Derivative of a Composition the Composition of the Derivatives? Preliminary report.
- (1507) Marcus Pendergrass, Hampden-Sydney College (1023-Z1-783)

10:00 AM
Using mnemonic and Ausubelian concept mapping to teach "and/or" probability problems. Preliminary report.
- (1508) M. A. Hamid, Temple University (1023-Z1-1380)

10:15 AM
What'd Ya Know?: Classroom Voting in a Liberal Arts Mathematics Course. Preliminary report.
- (1509) Jean M. McGivney-Burelle* and Raymond J. McGivney, University of Hartford (1023-Z1-1184)

10:30 AM
- (1510) Janet Thiel, Villa Julie College, Stevenson, MD & Towson University (1023-Z1-653)

10:45 AM
Teaching Optimization at a Liberal Arts College to Math and CS Majors.
- (1511) William P. Fox, Naval Postgraduate School (1023-Z1-622)

AMS Session on Operator Theory and Optimal Control, I

8:15 AM - 10:25 AM

8:15 AM
On the Commutator Ideal of the Toeplitz Algebra on the Bergman Space of the Unit Ball in C^n. Preliminary report.
- (1512) Trieu Le, University of Buffalo (1023-47-114)

8:30 AM
Composition operators on Banach spaces of analytic functions of the unit ball.
- (1513) Matthew A. Pons, University of Virginia (1023-47-1185)

8:45 AM
Determining the Membership of Hankel Operators in the Symmetrically-Normed Ideals of the Segal-Bargmann Space. Preliminary report.
- (1514) D. K. Farnsworth, University of Buffalo (1023-47-1194)

9:00 AM
Compact quantum group actions on C*-algebras.
- (1515) Raluca Dumitru, University of Cincinnati (1023-47-1397)

9:15 AM
Invariant subspaces of parabolic non-automorphisms in the Hardy space. Preliminary report.
- (1516) Alfonso Montes-Rodriguez, Manuel Ponce-Escudero* and Stanislav A. Shkarin, Universidad de Sevilla (1023-47-1434)

9:30 AM
Basic sequences, non-cyclicity and quasinilpotent supercyclic operators. Preliminary report.
- (1517) Alfonso Montes-Rodriguez, Alejandro Rodriguez-Martinez* and Stanislav Shkarin, Universidad de Sevilla (1023-47-1435)

9:45 AM
Break.

10:00 AM
Operator Means and its application in solving a class of operator equation.
- (1518) Mohammad Khadivi, Jackson State University (1023-47-1675)

10:15 AM
Hyperfinitary Subspaces for some Operator-Weighted Bilateral Shifts.
- (1519) Sami M. Hamid*, University of North Florida, and Carl Pearcy, Texas A&M University (1023-47-1883)

AMS Session on Combinatorics, III

8:15 AM - 10:40 AM

8:15 AM
On the expected height of t-ary trees under random edge compression. Preliminary report.
- (1520) Joshua Zatl, California Institute of Technology (1023-05-424)

8:30 AM
Splitter Theorems for 4-regular Planar Graphs.
- (1521) Guoli Ding, Louisiana State University, and Jinko Kanno*, Louisiana Tech University (1023-05-431)

8:45 AM
Break.
AMS Special Session on Representation Theory and the Theta Correspondence, I

8:30 AM - 10:55 AM

Organizers: Wee Teck Gan, University of California San Diego
Hongyu He, Louisiana State University
Annegret Paul, Western Michigan University

8:30 AM Preservation principle of local theta correspondence and supercuspidal representations of p-adic groups. Preliminary report. Shu-Yen Pan, National Tsing Hua University (1023-22-1488)

9:00 AM Special cohomology classes arising from the Weil representation. Jens P. Funke, New Mexico State University (1023-22-1323)

9:30 AM Transfer of unitary representations. Nolan Wallach, University of California at San Diego, and Chen-Bo Zhu, National University of Singapore (1023-22-1350)

10:00 AM Methods for studying complementary series of split groups. Preliminary report. Dan Barbasch and Alessandra Pantano, Cornell University (1023-22-612)


AWM Workshop: Research Presentations by Recent Ph.D.'s, I

8:30 AM - 10:20 AM

8:30 AM Categorical Self-Distributivity.
- (1534) Alissa S. Crans*, Loyola Marymount University, J. Scott Carter, University of South Alabama, Mohamed Elhamdadi and Masahico Saito, University of South Florida (1023-81-1268)

9:00 AM Optimal Harvesting of a Semilinear Elliptic Fishery Model.
- (1533) Wandi Ding* and Suzanne Lenhart, University of Tennessee-Knoxville (1023-49-857)

9:30 AM Thirteen ways of looking at a topological group.
- (1536) Julie Bergner, Kansas State University (1023-55-753)

10:00 AM Nonpositively curved decompositions of Coxeter groups.
- (1537) Angela Kubena Barnhill, The Ohio State University (1023-20-1284)

AMS Committee on Education Panel Discussion

8:30 AM - 10:00 AM

A panel on the National Math Panel.
Organizer: William G. McCallum, University of Arizona
Presenters: Francis Fennell, National Council of Teachers of Mathematics
Larry R. Faulkner, University of Texas at Austin

MAA Session on Integrating Mathematics and Biology in Undergraduate Education, III

8:40 AM - 10:35 AM

Organizers: Glenn W. Ledder, University of Nebraska-Lincoln
Yajun Yang, Farmingdale State University of New York
Jack Bookman, Duke University
James P. Fulton, Suffolk County Community College

8:40 AM Biology Content in Calculus Labs. Preliminary report.
- (1538) Joseph F. Kolacinski*, Elmira College, and John E. Beam, University of Wisconsin Oshkosh (1023-K1-1926)

9:00 AM Brining Life to Biocalculus: Lab Projects and Seminar Series.
- (1539) Timothy D. Comar, Benedictine University (1023-K1-161)

- (1540) Laurie J. Heyer* and A. Malcolm Campbell, Davidson College (1023-K1-617)

9:40 AM An "Experimental" Interdisciplinary Course in Mathematical Ecology.
- (1541) Glenn Ledder*, University of Nebraska-Lincoln, and Brigitte Tenhumberg, School of Biological Sciences, University of Nebraska-Lincoln (1023-K1-272)

10:00 AM Symbiosis: Integrating Mathematics and Statistics with an Introductory Biology Sequence.
- (1542) Jeff R. Knisley*, East Tennessee State University, and Istvan Karsai, Dept. of Biological Sciences, East Tennessee State University (1023-K1-1462)
10:20AM Integrating Mathematics into the Introductory Biology Laboratory Course.
James D. White* and Jenna P. Carpenter, Louisiana Tech University (1023-K1-899)

AMS Invited Address
9:00 AM - 9:50 AM
(1544) New combinatorics from the invariant theory of reflection groups.
Victor S. Reiner, School of Mathematics, University of Minnesota (1023-05-09)

ASL Invited Address
9:00 AM - 9:50 AM
(1545) Recent Uses of Proof Theory in Nonlinear Analysis and Geodesic Geometry.
Ulrich Kohlenbach, Darmstadt University of Technology (1023-03-411)

MAA Minicourse #10: Part B
9:00 AM - 11:00 AM
A beginner's guide to the scholarship of teaching and learning in mathematics.
Organizers: Curtis D. Bennett, Loyola Marymount University
Jacqueline M. Dewar, Loyola Marymount University

MAA Minicourse #16: Part B
9:00 AM - 11:00 AM
More music and mathematics.
Organizer: Leon Harkleroad, Wilton, ME

MAA Minicourse #4: Part B
9:00 AM - 11:00 AM
Creating visual mathematics applets using flash programming.
Organizers: Douglas E. Ensley, Shippensburg University
Barbara Kaskosz, University of Rhode Island

MAA Session on Mathematics of Chemistry
9:00 AM - 10:55 AM
Organizer: George Rublein, The College of William and Mary
9:00AM A Combustion Model Exhibiting Metastability.
Ronald E. McKens, Clark Atlanta University (1023-L5-33)
9:20AM Use of Singular Value Decomposition Theorem and Principal Component Analysis in Environmental Research—Research with Undergraduate Students. Preliminary report.
Umesh P. Nagarkatte* and Wilbert W. Hope, Medgar Evers College, CUNY (1023-L5-1735)
Katie White*, Megan Boyle, Toni L. O. Barstis, Joanne Snow and Jennifer Herdman, Saint Mary's College, Notre Dame (1023-L5-1482)
10:00AM Break.

Lynn S. Bennet, University of Colorado DHSC (1023-L5-773)
10:40AM Calculus of Chemical Engineering Thermodynamics.
(1550) Youyu Phillips, Keystone College (1023-L5-703)

MAA-YMN Panel Discussion
9:00 AM - 10:20 AM
Undergraduate career paths in mathematics.
Organizers: Dov N. Chelst, DeVry University
Vanessa Garcia, Texas State University, San Marcos
Panelists: Ellen Pierce, Casualty Actuarial Consultants, Inc.
Robert J. Frey, Stony Brook University
Kathy Lange, SAS Institute Inc.

MAA Panel Discussion
9:00 AM - 10:20 AM
Teaching and learning mathematics in a Computer Algebra Systems (CAS) enriched environment: College algebra to real analysis.
Organizer: Wade Ellis, Jr., West Valley College
Panelists: William C. Bauldry, Appalachian State University

MAA Special Report
9:00 AM - 10:20 AM
Algebra: Gateway to a technological future.
Organizer: Michael Pearson, MAA

NAM Panel Discussion
9:00 AM - 9:50 AM
Exhibits and Book Sales
9:00 AM - 1:00 PM

ASL Invited Address
10:00 AM - 10:50 AM
Back and forth through computable model theory.
Valentina S. Harizanov, George Washington University (1023-03-410)

NAM Business Meeting
10:00 AM - 10:50 AM

MAA Invited Address
10:05 AM - 10:55 AM
Big waves on deep water.
Jerry L. Bona, University of Illinois at Chicago (1023-A0-22)
AMS Business Meeting

11:10 AM - 11:40 AM

MAA Business Meeting

11:45 AM - 12:15 PM

Organizer: Martha J. Siegel, Towson University
Moderator: Carl C. Cowen, IPUI
AMS-MAA Special Session on History of Mathematics, IV  
1:00 PM - 5:55 PM
Organizers: Joseph W. Dauben, Lehman College  
Patti Hunter, Westmont College  
Victor J. Katz, University of the District of Columbia  
Karen H. Parshall, University of Virginia  

1:00 PM Euler Incorporated in the United States: Textbooks, Mathematical Instruments, and Telescopes. Preliminary report.  
Peggy Aldrich Kidwell, National Museum of American History, Smithsonian Institution (1023-01-351)

1:30 PM "The Acknowledged National Standard". Charles S. Davies, A. S. Barnes, and Textbooks as Teaching Tools.  
Amy Ackerberg-Hastings, University of Maryland College (1023-01-458)

2:00 PM Janos Bolyai's American supporter, G. B. Halsted. Preliminary report.  
James D. Gajda, University of Illinois (1023-01-216)

2:30 PM Peirce's Cantor. Preliminary report.  
Matthew E. Moore, Brooklyn College of the City University of New York (1023-01-787)

3:00 PM The other American mathematical congress.  
David E. Zitarelli, Temple University (1023-01-378)

3:30 PM Votterra in America.  
Judith R. Goodstein, California Institute of Technology (1023-01-645)

4:00 PM A punishment tour for "P" Echols. Preliminary report.  
Shawnne McMurray, California State University, San Bernardino, and U. S. Military Academy, and V. Frederick Rickey*, U. S. Military Academy (1023-01-868)

4:30 PM Frege's Diary and Frege's Politics.  
Martin D. Davis, UC Berkeley (visitor), NYU-Courant (Emeritus) (1023-01-276)

5:00 PM Applied Mathematics in Nazi Germany.  
Sanford L. Segall, University of Rochester (1023-01-444)

Judy Green, Marymount University, and Jeanne LaDuke*, DePaul University (1023-01-566)

AMS Special Session on Group Representations, Ergodic Theory, and Mathematical Physics: Honoring the Memory of George W. Mackey, IV  
1:00 PM - 3:45 PM
Organizers: Robert S. Doran, Texas Christian University  
Calvin C. Moore, University of California Berkeley  
Robert J. Zimmer, The University of Chicago  

1:00 PM George W. Mackey's work on representation theory and foundations of physics.  
V. S. Varadarajan, University of California, Los Angeles, CA 90095-1555 (1023-22-273)

2:00 PM Induced representations, vector bundles, and projections.  
Marc A. Rieffel, University of California, Berkeley (1023-46-177)

2:30 PM Characters of tame supercuspidal representations. Preliminary report.  
Fiona Murnaghan, University of Toronto (1023-22-1388)

3:00 PM Counting intertwining operators for real reductive groups.  
David A. Vogan, MIT (1023-22-654)

AMS Special Session on Mapping Class Groups and Handlebodies, II  
1:00 PM - 5:55 PM
Organizers: Tara E. Brendle, Louisiana State University  
William R. Vautaw, Southeastern Louisiana University  

1:00 PM Straightening tube sums.  
Martin Scharlemann, U. C. Santa Barbara (1023-57-670)

1:30 PM Mapping class groups of Heegaard splittings. Preliminary report.  
Jesse E. Johnson*, Yale University, and Hyam Rubinstein, University of Melbourne (1023-57-921)

2:00 PM On some relations and homology of the Dehn twist quandle.  
Joel Zablow, Rochester Institute of Technology, Rochester N.Y. (1023-57-553)

2:30 PM Some homological properties of a handlebody group.  
Susumu Hirose, Saga University (1023-57-811)

3:00 PM Right-VA-Vers Diffeomorphisms of Bordered Surfaces and the Burau Representation of B3.  
Emile K. Davie, University of Georgia (1023-57-1050)

3:30 PM Heegaard splitting and 3-manifold invariants from the Johnson-Morita homomorphisms. Preliminary report.  
Joan S. Birman, Columbia University, Tara E. Brendle, Louisiana State University, and Nathan D. Broaddus*, University of Chicago (1023-57-1243)

4:00 PM A Presentation For The Automorphisms of the 3-Sphere that Preserve a Genus Two Heegaard Splitting. Preliminary report.  
Erol Akbas, University of Arkansas (1023-57-1033)

4:30 PM Surface homeomorphisms that do not extend to any handlebody. Preliminary report.  
Jamie Bradley Jorgensen, Rice University (1023-57-1172)

5:00 PM From handlebodies to closed 3-manifolds: a geometric approach.  
Hossein Namazi, Princeton University (1023-57-945)

5:30 PM A classification of automorphisms of 3-manifolds. Preliminary report.  
Leonardo N. Carvalho*, Universidade Federal Fluminense - Brazil, and Ulrich Oertel, Rutgers University - Newark (1023-57-1212)

AMS Special Session on Nonsmooth Analysis in Inverse and Variational Problems, II  
1:00 PM - 5:55 PM
Organizers: M. Zuhair Nashed, University of Central Florida
AMS Special Session on Recent Advances in Mathematical Biology, Ecology, and Epidemiology, II

1:00 PM - 5:55 PM

Organizers: Lih-Ing Roeger, Texas Tech University
Linda J. Allen, Texas Tech University
Sophia Jang, University of Louisiana at Lafayette

1:00 PM Dynamics of a Discontinuous Discrete Model of West Nile-Like Epidemics.
Vlajko L. Kocic, Xavier University of Louisiana (1023-39-365)

1:30 PM Control of an Epidemic Model of Rabies in Raccoons.
Suzanne Lenhart, University of Tennessee (1023-92-249)

2:00 PM Dynamic Reduction, the Periodic Ricker Map and Genetically Altered Mosquitoes.
Robert J. Sacker*, University of Southern California, and Hubertus F. von Bremen, California State Polytechnic University (1023-92-1255)

2:30 PM Disease extinction and persistence in spatially heterogeneous host-parasite models with inter-patch travel. Preliminary report.
Thanate Dhirasakdanon, Horst R. Thieme*, Arizona State University, and Pauline van den Driessche, University of Victoria (1023-92-1282)

3:00 PM Modeling release in infectious diseases.
P. van den Driessche, Department of Mathematics and Statistics, University of Victoria (1023-92-593)

3:30 PM Effect of the introduction of refractory vectors in a vector-borne disease.
Julien Arino, University of Manitoba (1023-92-1642)

4:00 PM The Final Size of a SARS Epidemic Model Without Quarantine. Preliminary report.
Sze-Bi Hsu, National Tsing Hua University, and Lih-Ing W. Roeger*, Texas Tech University (1023-92-515)

4:30 PM Comparative estimation of the reproduction number for pandemic influenza from daily case notification data.
Gerardo Chowell*, Los Alamos National Laboratory, Hiroshi Nishiura, Institut fuer Medizinische Biometrie, Universitaet Tuebingen, and Luis M. A. Bettencourt, Los Alamos National Laboratory (1023-92-816)

5:00 PM Optimal Flooding and Native-Invasive Plant Population Dynamics.
Daniel L. Kern*, University of Nevada, Las Vegas, and Suzanne M. Lenhart, University of Tennessee (1023-92-110)

5:30 PM On a discrete West Nile epidemic model.
Sophia R.J. Jang, University of Louisiana at Lafayette (1023-92-1140)

AMS Special Session on Recent Developments in Floer Homology, II

1:00 PM - 5:55 PM

Organizers: Scott J. Baldridge, Louisiana State University
Ronald A. Fintushel, Michigan State University
Thomas E. Mark, Southeastern Louisiana University
Brendan E. Owens, Louisiana State University

1:00 PM Compactness for folded holomorphic maps.
Jens von Bergmann, University of Notre Dame (1023-58-1593)

1:30 PM Computations of Floer Homology for certain Lagrangian Tori in closed 4-manifolds.
Adam C. Knapp, Michigan State University (1023-53-1691)

2:00 PM On knot Floer homology.
Peter S. Ozsvath, Columbia University (1023-57-1129)

3:00 PM Topological triviality of smoothly knotted surfaces in 4-manifolds.
Hee Jung Kim*, McMaster University, and Daniel Ruberman, Brandeis University (1023-57-636)

3:30 PM Open Book Decompositions of Torus Bundles over S1.
Jeremy Van Horn-Morris, University of Texas at Austin (1023-54-1555)

4:00 PM Thurston-Bennequin bounds for knots in more general contact manifolds. Preliminary report.
Matthew E. Hedden, Massachusetts Institute of Technology (1023-51-558)
AMS Special Session on Representation Theory and the Theta Correspondence, II

1:00 PM - 6:00 PM

Organizers: Wee Teck Gan, University of California San Diego
Hongyu He, Louisiana State University
Annette Paul, Western Michigan University

1:00 PM An approach to the local theta correspondence through invariants
Roger Howe, Yale University (1023-22-307)

2:00 PM Signatures of invariant Hermitian forms on irreducible highest weight modules and signed Kazhdan-Lusztig polynomials
Tatiana K. Howard, University of Windsor (1023-22-1525)

2:30 PM Lifting of characters on p-adic orthogonal and metaplectic groups
Tatiana K. Howard, University of Maryland College Park (1023-22-436)

3:00 PM Bernstein's center for real groups
Gordan Savin, University of Utah, and Goran Muic, University of Zagreb (1023-22-464)

3:30 PM On the global non-vanishing of theta lifts from even orthogonal groups
Shuichiro Takeda, University of California, San Diego (1023-11-1289)

4:00 PM Minimal polynomials and elementary divisors for simple highest weight modules. Preliminary report.
Victor Protsak, University of Oklahoma (1023-22-1432)

4:30 PM Small principal series and representations of rank two
Hadi Salsamian, Queen's University, Kingston, Ontario, Canada (1023-22-1108)

5:00 PM Topology of Siegel modular threefolds and theta lifting. Preliminary report.
Hongyu He and Jerome William Hoffman, Louisiana State University (1023-14-692)

5:30 PM Discussion.

AMS Special Session on Structure Theory for Matroids and Graphs, II

1:00 PM - 5:55 PM

Organizers: Joseph P. Kung, University of North Texas
Bogdan S. Oporowski, Louisiana State University
James G. Oxley, Louisiana State University

1:00 PM Towards a structure theory for matroids.
Bert Gerards, Centrum voor Wiskunde en Informatica, Amsterdam & Technische Universität Eindhoven (1023-05-1266)

2:00 PM Ore-Type and Dirac-Type Theorems for Matroids.
Sean McGuinness, Dartmouth College (1023-05-752)

2:30 PM Transversal Lattices.

3:00 PM Non-separating cocircuits in 3-connected binary matroids.
Talmage Reid, The University of Mississippi (1023-05-520)

3:25 PM Break

4:00 PM On Kung's Growth-Rate Conjecture.
Jim Geelen, University of Waterloo (1023-03-1277)

5:00 PM Conjectures on clones, connectivity, and cycles in matroids.
Talmage Reid, The University of Mississippi (1023-05-520)

5:30 PM Can anything general be said about minor-closed classes of matroids? Preliminary report.
Joseph P. Kung, University of North Texas (1023-05-333)

AMS Special Session on Time Scales: Dynamic Equations with Applications, II

1:00 PM - 5:55 PM

Organizers: Martin J. Bohner, University of Missouri-Rolla
Allan C. Peterson, University of Nebraska-Lincoln

1:00 PM A Nonlinear Sturm-Picone Comparison Theorem for Dynamic Equations on Time Scales.
Boris Belinsky, John R. Graef, University of Tennessee at Chattanooga, and Sonja Petrovic, University of Kentucky (1023-39-1131)

1:30 PM Asymptotic Behavior of Solutions for Neutral Dynamic Equations on Time Scales.
Douglas Anderson, Concordia College-Moorhead (1023-34-316)

2:00 PM Oscillatory Criteria for a Three Dimensional System on a Time Scale. Preliminary report.
E. Akin-Bohner, University of Missouri Rolla, Z. Došlý, Masarykova Universizita, and B. Lawrence, Marshall University (1023-34-1263)

2:30 PM Asymptotic stability for 2x2 dynamic systems on time scales. Preliminary report.
Gro Hovhannisyan, Kent State University (1023-34-369)

3:00 PM Boundedness in Functional Dynamic Equations On Time Scales.
Elvan Akin, University of Missouri-Rolla, and Youssef Naim Raffoul, University of Dayton (1023-34-475)

3:30 PM Oscillation and nonoscillation for impulsiv dynamic equations on certain time scales.
Mouffak Benchohra, Samira Hamani, Université de Sidi Bel Abbes, and Johnny Henderson, Baylor University (1023-34-26)

4:00 PM On the number of positive periodic solutions of functional dynamic equations on time scales and population models.
Jo Hoffacker, Clemson University, and Doug Anderson, Concordia College (1023-34-803)

4:30 PM A Fourier Transform on a Basic Adaptive Grid.
Andreas L. Ruffing, Munich University of Technology (1023-39-820)
Program of the Sessions – Monday, January 8 (cont’d.)

AMS Special Session on Arithmetic Geometry, II

1:00 PM – 5:55 PM

Organizers: Matthew H. Baker, Georgia Institute of Technology
Bjorn Poonen, University of California Berkeley

1:00 PM Another n-point abc Conjecture.
(1655) Robert L. Benedetto, Amherst College
(1652-11-720)

1:30 PM Arithmetic of dynamical Green’s functions.
(1656) Matthew H. Baker, Georgia Institute of Technology
(1023-11-631)

2:00 PM Stable Reduction of , a Progress Report.
(1657) Ken McMurdy, Rose-Hulman Institute of Technology
(1023-11-988)

2:30 PM Multiplying Modular Forms.
(1658) Martin H. Weissman, University of California, Santa Cruz
(1023-11-556)

3:00 PM A family of K3 surfaces associated to a series for 1/p.
(1659) H. A. Verrill, Louisiana State University, and Heng Huat Chan, National University of Singapore
(1023-11-1304)

(1660) Michael O. Joyce, Tulane University, and Zachariah C. Teitler, Southeastern Louisiana University
(1023-11-574)

4:00 PM Drinfeld modular varieties as varieties with many rational points over finite fields.
(1661) Mihran Papikian, Stanford University
(1023-11-337)

4:30 PM Average twin prime conjecture for elliptic curves.
(1662) Alina Carmen Cojocaru, University of Illinois at Chicago, Antal Balog, Hungarian Academy of Sciences, and Chantal David, Concordia University
(1023-11-1768)

5:00 PM Explicit computations of Hecke operators on automorphic forms.
(1663) Lloyd J. Kilford, University of Oxford (1023-11-693)

5:30 PM The abc conjecture implies Vojta’s height inequality for curves.
(1664) Michel van Frankenhuijsen, Utah Valley State College
(1023-11-889)

AMS Special Session on Computational Algebra and Analytic Geometry for Low-Dimensional Varieties, II

1:00 PM – 5:55 PM

Organizers: Mika K. Seppälä, Florida State University
Tanush T. Shaska, Oakland University
Emil J. Volcheck, Association for Computing Machinery

1:00 PM The 100th anniversary of the Uniformization theorem.
(1665) Peter Buser, EPF Lausanne, and Mika Seppälä, Florida State University and University of Helsinki
(1023-30-718)

1:30 PM Myrberg Numerical Uniformization of Elliptic and Hyperelliptic Curves.
(1666) Robert S. Todid, Florida State University
(1023-30-1570)

2:00 PM Special identities for cyclic covers of order 3 and representation theory of symmetric group.
(1667) Yaacov Kopeliovich, New York, NY (1023-32-247)

2:30 PM Curves generated on surfaces by the G-M algorithm.
(1668) Vidur Malik, Rutgers University, Newark
(1023-51-1382)

3:00 PM The Ress Algebra and the Moving Curve Ideal.
(1669) David A. Cox, Amherst College (1023-14-952)

3:30 PM Syzygies of toric varieties.
(1670) Milena S. Herin, Institute of Mathematics and its Applications, Henry Schenck, Texas A&M, and Gregory Smith, Queen’s University (1023-14-1673)

4:00 PM Toric surface codes and Minkowski sums.
(1671) H. Schenck, Texas A&M University, and John Little, College of the Holy Cross (1023-14-1123)

4:30 PM Simultaneous Surface Resolution.
(1672) Nan Gu, Purdue University (1023-14-1029)

5:00 PM Linear precision for parametric patches.
(1673) Preliminary report.

AMS Special Session on Commutative Algebra and Algebraic Geometry, II

1:00 PM – 5:55 PM

Organizers: Paul C. Roberts, University of Utah
Anurag K. Singh, University of Utah
Gina Veliche, University of Utah

1:00 PM Extended modules. Preliminary report.
(1655) W. Hassler, Karl-Franzens-Universitaet Graz, R. Karr, L. Klingler, Florida Atlantic University, and R. Wiegang, University of Nebraska (1023-13-1139)

1:30 PM A criterion for integral dependence of modules.
(1656) Javid Validashti and Bernd Ulrich, Purdue University (1023-13-466)

2:00 PM Asymptotic Castelnuovo-Mumford Regularity.
(1657) Preliminary report.

2:30 PM Ideal Class Semigroups of Overrings.
(1658) Javid Validashti and Bernd Ulrich, Purdue University
(1023-13-1456)

3:00 PM Failure of Tameness for Local Cohomology.
(1659) Steven Dale Cutkosky, University of Missouri, and Juergen Herzog, University of Duisburg-Essen, Campus Essen (1023-13-1224)

3:30 PM A counterexample to an open problem concerning a comparison between the quasi-coherent and étale cohomological dimension of a scheme.
(1660) Gennady Lyubeznik, University of Minnesota (1023-14-1681)

4:00 PM Adams operations and New Intersection.
(1661) Greg Plepmeier and Mark E. Walker, University of Nebraska, Lincoln (1023-19-1237)
MAA Minicourse #11: Part 8

AMS Session on Operator Theory and Optimal Control, II

AMS Session on Numerical Analysis and Computer Science, II

Monday, January 8 – Program of the Sessions

2:45PM Using the Leray-Schauder Degree for a Degree Involving Maximal Monotone Perturbations of ($+$)-operators.
Boubakari Ibrahimou* and Athanassios G. Kartsatos, University of South Florida (1023-47-932)

3:00PM Position Registration from Voltage Samples.
Fadil Santosa and Carl Toews*, IMA (1023-49-757)

3:15PM Break.

3:30PM Existence Theorems for Thin Inflated Wrinkled Membranes Subjected to a Hydrostatic Pressure Load. Preliminary report.

3:45PM Minimax Approach to Feedback Control of Distributed-Parameter Systems.
Ilya Shartysman*, Miami University, and Boris S. Mordukhovich, Wayne State University (1023-49-779)

4:00PM Optimization of Traveling Wave Tubes using Large Signal Codes and Optical Beam Analysis.
Adam R. Attarian*, North Carolina State University, Jeremy Zuckero, Wilkes University, Laura Tarko, Mt. Holyoke University, John David, North Carolina State University, and Lawrence Ives, Calabazas Creek Research, Inc. (1023-49-1489)

4:15PM Break.

4:30PM Exact subdifferential calculus and optimality conditions in nondifferentiable programming.
Boris Mordukhovich and Mau Nam Nguyen*, Wayne State University (1023-49-134)

4:45PM A regularity theory for multiple-valued Dirichlet minimizing maps. Preliminary report.
Wei Zhu, Rice University (1023-49-897)

5:00PM The onset problem for a thin superconducting loop in a large magnetic field.
Tien-Tsan Shieh* and Peter Sternberg, Indiana University (1023-49-1506)

5:15PM Convergence Rate of an Interior Point Gradient Method for the Totally Non-Negative Least Squares Problem. Preliminary report.
Elaine T. Hale* and Yin Zhang, Rice University (1023-49-1674)

1:00PM - 4:25PM

1:00PM Simplicity of C*-algebras using unique eigenstates.
Lon H. Mitchell, University of Kansas (1023-47-322)

1:15PM On a class of Integral Operators related to the Fock Spaces.
Ovidiu Furdui, Western Michigan University (1023-47-36)

1:30PM Weighted shifts whose $p^th$ root shifts are subnormal. Preliminary report.
George R. Exner, Bucknell University (1023-47-498)

1:45PM Monotone variational inequalities revisited.
Dan D. Pascal, Courant Institute, New York University (1023-47-508)

2:00PM C*-Algebras of Inverse Semigroups: Amenability and Weak Containment. Preliminary report.
David Milan, University of Nebraska (1023-47-582)

2:15PM Topological Degree Theories and Nonlinear Operator Equations in Banach Spaces.
Dhruba R. Adhikari* and Athanassios G. Kartsatos, University of South Florida (1023-47-643)

2:30PM Rank Preserving Maps on CSL Algebras.
Jaedeok Kim*, Jacksonville State University, and Robert L. Moore, University of Alabama (1023-47-793)

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**Program of the Sessions – Monday, January 8 (cont’d.)**

**AMS Session on Applications of Mathematics, IV**

1:00 PM – 5:25 PM

1:00PM
- **A bifurcation analysis of pattern formation in the developing ear.** Preliminary report.
  K. A. Montgomery, University of Utah (1023-92-1643)

1:15PM
- **Control of synchronization in coupled oscillatory networks.**
  Menaka Bandara Navaratna, Florida Gulf Coast University (1023-92-1738)

1:30PM
- **Agent-based model of therapeutic intervention following exposure to botulinum neurotoxin.** Preliminary report.
  Keith A. Erickson, United States Military Academy (1023-92-1749)

1:45PM
- **A Monotone Approximation for a Size-Structured Population Model with a Generalized Environment.**
  Azmy S. Ackleh, Keng Deng and Jeremy J. Thibodeaux*, University of Louisiana at Lafayette (1023-92-1767)

2:00PM
- **Generalized Trojan Gene Hypothesis.**
  Juan B. Gutierrez, Florida State University (1023-92-1788)

2:15PM
- **An Enzyme Kinetic Model of Tumor Dormancy: Regulation and Control of Secondary Metastases by Plasmin, Intratumoral Distance and Surgical Removal of the Primary Tumor.** Preliminary report.
  Andrew Lewis Matteson, Texas A&M University (1023-92-1904)

2:30PM
- **The influence of segregation from reproduction in the long term dynamics of persistent sexually transmitted diseases.**
  Daniel Maxin* and Fabio A. Milner, Purdue University (1023-92-469)

2:45PM
- **A Situation in which a Local Nontoxic Refuge Promotes Pest Resistance To Toxic Crops.**
  Jemal Said Mohammed-Awel*, Valdosta State University, Karen Kopecky, University of Western Ontario, and John Ringland, SUNY Buffalo (1023-92-702)

3:00PM
- **Break.**

3:15PM
- **A computational model of tumor therapy.**
  Jin Wang, Duke University (1023-92-707)

3:30PM
- **Do implicit measures for female associations with mathematics display cultural or regional biases?** Preliminary report.
  Rosa A. Del Angel* and Diana W. Verzi, San Diego State University-Impervial Valley Campus (1023-92-920)

3:45PM
- **Effect of Input Noise on a Magnetometer with Quantum Feedback.**
  Zhigang Zhang, Texas A&M University (1023-93-1645)

4:00PM
- **An ergodic control problem of a diffusion with jumps.** Preliminary report.
  Cristin Buescu* and Michael I. Taksar, University of Missouri-Columbia (1023-93-1740)

4:15PM
- **The Pivotal Role of Commutators in Action.** Preliminary report.
  Dov A. Rhodes*, Indiana University, Bloomington, and Nathan Olson, Cal Poly, Pomona (1023-93-1815)

4:30PM
- **Electromagnetic Analysis of a MEMS Integrated Frequency Reconfigurable Antenna.**
  Toby Ann Hale* and Bedri A. Cetiner, Morehead State University (1023-94-1436)

4:45PM
- **Resistor Networks with Finitely Many Solutions to the Discrete Inverse Boundary Problem.** Preliminary report.
  Ilya Griгорiev, University of Chicago (1023-94-1846)

5:00PM
- **Agreement in Circular Societies.** Preliminary report.
  Christopher S. Hardin, Smith College (1023-95-1269)

5:15PM
- **From RNA Molecules to Brain Structures: Geometric Measures as Shape Descriptors.** Preliminary report.
  Christian Laing, Florida State University (1023-92-125)

**AMS Session on Combinatorics, IV**

1:00 PM – 3:25 PM

1:00PM
- **Incidence Matrices and Inequalities for Combinatorial Designs.**
  D. Raghavarao, Temple University, S. Shrikhande, Mt. Pleasant, MI, and M. S. Shrikhande*, Central Michigan University (1023-05-704)

1:15PM
- **On Long Cycles in Triangle-Free Graphs.**
  Doug Bauer, Stevens Institute of Technology, Nathan Kahli*, Seton Hall University, Linda McGuire, Muhlenberg College, and Edward Schmeichel, San Jose State University (1023-05-77)

1:30PM
- **Cycles in the Cartesian Product of Two Directed Cycles.**
  Sherry Xiaohua Wu, Cornell University (1023-05-790)
Monday, January 8 - Program of the Sessions

MAA Session on Applications of Discrete Mathematics, II

1:00 PM - 4:55 PM

Organizers: Thomas Koshy, Framingham State College
Thomas Moore, Bridgewater State College

1:00 PM
Dynamic service scheduling on directed graphs.
D. Jacob Wildstrom, University of California, San Diego (1023-D1-633)

1:20 PM
Borderline Behavior for 2x2 Iterative Systems.
Samer Habre*, Lebanese American University, Beirut, and Jean Marie McDill, California Polytechnic State University (1023-D1-879)

1:40 PM
Derangements, Probability, and Calculus.
Thomas Koshy, Framingham State College (1023-D1-1126)

2:00 PM
Approximative policies for Preemptive Stochastic Online Scheduling.
Nicole Megow*, TU Berlin, and Tjark Vredeveld, Maastricht University (1023-D1-1226)

2:20 PM
Generating Functions and the Prisoner’s Dilemma on Graphs.
Stephen Devlin* and Reza Dibaj, University of San Francisco (1023-D1-1327)

2:40 PM
Counting Point-Determining Graphs Using Joyal’s Theory of Species.
Ji Li, Brandeis University (1023-D1-1357)

3:00 PM
The Geometry Behind Paradoxes of Voting Power.
Michael A. Jones, Montclair State University (1023-D1-1419)

3:20 PM
Visualizing Binomial Identities using PascGaloisJE.
Michael J. Bardzell, Salisbury University (1023-D1-1601)

MAA Session on Assessment of Student Learning in Undergraduate Mathematics, II

1:00 PM - 2:40 PM

Organizers: William Martin, North Dakota State University
Bernard L. Madison, University of Arkansas

1:00 PM
Program Assessment - What Worked and What Did Not Work.
Jim Fulmer*, University of Arkansas at Little Rock, and Tom McMillan, State University of New York at Utica (1023-D5-1793)

1:15 PM
Learning-focused Exam Construction.
James S. Rolf*, Michael A. Brilleslyper and Scott Callihan, United States Air Force Academy (1023-D5-1837)

1:30 PM
From Pre-tests to Capstones.
Theresa Shelton, Western Washington University (1023-D5-1633)

1:45 PM
Students Assessing Other Students: Competition is the Great Motivator to Learn.
Barbara S. Melendez* and Tasha Williams, United States Military Academy (1023-D5-438)

2:00 PM
Assessing Student Performance in College Algebra with WeBWorK.
Alberto Candel*, CSUN, and Juana Sanchez, UCLA (1023-D5-1420)

2:15 PM
Using Cumulative Assessment to Enhance the Mathematics Experience of College Students at the Entry Level.
Blanche S. Presley and Barry J. Monk, Macalester College (1023-D5-123)

2:30 PM
A Misadventure with a Web-based Assessment Method.
Louis M. Beaugris, Kean University (1023-D5-1816)

MAA General Contributed Paper Session, VIII

1:00 PM - 4:25 PM

Organizers: Eric S. Marland, Appalachian State University
Jay A. Malmstrom, Oklahoma State University

1:00 PM
Primordial Black Holes and Large Scale Structure.
Adam Drake, University of Houston-Downtown (1023-Z1-1096)

1:15 PM
The Aerodynamics of Turbulent Coanda Jet Flows.
Jason C. Fox* and Caroline P. Lubert, James Madison University (1023-Z1-317)
Program of the Sessions – Monday, January 8 (cont’d.)

1:30 PM Three Dimensional Computational Model of Water Movement in Plant Root Growth Zone. Preliminary report.
Brandy S. Wiegers*, Angela Y. Cheer, and Wendy K. Silk, University of California, Davis (1023-Z1-1689)

1:45 PM Verifying hydraulic design of the water-conducting networks taking into account the maintenance of the reliability.
Boli Yarkylov, Samarkand State Civil Engineering and Architectural Institute (1023-Z1-230)

2:00 PM Keeping the Doors Open: A Summer Algebra Camp for Underrepresented Minority Middle Schoolers. Preliminary report.
John B. Fink, Kalamazoo College (1023-Z1-835)

2:15 PM Models in my head “How a blind student sees graphs and their equations.”
Aldo R. Maldonado, Park University (1023-Z1-517)

2:30 PM What do business students need to know about math? Preliminary report.
Julia Darby Head*, G. Brock Williams and Amanda Michelle Wheeler, Texas Tech University (1023-Z1-1731)

2:45 PM Journeys in Mathematics: Courses in Problem Solving, Number and Operation, Algebra, Geometry and Measurement, Probability and Data Analysis, and Concepts of Trig and Calculus for K-8 teachers.
Cora Neal*, Sonoma State University, and Deborah Narang, University of Alaska Anchorage (1023-Z1-306)

3:00 PM Mathematics Courses for Future Grade 1-6 Teachers at Louisiana State University Shreveport. Preliminary report.
Judith Covington, Louisiana State University Shreveport (1023-Z1-852)

3:15 PM K-5 teachers explore the nature of rational numbers: A case for inquiry in a mathematics specialist program.
Aimee J. Ellington* and Joy W. Whitenack, Virginia Commonwealth University (1023-Z1-359)

3:30 PM Professors in the Schools at Morehead State University. Preliminary report.
Mike Dobranski, Morehead State University (1023-Z1-1761)

3:45 PM Inequalities Through Geometry.
Anand Kumar, Ramanujan School of Mathematics (1023-Z1-606)

4:00 PM Sharing Triangles, Geometric Triangles, and Pascal’s Triangle. Preliminary report.
Charles J. Kicey*, Valdosta State University, Jun Ji, Kennesaw State University, and Arsalan Wares, Valdosta State University (1023-Z1-1091)

Robert D. Pooldack, Norwich University (1023-Z1-1395)

1:15 PM WeEB Math: College Algebra and Trigonometry for High School Students.
Michael Mayes* and Laura Pyzdrowski, West Virginia University (1023-Z1-315)

1:30 PM ORICUT: Proposal of teaching in Basic Education (Level K4 and K5).
Alberto de Leon de Leon* and Lineth Alejandra De Leon Torres, Instituto Tecnologico de Cdv. Madero (1023-Z1-1611)

1:45 PM Using WeEBWork to foster reading. Preliminary report.
George R. Exner, Bucknell University (1023-Z1-499)

2:00 PM Pre-calculus ILAPs as a path to QL.
(Aaron Montgomery, Central Washington University (1023-Z1-1398)

Shumee C. Richman, Midlands Technical College (1023-Z1-1258)

2:30 PM Couples interactive Computer Based Math Games.
(Hongbiao Zeng, Fort Hays State University (1023-Z1-1233)

2:45 PM Who are the Best Sluggers in Baseball?
(Steve Alan Krevinsky*, Middlesex Community College, Randy Taylor, Las Positas College, and Rodrigo Faria, University of Sao Paulo Western (1023-Z1-1786)

3:00 PM Placement Made Personal. Preliminary report.
(John C. Nardo and Judith L. Gieger*, Oglethorpe University (1023-Z1-672)

3:15 PM Helping First-Semester Freshmen Mathematics Students.
(Bonnie Golden, Monmouth University (1023-Z1-632)

3:30 PM Getting Students to Learn from their Mistakes.
(Vera Cherepinsky, Fairfield University (1023-Z1-1724)

(Clyde L. Greeno, The MALEI Mathematics Institute (1023-Z1-927)

4:00 PM Mathematics and the TBR Teacher Preparation Collaborative. Preliminary report.
(Anant P. Godbole, East Tennessee State University (1023-Z1-567)

4:15 PM Pre-service Teachers enhance their Mathematical Understanding Through Journal writing. Preliminary report.
(Barba Patton* and Carol Klages, University of Houston-Victoria (1023-Z1-1818)

MAA Panel Discussion

1:00 PM – 2:20 PM

Organizers: Joan Ferrini-Mundy, Michigan State University
Raven McCrory, Michigan State University

Presenters: Michael Frasier, University of Tennessee
Joan Ferrini-Mundy
Raven McCrory
Sharon Schmidt, Michigan State University
William Schmidt, Michigan State University

MAA General Contributed Paper Session, IX

1:00 PM – 4:25 PM

Organizers: Eric S. Marland, Appalachian State University
Jay A. Malmstrom, Oklahoma City Community College

1:00 PM Enhancing student interest in mathematics with the course related multimedia tools.
Atul N. Roy, Montgomery College (1023-Z1-1210)
Monday, January 8 - Program of the Sessions

MAA Panel Discussion
1:00 PM - 2:20 PM
MathNerds, Moore Method, and mathematics education: What do they have in common?
Organizers: W. Ted Mahavier, Lamar University
Laurie O. Cavey, James Madison University
Panelists: Terry McCabe, Texas State University
G. Edgar Parker, James Madison University
Hiroko K. Warshauer, Texas State University
Max L. Warshauer, Texas State University
Alexander White, Texas State University
Laurie O. Cavey

AWM Workshop Panel Discussion
1:00 PM - 2:15 PM
Critical career decision stages: Research and funding opportunities.
Moderator: Claudia Polini, University of Notre Dame
Kathleen O'Hara, Mathematical Sciences Research Institute
Barbara Lee Keyfitz, Fields Institute and University of Houston
Michelle D. Wagner, National Security Agency

AMS Session on Probability and Statistics, II
1:30 PM - 4:55 PM
2:00 PM Gambler's Ruin with Catastrophes and Windfalls.
Blake Hunter, University of California, Davis
Alan Khinzh, Chau Nguyen, Jenny Switkes and Hubertus von Bremen, California State Polytechnic University, Pomona (1023-60-1863)
2:15 PM A Single-server Poisson Queuing System with Delayed-Service.
Aliakbar Montazer Haghighi, Dimitar P. Mishev, Prairie View A&M University, and Stefanka S. Chukova, Victoria University of Wellington (1023-60-239)
2:30 PM Laws of Large Numbers in D(0, 1).
Paul H. Bezandry, Howard University (1023-60-658)
2:45 PM The submartingale problem for a class of degenerate elliptic operators.
Richard F. Bass, University of Connecticut, and Alexander Lavrentiev, University of Wisconsin - Fox (1023-60-708)
2:00 PM Mutual Information for a Multivariate
T-Distribution.
Walfredo R. Javier, Southern University-BR, and Arjun K. Gupta, Bowling Green State University (1023-60-970)

AWM Workshop: Research Presentations by Recent Ph.D.'s, II
2:30 PM - 4:20 PM
2:00 PM Pedagogical Utilization and Assessment of the Statistic Online Computational Resource in Introductory Probability and Statistics Courses.
Ivo D. Dinov, Juana Sanchez and Nicolas Christou, UCLA Statistics (1023-62-01)
3:00 PM Statistical Modeling of Terrain Profiles.
Tze-Chien Sun and Jinfeng Wei, Wayne State University (1023-62-809)
3:15 PM Comparing Control Charts With Estimated Parameters.
Maria E. Calzada and Stephen M. Scariano, Loyola University New Orleans (1023-62-1326)
3:30 PM Break.
Evgenia Rubinstein, University of Central Arkansas, and Anuj Srivastava, Florida State University (1023-62-1492)
4:00 PM Impact of exogenous factors on patients expiratory volume. Preliminary report.
Rachid Bekrales, BMCC City University (1023-62-1681)
Ashraf F. ElHoubi, Lamar University (1023-62-377)
4:30 PM A Comparison of Data Mining Courses Taught Across Disciplines. Preliminary report.
Alan M. Safer, California State University, Long Beach (1023-62-379)
4:45 PM Smooth Inference for Survival Functions with Arbitrarily Censored Data.
Kirsten Doehler, University of North Carolina Greensboro, and Marie Davidian, North Carolina State University (1023-62-676)

ASL Contributed Papers
2:00 PM - 4:00 PM
Organizer: Marcia Groszek, Dartmouth College
2:00 PM Effective Souslin trees and degrees in $\alpha$-recursion theory.
Francois Dorais, Dartmouth College (1023-62-1492)
2:25 PM The strength of the rainbow Ramsey theorem.
Joe Miletic, University of Chicago, and Barbara Csima, University of Waterloo (1023-62-379)
2:50 PM Turing computable embeddings into equivalence structures.
Sara Miller, University of Notre Dame (1023-62-379)
3:15 PM Classification of a family of countably universal H-free graphs.
Rehana Patel, St. John's University (1023-62-379)
3:40 PM The Boltzmann principle and protein primary structure.
Dennis F. Cudia, Rockford, IL (1023-62-379)
Program of the Sessions – Monday, January 8 (cont’d.)

3:30 PM  Diffusion Flame Stability.
(1806) Amy B. Moore*, Alma College, and Milan
Miklavcic, Michigan State University
(1023-35-1082)

4:00 PM  Petite K-types and Unitary Representations.
(1807) Alessandra Pantano, Cornell University
(1023-22-901)

MAA Minicourse #6: Part B

3:30 PM - 5:30 PM

WeBWork 2: An internet-based system for
generating and delivering homework.
Organizers: Arnold K. Pizer, University of
Rochester
Michael E. Gage, University of
Rochester
Vicki Roth, University of Rochester

AMS Banquet Reception

6:30 PM - 7:30 PM

AMS Banquet

7:30 PM - 10:30 PM

Susan J. Friedlander  James J. Tattersall
AMS Associate Secretary  MAA Associate Secretary
Chicago, Illinois  Providence, Rhode Island
The Board of Governors of the Institute for Mathematics and Its Applications (IMA) and the University of Minnesota seek a new Director of the IMA for an appointment beginning August 2008 (or possibly earlier in the summer). The new Director will be offered a tenured Professorship at the University of Minnesota. Candidates should have the qualifications to provide scientific and administrative leadership to the IMA. Distinguished academic credentials, including a Ph.D. or equivalent, and a record of scientific leadership are required. Salary and term as Director of the IMA are negotiable.

The IMA was established in 1982 with financial support from the National Science Foundation. The Foundation has now renewed the funding for the IMA until 2010. The mission of the Institute is to identify areas of research in science, engineering and industry where mathematics can have an impact and to encourage participation of mathematicians in these areas.

Nominations and applications should be sent to Chair of the School of Mathematics, University of Minnesota, 206 Church Street S.E., Minneapolis, MN 55455. Consideration of applications will begin March 15, 2007.

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**Research topic:** Statistical Mechanics
**Education Theme:** Knowledge for Teaching Mathematics
**A three-week summer program for:** graduate students undergraduate students mathematics researchers undergraduate faculty secondary school teachers math education researchers

**IAS/Park City Mathematics Institute (PCMI)**
July 1 - 21, 2007
Park City, Utah

**Organizers:** Scott Sheffield, Courant Institute; Thomas Spencer, Institute for Advanced Study.
**Graduate Summer School Lecturers:** David Brydges, University of British Columbia; Alice Guionnet, Ecole Normale Superieure de Lyon; Richard Kenyon, University of British Columbia; Gregory Lawler, University of Chicago; Yuval Peres, Microsoft Research and University of California Berkeley; Wendelin Werner, Universite Paris-Sud.
**Clay Senior Scholars in Residence:** Andrei Okounkov, Princeton University; Srinivasa Varadhan, Courant Institute.
**Other Organizers:** Secondary School Teachers Program: Gail Burrill, Michigan State University; Carol Hattan, Vancouver, WA; James King, University of Washington. Undergraduate Summer School: Aaron Bertram, University of Utah. Undergraduate Faculty Program: William Barker, Bowdoin College.

**Applications:** www.ias.edu/parkcity
**Deadline:** February 15, 2007
IAS/Park City Mathematics Institute
Institute for Advanced Study, Princeton, NJ 08540
Financial Support Available

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**2007 AMS Sectional Meetings**

- **March 3-4, 2007 (Saturday-Sunday)**
  Davidson College, Davidson, NC
  (2007 Spring Southeastern Section Meeting)

- **March 16-17, 2007 (Friday-Saturday)**
  Miami University, Oxford, OH
  (2007 Spring Central Section Meeting)

- **April 14-15, 2007 (Saturday-Sunday)**
  Stevens Institute of Technology, Hoboken, NJ
  (2007 Spring Eastern Section Meeting)

- **April 21-22, 2007 (Saturday-Sunday)**
  University of Arizona, Tucson, AZ
  (2007 Spring Western Section Meeting)

- **October 5-6, 2007 (Friday-Saturday)**
  DePaul University, Chicago, IL
  (2007 Fall Central Section Meeting)

- **October 6-7, 2007 (Saturday-Sunday)**
  Rutgers University-New Brunswick, Busch Campus,
  New Brunswick, NJ
  (2007 Fall Eastern Section Meeting)

- **October 13-14, 2007 (Saturday-Sunday)**
  University of New Mexico, Albuquerque, NM
  (2007 Fall Western Section Meeting)

- **November 3-4, 2007 (Saturday-Sunday)**
  Middle Tennessee State University, Murfreesboro, TN
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Meetings and Conferences of the AMS

Associate Secretaries of the AMS

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Meetings and Conferences of the AMS

The Meetings and Conferences section of the Notices gives information on all AMS meetings and conferences approved by press time for this issue. Please refer to the page numbers cited in the table of contents on this page for more detailed information on each event. Invited Speakers and Special Sessions are listed as soon as they are approved by the cognizant program committee; the codes listed are needed for electronic abstract submission. For some meetings the list may be incomplete. Information in this issue may be dated. Up-to-date meeting and conference information can be found at www.ams.org/meetings/.

Meetings:

2007

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October 6-7 New Brunswick, New Jersey p. 88

October 13-14 Albuquerque, New Mexico p. 88

November 3-4 Murfreesboro, Tennessee p. 88

December 12-15 Wellington, New Zealand p. 89

2008

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2009

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2010

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Important Information Regarding AMS Meetings

Potential organizers, speakers, and hosts should refer to page 78 in this issue of the Notices for information regarding participation in AMS meetings and conferences.

Abstracts

Speakers should submit abstracts on the easy-to-use interactive Web form. No knowledge of \LaTeX{} is necessary to submit an electronic form, although those who use \LaTeX{} may submit abstracts with such coding, and all math displays and similarly coded material (such as accent marks in text) must be typeset in \LaTeX{}. Visit http://www.ams.org/cgi-bin/abstracts/abstract.pl. Questions about abstracts may be sent to abs-info@ams.org. Close attention should be paid to specified deadlines in this issue. Unfortunately, late abstracts cannot be accommodated.

Conferences: (see http://www.ams.org/meetings/ for the most up-to-date information on these conferences.)

June 16-July 6, 2007: Joint Summer Research Conferences, Snowbird, Utah.

July 8-July 12, 2007: von Neumann Symposium on Sparse Representation and High-Dimensional Geometry, Snowbird, Utah.
NEW MATHEMATICAL MONOGRAPHS

Hilbert's Tenth Problem
Diophantine Classes and Extensions to Global Fields
Alexandra Shlapentokh
This book presents an account of results extending Hilbert's Tenth Problem to integrally closed subrings of global fields, including, in the function field case, the fields themselves.

Theory of Finite Simple Groups
Gerhard O. Michler
This book provides the first representation theoretic and algorithmic approach to the theory of abstract finite simple groups.

Free Ideal Rings and Localization in General Rings
P. M. Cohn
This book presents the theory of free ideal rings (firs) in detail. Particular emphasis is placed on rings with a weak algorithm, exemplified by free associative algebras.
$120.00: Hardback: 0-521-69524-4: 454 pp.

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Marc Cabanes and Michel Enguehard
At the crossroads of representation theory, algebraic geometry, and finite group theory, this book blends together many of the main concerns of modern algebra, with full proofs of some of the most remarkable achievements in the area.
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Earl Hunt
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Antonio Ambrosetti and Andrea Malchiodi
Starting from elementary tools of bifurcation theory and analysis, this graduate text covers a number of more modern topics from critical point theory to elliptic partial differential equations.
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Gerard Cornuejols and Reha Tütüncü
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Quantum Stochastic Processes and Noncommutative Geometry
Kalyan B. Sinha and Debashish Goswami
This book will be of interest to graduate students and researchers in functional analysis, probability, and mathematical physics.
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Random Dynamical Systems
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Rabi Bhattacharya and Mukul Majumdar
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$39.99: Paperback: 0-521-53272-8

Spectral Methods for Time-Dependent Problems
Jan Hesthaven, Sigal Gottlieb, and David Gottlieb
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Steven Brams, New York University
Superior Beings is an extraordinary book. ... (American Scientist)
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Nowadays game theory is being applied to an array of subjects, from finance and economics to law, political science and natural science to name a few. In 1983, Brams applied game theory to theology in his book Superior Beings to create a masterful work that posed provocative questions about religion from a game theorist's viewpoint. This second edition includes all of the rigorous, yet comprehensible and fascinating applications of game theory from the previous edition, but with a new, modern look and feel.

A Course in Enumeration
Martin Aigner, Freie Universität Berlin, Germany
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Approval Voting
Steven Brams and Peter C. Fishburn
Approval Voting proposes a compelling way to elect some 500,000 officials in public elections. Under this system voters may vote for, or approve of, as many candidates as they like in multicandidate elections. Since the publication of the first edition of this book, its arguments in favor of an election reform practically unknown in 1983 have stood the test of time. Perhaps the proof of the pudding lies in the adoption of approval voting by about a dozen professional societies—several with tens of thousands of members—and their generally favorable experience with it. After a generation of discussion and debate on the subject, the authors remain convinced that Approval Voting is as relevant today as it was when rigorous analysis and systematic empirical research on this election reform began more than 30 years ago.

Bounded Analytic Functions
John Garnett, University of California, Los Angeles
The book, which covers a wide range of beautiful topics in analysis, is extremely well organized and well written, with elegant, detailed proofs. The book has educated a whole generation of mathematicians with backgrounds in complex analysis and function algebras. It has had a great impact on the early careers of many leading analysts and has been widely adopted as a textbook for graduate courses and seminars in both the US and abroad.
From the Citation for the 2003 Leroy P. Steele Prize for Exposition.

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David A. Cox, Amherst College, Massachusetts; John Little, College of the Holy Cross, Massachusetts; and Donal O'Shea, Mt. Holyoke College, Massachusetts
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The American Mathematical Monthly
This third edition has been revised and includes updated sections on Maple, AXIOM, CocalcL Macaulay 2, Magma, Mathematica and SINGULAR, as well as a shorter proof of the Extension Theorem.

An Invitation to Morse Theory
Liviu Nicolaescu, University of Notre Dame, Indiana
This self-contained treatment of Morse Theory focuses on applications and is intended for a graduate course on differential or algebraic topology. This is the first textbook to include topics such as Morse-Smale flows, min-max theory, moment maps and equivariant cohomology, and complex Morse theory. The exposition is enhanced with examples, problems, and illustrations.