

CHARTER RENEWAL APPLICATION
SIAG on Linear Algebra

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Linear Algebra. The SIAM Activity Group (or SIAG) to which this renewal applies was originally formed under the aegis of SIAM on July 18, 1982 by the SIAM Council and also in July 1982 by the SIAM Board of Trustees with its initial operating period beginning July 1982 and ending December 31, 1985. Its charter has been renewed by the Council and Board four times thereafter. This SIAG has 450 members as of March 31, 2006.

According to its Rules of Procedure, the objective(s) of the SIAG are to identify and explore the links between linear algebra and other applied sciences, to stimulate the applications of linear algebra, and to foster research in linear algebra and its applications.

Its purposed functions were to conduct sessions at regular SIAM meetings, conduct special meetings, and participate in organizing publications in the areas of linear algebra and its applications.

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The SIAG has complemented SIAM's activities and supported its proposed functions. The answers to the questions below indicate how this was accomplished and what the officers propose as the future directions for the SIAG.

1. How is the field covered by the activity group doing? Is it growing, is the focus shifting? What have been the significant advances over the last three years?

Occasional pronouncements on the decline of linear algebra notwithstanding linear algebra is burgeoning and thriving. One indicator is the large number of diverse minisymposia at the forthcoming GAMM-SIAM meeting in Duesseldorf.

The focus of applied and numerical linear algebra has been shifting towards applications. More papers with a strong focus on applied and numerical linear algebra are being published in "applied" journals, such as engineering, computer science, and physics journals. This is especially true for topics such as iterative methods, preconditioning, eigensolvers, nonnegative factorizations, Markov chains (including methods for "Google-type" problems), structured matrix algorithms (e.g., in signal/image processing and in quantum computing) and matrix functions.

We would like to single out three significant advances in the last three years:

- (a) The theory and application of inexact Krylov methods, especially in eigenvalue computations, has an increasing impact in many areas of computational science.
- (b) Robust general purpose preconditioners for highly indefinite and

unstructured linear systems, where a combination of direct solver technology and multilevel ideas is used to construct algebraic preconditioners.

(c) Greatly improved algorithms for model order reduction based on Krylov subspace methods.

2. How is the activity group doing? Is it remaining vibrant? Is the size of the SIAG stable or increasing? How is the SIAG keeping up with the changes in the field? How are the broader interests of SIAM reflected in the activities of the SIAG?

The activity group is doing well. SIAGLA membership has increased to 457 members (as of 8 May) from 413 members four years ago (15 May 2002).

In addition to organizing a SIAM Conference on Applied Linear Algebra every three years, we have been sponsoring numerous conferences and organizing minisymposia at the SIAM Annual Meetings. The SIAGLA had a track at the 2005 Annual Meeting. We are also making a concerted effort to strengthen our ties with other societies, such as the International Linear Algebra Society (ILAS) and the German applied mathematics society (GAMM), by sponsoring plenary speakers and holding the linear algebra meeting in Europe for the first time.

The SIAGLA also tries to maintain visibility within SIAM by publishing articles in SIAM News.

3. Please list conferences/workshops the activity group has sponsored or co-sponsored over the past three years, and give a brief (one sentence or phrase) indication of the success or problems with each.

a) We have organized two meetings: The eighth SIAM Conference on Applied Linear Algebra at the College of William and Mary, 15-19 July 2003; and the Joint GAMM-SIAM Conference on Applied Linear Algebra in Duesseldorf, Germany, 24-27 July 2006. ILAS sponsored two speakers at each meeting.

The 2006 conference is organized jointly with GAMM, the German applied mathematics Society. The 2006 meeting has more talks than the 2003 meeting: 28 minisymposium sessions have been scheduled (compared to 26 in 2003) and 23 sessions of contributed talks (compared to 18 in 2003). The total number of talks is 220.

Conference attendance has been monotonically increasing. Attendance for the 2006 meeting is 250 (as of 8 May), and estimated to be about 270 at the time of the meeting. This compares favourably to previous attendance figures:

ALA 2003	261
ALA 2000	235
ALA 1997	166

b) We have sponsored the following meetings:

Matrix Analysis and Applied Linear Algebra, A meeting in honor of Carl Meyer on the occasion of his 60th birthday, North Carolina State University, 15 May 2003

Third International Conference on Preconditioning Techniques for Large Sparse Matrix Problems, Napa, California, 26-28 October 2003

IWASEP5, V International Workshop on Accurate Solution of Eigenvalue Problems, Hagen, Germany, 28 June - 1 July 2004

Householder Symposium XVI, Seven Springs Mountain Resort, Campion, Pennsylvania, 23-27 May, 2005

Fourth International Conference on Preconditioning Techniques for Large Sparse Matrix Problems, Emory University, Atlanta, 19-21 May 2005

c) We co-operated with the 11th ILAS conference in Coimbra, Portugal, 19-22 July 2004, where we sponsored two SIAGLA lecturers.

4. Please indicate the number of minisymposia directly organized by the activity group at the last two SIAM annual meetings. When did the SIAG last organize a track of minisymposia at an annual meeting?

a) 2003 SIAM Annual Meeting in Montreal, Canada:

Sparse Direct Solution Techniques for Linear Systems and Eigenvalue Problems (organized by Xiaoye Li)

Matlab Lessons and Experiences
(organized by Edmond Chow and Penny Anderson)

b) 2004 SIAM Annual Meeting in Portland:

Sparse Direct Methods, Combinatorial Techniques and their Applications
(organized by Iain Duff)

Alternatives to Eigenvalues, Parts I and II (organized by Anne Greenbaum)

Recent Advances in Matrix Eigenvalue Problems (organized by Nick Higham)

Computations and Applications of Tensor Decompositions (organized by Tammy Kolda)

Markov Chains and PageRank
(organized by Amy Langville and Carl Meyer)

c) The SIAGLA had a track the 2005 Annual Meeting in New Orleans:

Linear Algebra in Image Processing
(organized by Misha Kilmer)

Linear Systems and Matrix Functions in Computational Theoretical Physics (organized by Andreas Frommer and Ilse Ipsen)

Eigenvector Methods in Information Retrieval (organized by Amy Langville and Carl Meyer)

Historical Aspects of Numerical Linear Algebra (organized by Michele Benzi)

The plenary speakers were Volker Mehrmann and Martin Gander.

d) In addition to the above minisymposia sponsored by the SIAGLA many other linear algebra-oriented minisymposia have been organized. This includes a two-part minisymposium on model reduction and a four-part minisymposium on structured matrices and fast algorithms at the 2006 Annual Meeting.

5. Please indicate other activities sponsored by the activity group, to include newsletters, prizes and Web sites. Have each of these been active and successful?

a) Articles in SIAM News:

James G. Nagy: "Kronecker Products in Image Restoration", SIAM News, vol. 36, no. 4, p 3, May 2003

Andreas Frommer: "QCD Simulations: Minuscule Particles, Gigantic Computations", SIAM News, vol. 36, no. 5, p 1, June 2003

Nick Higham: "SIAG/LA Prize Winners Speed up the QR Algorithm", SIAM News, vol. 36, no. 9, November 2003

Ilse Ipsen: "Accurate Eigenvalues for Fast Trains", SIAM News, vol. 37, no. 9, November 2004, pp 1-2

Beresford Parlett: "Accurate Eigenvalues, Anyone?", SIAM News, vol. 37, no. 9, November 2004, p 3

M.E. Kilmer and C.D. Moravitz Matin: "Decomposing a Tensor", SIAM News, vol. 37, no. 9, November 2004, p 20

Nick Higham: "An Interview with Peter Lancaster", SIAM News, vol. 38, no. 6, July/August 2005, pp 5-6

b) SIAGLA Prize:

In 2003 the SIAGLA prize was awarded to Karen Brennan, Ralph Byers, and Roy Mathias for their paper "The Multishift QR Algorithm. Part II: Aggressive Early Deflation", SIAM J. Matrix Anal. Appl., vol. 23, no. 4, pp 948-973 (2002).

In 2006 the SIAGLA prize will be awarded to Inderjit Dhillon and Beresford Parlett for their paper "Orthogonal Eigenvectors and Relative Gaps", SIAM J. Matrix Anal. Appl., vol. 25, no. 3, pp

858-899 (2004).

c) Web Page

All activities of the SIAG and other items of interest are published on the web page <http://www.tufts.edu/emkilmer01/siagla/index.html>

d) Mailing List:

The SIAGLA maintains a mailing list, to which all SIAGLA members are automatically subscribed and to which announcements can be posted. Information about new papers published in SIMAX is automatically forwarded to the mailing list.

6. What activities are planned and proposed for the next period of the charter? Please describe scheduled and suggested future activities in detail.

We will continue to organize SIAM Conferences on Applied Linear Algebra. One possible option would be to hook up with the SIAM Annual Meeting in 2009.

We will also continue to foster collaboration with other organizations such as ILAS and GAMM, and sponsor other linear algebra-related conferences such as the triennial Householder meeting. Similarly we will continue to award the SIAM Linear Algebra Prize every three years, and to maintain our electronic mailing list and web page.

7. How can SIAM help the activity group achieve its goals?

SIAM is already providing much support for the SIAG, with a journal, a conference and many SIAM books in our area, and the SIAM staff are very responsive and helpful.

However more financial travel support for students and postdocs would be helpful, in particular for meetings abroad.

8. How can the activity group help SIAM in its general role of promoting applied mathematics and computational science?

We will try to continue publishing articles in SIAM News to promote linear algebra and inform about the activities of the SIAG. Other than that, it is important that we maintain the number and quality of linear algebra minisymposia and invited speakers at SIAM meetings.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a three-year operating period beginning January 1, 2007.

Signed
Ilse Ipsen
10 May 2006

Linear Algebra

The SIAM Activity Group on Linear Algebra promotes research in linear algebra and its applications. The group organizes regular conferences such as the SIAM Conference on Linear Algebra in Signals, Systems, and Control and the triennial SIAM Conference on Applied Linear Algebra. They also support smaller, less formal conferences as requested by the membership. Every three years the activity group awards prizes for the best paper and the best poster in linear algebra.

The activity group maintains an electronic discussion group and publishes a column periodically in *SIAM News* presenting primarily survey articles on advances and activities in linear algebra.

Chair: [Ilse C. F. Ipsen](#) (01/01/04 - 12/31/06)

Vice Chair: [Anne Greenbaum](#) (01/01/04 - 12/31/06)

Secretary: [Misha Elena Kilmer](#) (01/01/04 - 12/31/06)

Program Director: [Michele Benzi](#) (01/01/04 - 12/31/06)