Nominations for President

Nomination of Eric Friedlander

John Franks

I am very pleased to support the nomination of Eric Friedlander for the position of president of the American Mathematical Society. Eric has had an extremely distinguished career in our profession spanning almost four decades. Beyond a sterling research record his career is characterized by numerous and wide-ranging contributions to the mathematical enterprise. In my opinion his contributions to mathematics and his past experience serving the mathematical community make him exceptionally qualified for the role of president of the Society.

Eric received his doctorate in mathematics in 1970 from MIT, where he studied with Michael Artin. After spending some years at Princeton University, he went to Northwestern University in 1975 as an associate professor. He was promoted to professor in 1980 and became the Henry S. Noyes Professor of Mathematics in 1999. Subsequently, he succumbed to the allure of Southern California and starting in September of 2008 he became Dean's Professor of Mathematics at the University of Southern California.

Beginning with his thesis and throughout his career, Eric developed a unique blend of algebraic geometry and algebraic topology that made him a leader in a number of diverse fields, especially algebraic K-theory, cohomology of algebraic groups, representation theory, and cohomology theories for algebraic varieties. He is the author of numerous papers and monographs, including three papers in the *Annals of Mathematics*, ten papers in *Inventiones Mathematicae*, and two books in the *Annals of Mathematical Studies*. For this work, Eric has earned a number of important honors, including a Humboldt prize and invitations to speak at the International Congress of Mathematicians. In 2005, he became a Fellow of the American Academy of Arts and Sciences.

The president plays many crucial roles in the governance of the Society. He or she presides over the Executive Committee and Board of Trustees which sets our policy and has the fiduciary responsibility for the financial well-being of the AMS. Eric's years of exemplary service on the Board (which I have had the opportunity to observe first-hand) have prepared him well to accept this responsibility. The president is also called on to enhance our presence in Washington, in conjunction with our Washington office, and to represent the mathematical research community to members of Congress and other government officials. Eric's past service on the Committee on Science Policy of the AMS has familiarized him with this aspect of the Society's activities and his outgoing nature leads me to believe he will perform extremely well in discharging this task.

Another important responsibility of the president is to represent the Society, and indeed American mathematics generally, in international mathematical circles. This is a role for which Eric is exceptionally well qualified. He has interacted with the mathematical community at an international level to an extent rarely matched by others in our profession. He has been a research fellow at Trinity College, Cambridge, and New College, Oxford, a Professor Associé in Paris, a visiting fellow at the Max Planck Institute in Germany, ETH in Zurich, and the Institut Henri Poincaré in Paris. He has held a visiting professorship at Heidelberg and been a visiting member at the IHES multiple times. He is prominent in the activities of the "Friends of the IHES" and he has served on the Scientific Advisory Panel of the Fields Institute in Toronto.

Eric has directed the theses of fourteen Ph.D. students. He spends enormous amounts of time with each of his students and many have written very fine theses. Throughout his career he has also had a number of very productive collaborations, developing important and separate lines of research. In all Eric has had nearly twenty-five coauthors, including a number of postdocs and new Ph.D.s with whom he generously shared ideas and his experience.

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During his years at Northwestern, Eric served the department and the university with enormous dedication and enthusiasm. He was chair of the Mathematics Department twice (1987–1990 and 1999–2003), Academic Associate Dean for Science (1995–1998), and served on a number of important college and university committees. As a member of the department, he was part of a very strong group in algebraic topology, and he helped organize numerous emphasis years and large conferences, including one of the landmark conferences in the field which saw a cascade of solutions to long-standing and important problems.

Eric is known by his colleagues and, indeed, throughout the mathematical world, for his inexhaustible energy. Those who know him well can attest how much of his time is devoted to students, his department, and to the mathematical community in general. Election to its presidency is one of the highest honors the Society bestows, and one Eric richly merits. But, beyond honoring past achievements, the presidency is an office which carries a great responsibility for the stewardship of the Society. For all the reasons cited above—his contributions to mathematics, his experience both within the Society and in the broader world mathematical community, and his dedication to the goals of the AMS—I believe that Eric is an outstanding choice to be our next president.

Nomination of Wilfried Schmid

Roger Howe

It is my pleasure and honor to nominate Wilfried Schmid for president of the American Mathematical Society.

What qualifications should a president of AMS have? Certainly, one would want the AMS president to be an excellent mathematician. Also, our president should have a strong sense of mathematics as an enterprise—a broad view of the subject, a keen appreciation of its value and its values, and ideas about how to help mathematicians achieve their best. Moreover, and perhaps most importantly, our president should be able to communicate with nonmathematicians, to promote the value of mathematics, and to help the many people who can affect mathematics for better or worse, understand why better is better.

Wilfried Schmid easily satisfies all these criteria. To take the second one first, anyone who has been to one of Wilfried's talks knows that he is a superb expositor of mathematics. A lecture by Wilfried is like a three ring circus. He always has a lot to say, and his talks always involve a large cast of ideas and several death-defying feats. But he orchestrates his players—definitions, techniques, and results—so deftly, and weaves in history and motivations so skillfully that nobody falls off the trapeze, and a listener goes away with a sense of enlightenment and even awe. His expository skill has been recognized by invitations to deliver series of lectures in North and South America, Europe, India, and China. He has also spoken three times at ICMs, including a plenary lecture.

Moreover, Wilfried's sense of mathematics goes well beyond technical mastery. He values the depth and the variety and the vitality of mathematics in all its manifestations. The following quotation shows this better than I can. This is from the foreword to the volume *Mathematics Unlimited: 2001 and Beyond*, edited by Wilfried and Björn Engqvist.

> At the dawn of the 20th century, it was possible for one sage individual to survey the whole of mathematics: Hilbert's presentation of twenty-three problems in 1900 not only gave a sense of the direction of mathematics, but also helped it move forward.
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> The scope of mathematics has expanded tremendously over the last hundred years.
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> Scientific and technological advances, in particular, the explosive growth of computing power, have created numerous opportunities for mathematics and mathematicians. The core areas did not suffer as a result of the proliferating areas, quite to the contrary, "pure mathematics" is thriving, with the invention of powerful theories, the solution of celebrated problems, and the emergence of unforeseen connections between different areas of mathematics and mathematical physics.
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> Can one eminent mathematician, or a small group of eminent mathematicians, afford an overview of the breadth of today's mathematics? We think not—we present a composite of many individual views, both out of necessity and conviction…. We hope to provide the reader with a glimpse of the great variety and the vitality of mathematics as we enter the new millennium.

Wilfried has also served the mathematics community as an editor of several journals. In particular, he was a founding editor of the *Journal of the AMS*, and managing editor from 1991 to 1994. I can testify from direct experience, that as editor he was not a passive recipient of manuscripts, but also was on the lookout for promising articles that might not otherwise have found their way to *JAMS*.

There is no question, then, that Wilfried embodies a strong sense of mathematics and that he can communicate well with mathematicians. What about with the wider public? One would not expect this to be an issue, since Wilfried's expository skills reflect a clarity and thoroughness of thought that he brings to everything he does. However, it is not necessary to speculate. Wilfried has a well-established track record, through his involvement in issues of mathematics education.

As probably with many of us, Wilfried's attention to mathematics education started when his daughter expressed deep unhappiness with her second grade

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mathematics experience. Unlike most of us, however, he did not leave things with a visit to the school or the purchase of some supplementary books. He quickly became involved in math education issues at the state level. In 2000, he was invited by the Massachusetts Department of Education to help with the editing of the state mathematics standards, and he played a major role in shaping their final form. This version of the Massachusetts standards is still in force, a remarkably long life for a document of this sort. Anyone who has taken time to read state mathematics standards knows what mind-numbing documents they can be. The readability of the Massachusetts standards is in notable contrast to the standards of most other states.

After his work in Massachusetts Wilfried was invited to participate in several projects at the national level. He served on the steering committee to develop the framework for the mathematics section of NAEP (National Assessment of Educational Progress—aka, "the nation's report card"—a statistical sampling of mathematics achievement in each state and nationally). He served on review panels for the SAT and for NAEP. He was a member of the program committee for the 10th International Congress on Mathematics Education. He was part of the Common Ground committee, convened to promote cooperation between mathematicians and mathematics educators toward common goals. Most recently, he served on the National Mathematics Panel. In all these situations, he worked productively with people from a variety of backgrounds, and advocated for the integrity of mathematics and for strong content. As mathematics education continues to heat up as a policy issue, with increased attention from the Obama administration, expertise in this area will be especially valuable for the president of AMS.

I should round out this discussion with some description of Wilfried's research. This has been mostly in representation theory, broadly construed. This subject has roots in physics, where it has several striking applications. It is also linked with classical topics such as Fourier analysis, the theory of spherical harmonics, and many other aspects of special functions. It is strongly interwoven with symplectic geometry and microlocal analysis. Somewhat serendipitously, it has turned out also to have applications to ergodic theory, to geometric integration theory, and probably most significantly, to number theory, through the theory of automorphic forms, including the Langlands Program, and the theory of theta functions.

A drawback to representation theory is the high entrance fee. It is notorious for the level of technicality needed to start talking about it, and the technical proficiency needed to practice it. Although it has recently become much better known, especially in connection with the Langlands Program, representation theory, especially infinite-dimensional representations, is still not part of a general mathematical background to the extent that complex analysis or measure theory is. Even among representation theorists, Wilfried is known for his technical power, and many of his papers are technical tours de force. Our brief descriptions will elide most of the technicalities.

The representation theory of finite groups on complex vector spaces is frequently seen in graduate study, and we will assume that the reader is familiar with it. The basic problems are

i) Given a group G, describe the irreducible representations of G.

ii) Given a representation of G, describe its decomposition into a direct sum of irreducible representations.

One can think of representation theory of Lie groups as being the representation theory of finite groups on steroids. The basic problems are the same, but the typical irreducible representation will be infinite dimensional, and in decomposing representations, one must consider direct integrals (aka, continuous direct sums) as well as the conventional algebraic direct sums.

I will briefly describe three items from Wilfried's research.

1. Proof of the Kostant-Langlands conjecture on construction of models for the discrete series for semisimple Lie groups, and proof of Blattner's formula.

2. Analysis of possible degenerations of Hodge structures.

3. Proof of the Barbasch-Vogan conjecture on asymptotic invariants of representations.

1. After pioneering work by physicists and the Gelfand school, representation theory of semisimple groups was studied systematically by Harish-Chandra. He found that in some cases (for example, for the indefinite orthogonal groups $O_{p,q}$ if at least one of p or q is even), the regular representation of G on $L^2(G)$ contained some irreducible subspaces. These became known as the *discrete series*. Harish-Chandra showed that the discrete series were the essential ingredient in the Plancherel formula—the explicit decomposition of the regular representation. (Later, Langlands and others showed that the discrete series were also key to constructing all irreducible representations of G.) Harish-Chandra had classified the discrete series, but his approach was indirect, and did not provide explicit realizations for them. Kostant and Langlands suggested a method for constructing them, by means of a non-compact analog of the Bott-Borel-Weil construction of irreducible representations of compact Lie groups, on cohomology of vector bundles. In a series of papers in the 1970s, Wilfried established the Kostant-Langlands conjecture. At the same time, he (jointly with Henryk Hecht) established a formula conjectured by R. Blattner describing the multiplicities of the irreducible representations of K, a maximal compact subgroup of G, in the restriction to K of a discrete series representation.

2. This has little to do with representation theory. It is about algebraic geometry, and emphasizes Wilfried's expertise in this area (which he often uses in doing representation theory). Hodge theory shows that the cohomology of a compact Kähler manifold has a bigraded structure known as a *Hodge structure*. The Hodge structure is not a topological invariant of the manifold—it reflects the complex structure. As an approach to describing the moduli of higher-dimensional algebraic varieties, Griffiths proposed looking at how the Hodge structure varies in families of algebraic varieties. Wilfried's original paper concerns the case of a one-dimensional family of Kähler varieties, which may degenerate at one point. Locally, this means

that one is studying a family of varieties parametrized by the punctured disk $D^* = \{z \in \mathbf{C} : 0 < |z| < 1\}$. In this context, Wilfried shows that the limit at the origin of the Hodge structures of the varieties in the family is a mixed Hodge structure that in some sense would be the Hodge structure of the fiber over 0, if that existed. The review of this paper in *Math Reviews* finishes with the opinion that "this paper must surely play a key role in future work on Hodge theory." In a pair of papers with Eduardo Cattani and Aroldo Kaplan, Wilfried later generalized this to families of higher dimension.

3. In their work on the classification of representations, Dan Barbasch and David Vogan attached two geometric invariants with analogous structure to an irreducible representation. One invariant reflected the structure of the restriction of the representation to K. The other reflected the analytic behavior of the character (in the sense of Harish-Chandra) of the representation. Barbasch and Vogan conjectured that the two invariants were related in a precise way (known as the Kostant-Sekiguchi correspondence). In a series of papers with Kari Vilonen, Wilfried showed that this was correct.