



The Bulletin of the International Linear Algebra Society

Serving the International Linear Algebra Community

Edited by S.J. Leon and R.C. Thompson

Issue 4

JANUARY 1990



Group picture taken at the ILAS Inaugural Conference, August 1989

ILAS INAUGURAL CONFERENCE HELD AT BYU

Report by Wayne Barrett

The Inaugural Conference of the International Linear Algebra Society — ILAS was held 12–15 August 1989 at Brigham Young University. There were eighty-five participants who came from the countries of Japan, Taiwan, Hong Kong, India, Israel, Finland, Hungary, West Germany, the Netherlands, Belgium, Spain, Portugal, Ireland, Canada, and the United States. Funds provided by Brigham Young University and by the National Security Agency and the National Science Foundation of the United States contributed to the success of the meeting.



Picture of ILAS officers taken at the ILAS Inaugural Conference. From left to right: Danny Hershkowitz, Secretary, Hans Schneider, President, Bob Thompson, Vice-President, Steve Leon, Co-editor of *IMAGE*, Jim Weaver, Treasurer

The organizing committee for the conference consisted of Wayne Barrett, Brigham Young University, Daniel Hershkowitz, Technion-Israel Institute of Technology, Charles Johnson, The College of William and Mary, Hans Schneider, University of Wisconsin, and Robert Thompson, University of California-Santa Barbara. James R. Weaver, ILAS Treasurer, contributed many hours to the details of registration and other matters. The meeting was held on the BYU campus the 12th, 14th and 15th; there was a morning session of talks and a luncheon buffet on the 13th at Sundance, a local mountain resort. Many participants took advantage of the pleasant weather and attractive scenery to enjoy hiking, mountain biking, or conversing with each other.

The program consisted of a large number of carefully prepared, well-presented talks. In all there were thirty-seven 30-minute talks and twenty-three 15-minute talks. The proceedings of the conference will be published in a special issue of *Linear Algebra and its Applications*; special editors for the issue are Wayne Barrett, Daniel Hershkowitz and Donald Robinson.

LIST OF THIRTY MINUTE TALKS

T. Ando, Hokkaido University, *Symmetric Function Means for Positive-Definite Matrices*

R. B. Bapat, Indian Statistical Institute, *An Interlacing Theorem for Tridiagonal Matrices*

- H. Bart, Erasmus University, *Simultaneous Reduction to Complementary Triangular Forms of Pairs of Matrices*
- L. Beasley, Utah State University, *Linear Operators on Matrices over Semirings*
- A. Berman, Technion-Israel Institute of Technology, *Completely Positive Graphs*
- R. Bhatia, Indian Statistical Institute, *Bounds for the Distance Between the Roots of Two Polynomials*
- R. Brualdi, University of Wisconsin, *Small Matrices (of Large Dimension)*
- J. A. Dias da Silva, Universidade de Lisboa, Portugal, *Recent Work on Multilinear Algebra*
- J. Dancis, University of Maryland, *Hermitian Completions of Certain Band Matrices*
- B. N. Datta, Northern Illinois University, *Theoretical and Computational Aspects of some Matrix Theoretic Problems in Control Theory*
- S. Friedland, University of Illinois at Chicago, *Normal Forms for Definite Integer Unimodular Quadratic Forms*
- I. Gohberg, Tel Aviv University, *Completion Problems for Matrices and Control*
- M. Goldberg, Technion-Israel Institute of Technology, *Norms, Seminorms and Multiplicativity Factors*
- R. Grone, San Diego State University, *On the Geometry and Laplacian of a Graph*
- D. Hershkowitz, Technion-Israel Institute of Technology, *Height and Level Characteristics and their Relation*
- I. Koltracht, University of Connecticut, *Error Analysis for Cauchy and Vandermonde Matrices*
- C-K. Li, The College of William and Mary, *Linear Operators Preserving Certain Functions on Singular Values of Matrices*
- T. Laffey, University College, Dublin, *Solving the Equation $f(X) = A$ in Matrix Algebras*
- P. Lancaster, University of Calgary, *Selfadjoint Quadratic Eigenvalue Problems*
- R. Loewy, North Carolina State University and Technion-Israel Institute of Technology, *Cones of Nonnegative Matrices having Given Left and Right Perron Eigenvectors*
- M. Marcus, University of California, Santa Barbara, *Multilinear Methods in Linear Algebra*
- J. Maybee, University of Colorado, *On Problems of Matrix Rank and Some of Their Applications*
- V. Mehrmann, University of Bielefeld, Germany, *Generalizations of M-matrices occurring in Fluid Flow Computations*

- J. K. Merikoski, University of Tampere, Finland, *On c -Norms and c -Antinorms on Cones*
- R. Merris, California State University at Hayward, *Schwenk's Theorem for the Laplacian Matrix*
- D. Olesky, University of Victoria, *Sparsity Analysis of the QR Factorization*
- S. Pierce, San Diego State University, *Extreme Points of the Positive Semidefinite Doubly Stochastic Matrices*
- R. Puystjens, Universiteit Gent, Belgium, *Generalized Invertibility of a Product*
- J. F. Quiero, Universidade de Coimbra, Portugal, *Generalized Invariant Factors*
- L. Rodman, The College of William and Mary, *Common Divisors and Common Multiples of Rational Matrix Functions*
- F. C. Silva, Faculdade de Ciencias de Lisboa, Portugal, *Existence of Matrices with Prescribed Submatrices*
- B-S. Tam, Tamkang University, Taiwan, *A Study of Projectionally Exposed Cones*
- O. Taussky-Todd, California Institute of Technology, *My Matrix Connections with Mark Kac*
- N-K. Tsing, University of Maryland, *G-invariant Norms and G-radii*
- F. Uhlig, Auburn University, *Classifications of Inertiaed Matrix Pencils via Quadratic Forms and Joint Fields of Values*
- H. J. Werner, University of Bonn, F.R.G., *Some Results on Generalizations of Matrix Monotonicity*
- H. Woerdeman, Vrije Universiteit, Amsterdam, *Matrix Completion Problems*

LIST OF FIFTEEN MINUTE TALKS

- Y-H. Au-Yeung, University of Hong Kong, *Permutation Matrices whose Convex Combinations are Orthostochastic*
- J. Bevis, Georgia State University, *Integer LU-factorizations of Integral Matrices*
- R. Bru, University Politecnica de Valencia, *Marked Invariant Subspaces*
- B. Cain, Iowa State University, *Monotone Map Facts and Why Controllability Persists*
- Y. Censor, University of Haifa, *Interval Constrained Matrix Balancing*
- N. Cohen, Weizmann Institute, Israel, *Linear Fractional Decompositions of Rational Matrix Valued Functions*

- C. Cowen, Purdue University, *Using Hadamard Products to Transfer Structure of Hilbert Space Operators*
- R. DeMarr, University of New Mexico, *Refinements of Nonnegative Idempotent Matrices*
- R. Ellis, University of Maryland, *Rank-preserving Extensions of Band Matrices*
- C. Eschenbach, Georgia State University, *Combinatorial Generalizations of Singular Matrices*
- S. Leon, Southeastern Massachusetts University, *Matrix and Other Methods for Solving Integral Equations of the First Kind with Applications to Remote Temperature Sensing*
- M. Lundquist, The College of William and Mary, *Matrix Completion Problems with Linear Constraints*
- R. Mathias, Cornell University, *Concavity of Monotone Matrix Functions of Finite Order*
- P. Nylén, Auburn University, *Cases of Equality for the Spectral Norm; Submultiplicativity of the Hadamard Product*
- K. Okubo, Hokkaido University, *On Schur Multiplicative Operator Norms*
- P. Rozsa, Technical University of Budapest, Hungary, *Block Tridiagonal Matrices, Band Matrices and their Inverses*
- E. Schreiner, Western Michigan University, *Explicit Jordan Form for Certain Block Triangular Matrices*
- D. Scully, Saint Cloud State University, *Maximal Rank-One Spaces of Matrices Over Chain Semirings*
- D. Slock, Stanford University, *A Stochastic Interpretation for the Generalized Schur and Levinson Algorithm and the Chandrasekhar Algorithm*
- G. Soules, IDA, Communications Research Division, *The Rate of Convergence of Sinkhorn Balancing*
- R. Stern, Concordia University, Montreal, *Results on Invariant Ellipsoidal Cones*
- J. Stuart, University of Southern Mississippi, *Matrices that Commute with a Permutation Matrix*
- J. Todd, California Institute of Technology, *Another Look at a Matrix of Mark Kac*

Fifth Issue of *IMAGE* Planned for July 1990

IMAGE is edited by S. J. Leon and R. C. Thompson. Ann Cox served as assistant editor in charge of printing and mailing for issue 4. News items for the fifth issue should be sent to:

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All news of interest to the Linear Algebra community is welcome including: news of conferences, journals and books, upcoming events, and activities of members. E-mail appears to be the fastest and most efficient way to submit news items.

Future issues of *IMAGE* will contain feature articles on linear algebra activities in other countries. These articles should be no more than three pages in length. We will also feature more book reviews. Reviewers who need review copies of books should contact S.J. Leon. If you're a member of ILAS then *IMAGE* is your publication. It needs your support. Please keep us informed about the linear algebra activities in your country.

The International Linear Algebra Society also maintains an electronic news service *ILAS-NET* edited by Danny Hershkowitz. If you want to submit news items or to have your name added to the *ILAS-NET* distribution list, send a message to Danny at:

MAR23AA@TECHNION.BITNET

NEWS ITEMS

ILAS Developments

Report by Daniel Hershkowitz

The following is a summary of actions taken by the executive board, the nomination committee, and the president of ILAS during the ILAS Inaugural conference, August 1989, Provo, Utah, U.S.A..

1. The official date of the incorporation of the International Linear Algebra Society, Inc. is March 1, 1989. On that date ILAS was fully recognized by the State of Florida as a Florida Corporation Not For Profit. We are now in the process of filing Form 1023 with the Department of Treasury, Internal Revenue Service of the United States of America. Once this process is completed and we are recognized as a tax-exempt organization in the eyes of the federal government, contributions made to ILAS will be deductible from ones federal income tax.
2. This issue of *IMAGE* and the next one will be mailed to everyone currently on our mailing list. Later, starting 1991, *IMAGE* will be sent to members only. Members will be granted the whole year for membership renewal, that is, *IMAGE* will be mailed to those on the membership list for 1990 during 1991,

3. As required by our by-laws, the executive committee and board of directors will be elected in the future. In 1990 there will be elections for vice president and secretary. The nomination committee for the 1990 elections, consisting of Richard A. Brualdi (Chairman), Shmuel Friedland, Tom Laffey, Dias Da Silva, and Yik-Hoi Au-Yeung, has nominated Robert C. Thompson for the position of vice president and Daniel Hershkowitz for the position of secretary. Note that according to ILAS' by-laws, every three members of ILAS can suggest additional candidates for election. Such suggestions should be sent to Richard A. Brualdi, Math. Dept., Madison, WI 53706, U.S.A., no later than 31 March 1991. The elections will take place by mail in April or May 1991. Elections for president and treasurer will be held in 1991.
4. Tom Ando and Harm Bart were appointed to serve as members of the board of directors. Ando's term will expire in 1991, and Bart's in 1992. At these times, their positions will be filled by election.

The Second International Linear Algebra Society Conference

Report by Hans Schneider

The International Linear Algebra Society is pleased to announce its second conference

LINEAR ALGEBRA, NUMERICAL LINEAR ALGEBRA AND APPLICATIONS

to be held at Northern Illinois University, De Kalb, Illinois, U.S.A. The tentative dates are April 25-28, 1991.

The conference has been sponsored by Northern Illinois University. Professors Biswa Nath Datta of Northern Illinois University and Hans Schneider of University of Wisconsin are the co-chairmen of the organizing committee.

The conference will cover all active research areas of core and numerical linear algebra and their applications to systems and control theory, signal processing, statistics, combinatorics, mathematical economics and modeling, etc.

The purpose of the conference is to bring together researchers in linear algebra, numerical linear algebra, and those working in various applications areas for an effective exchange of ideas and discussions on recent developments and future directions.

All (and particularly members of ILAS) are encouraged to send suggestions for the meeting to either of the co-organizers.

ILAS Conference in Portugal Planned for Summer 1992

Report by Jose da Silva

An ILAS meeting is being planned for the summer of 1992 at Lisbon University, Portugal. It will be jointly organized by the groups of Portuguese and Spanish Linear Algebraists. It is hoped that there will be speakers from all aspects of the field, e.g numerical linear algebra, systems theory, multilinear algebra, core linear algebra, etc. Further information will be supplied in future issues of *IMAGE*.

The Second International Workshop on SVD and Signal Processing

Report by Rick Vaccaro

The Second International Workshop on Singular Value Decomposition (SVD) and Signal Processing, will be held June 25-27, 1990 at the University of Rhode Island, Kingston, RI, USA. This meeting is an outgrowth of a previous workshop of the same name which was held in Les Houches, France in September of 1987. The goal of this workshop is to bring together active researchers in several fields related to the SVD. The workshop is sponsored by the College of Engineering at the University of Rhode Island in cooperation with the ASSP (signal processing) Society of the IEEE, by EURASIP (the European signal processing society), and by SIAM (society for industrial and applied mathematics).

Papers are solicited for technical sessions on the following and related topics:

Algorithms for the SVD including parallel implementation, real-time, and adaptive algorithms. Complexity, accuracy, and convergence.

Special purpose signal processing applications such as array processing, model identification, model reduction, spectrum analysis, and harmonic retrieval.

Performance analysis and resolution limits of SVD-based algorithms. Error analysis.

Special purpose architectures for computing the SVD.

Other topics related to the SVD and its application are welcome. Authors are invited to submit three copies of a four page extended summary to R.J. Vaccaro, Dept. of Electrical Engineering, University of Rhode Island, Kingston RI 02881. The deadline for submission is January 29, 1990. Authors of accepted papers will be asked to prepare a version for publication in a conference proceedings. All regular sessions will be poster presentations. In addition, the workshop will include a number of invited plenary talks on topics of general interest.

The Conference Committee consists of Richard J. Vaccaro, G. Faye Boudreaux-Bartels, Ed F. Deprettere, Gene H. Golub, Franklyn T. Luk, and Don Tufts.

Alston S. Householder Award V (1990)

Report by G. W. Stewart

In recognition of the outstanding services of Alston Householder, former Director of the Mathematics Division of the Oak Ridge National Laboratory and Professor at the University of Tennessee, to numerical analysis and linear algebra, it was decided at the Fourth Gatlinburg Symposium (now renamed the Householder Symposium) in 1969 to establish the Householder Award. This award is in the area in which Professor Householder has worked and its natural developments, as exemplified by the international Gatlinburg Symposia [see A. S. Householder, *The Gatlinburgs*, SIAM Review 16: 340-343 (1974)]. Recent recipients of the award include James Demmel (Berkeley), Ralph Byers (Cornell), and Nicholas Higham (Manchester).

The Householder Prize V (1990) will be awarded to the author of the best thesis in Numerical Algebra. The term Numerical Algebra is intended to describe those parts of

mathematical research which have both algebraic aspects and numerical content or implications. Thus the term covers, for example, linear algebra that has numerical applications or the algebraic aspects of ordinary differential, partial differential, integral, and nonlinear equations.

The thesis will be assessed by an international committee consisting of Chandler Davis (Toronto), Beresford Parlett (Berkeley), Axel Ruhe (Gothenborg), Pete Stewart (Maryland), and Paul Van Dooren (Phillips, Belgium).

To qualify, the thesis must be for a degree at the level of an American Ph.D. awarded between 1 January 1987 and 31 December 1989. An equivalent piece of work will be acceptable from those countries where no formal thesis is normally written at that level. The candidate's sponsor (e.g., supervisor of his research) should submit five copies of the thesis (or equivalent) together with an appraisal to: Professor G. W. Stewart, Department of Computer Science, University of Maryland, College Park, MD 20742, USA by 28 February 1990. The award will be announced at the Householder XI meeting and the candidates on the short list will receive invitations to that meeting.

MATLAB Users Group

Report by S. J. Leon

MATLAB is an interactive software package for matrix computations. It is widely used by linear algebra teachers and researchers. This software was developed by Cleve Moler and is distributed by the Mathworks, Inc., 21 Eliot Street, South Natick, MA 01760. A MATLAB Users Group has been organized by Chris Bischof, Howard Wilson and Don Mackison to provide a forum for discussion among MATLAB users and a facility for sharing code. Chris Bischof is acting as editor of the electronic newsletter for the group. In order to have your name added to the mailing list, send Chris a message at the following e-mail address: matlab-users-request@mcs.anl.gov. Discussion items for the newsletter should be sent to: matlab-users@mcs.anl.gov. You can also submit code for MATLAB routines to: matlab-library@mcs.anl.gov. Further information about the users group can be obtained from Christian Bischof, Math. & Comp. Sc. Division, Argonne National Laboratory, 9700 S. Cass Ave, Argonne, IL 60439

MATLAB Primer

Report by Kermit Sigmon

As I was teaching a course several years ago in which use of MATLAB was required, I realized that there was no document available to help the students begin to use MATLAB. To fill this void I wrote a 25 page document *MATLAB Primer* which is intended for student use in courses which require use of MATLAB. While this is its primary purpose, it could, of course, serve as an introduction to MATLAB for others.

The Primer has been used with success in a number of courses across the campus at the University of Florida for the last several years. The Primer, along with the on-line help facility, usually suffice for the students to use MATLAB in a classroom setting. It assumes, however, that the complete MATLAB User's Guide is available for review at certain locations

— such as consulting desks, terminal rooms, computing laboratories, and the reference desk in the library — as a source for more in-depth information.

I am now happy to share the (plain) T_EX source for *MATLAB Primer* with others. If you would like to take a look at the Primer, please let me know at the address below; I will send you the T_EX source via email. It is also available via netlib; send the message *send primer.tex from matlab/teaching to netlib@ornl.gov*.

The most convenient method of distribution to students seems to be through a local copy center where the student can purchase it for a few dollars. I have an agreement with Kinko's copy centers for distribution of the Primer. If you wish to use the Primer in your classes, please send me the address and telephone number of the most convenient Kinko's; I should be able to have the Primer available there within a week. If there is no Kinko's in your area you may, of course, use another copy center.

Kermit Sigmon, Department of Mathematics, University of Florida, Gainesville, Florida 32611, e-mail: sigmon@tarheel.math.ufl.edu or sigmon@ufpine.bitnet

CALENDAR OF COMING CONFERENCES

March 20–23, 1990 Directions in Matrix Theory Conference, Auburn, Alabama
Information: Frank Uhlig or Tin-Yau Tam, Department of Mathematics-ACA, Auburn University, Alabama 36849-5307 (See also article in *IMAGE* #3)

April 1–5, 1990 Copper Mountain Conference on Iterative Methods, Copper Mountain Colorado
Information: Tom Manteuffel, University of Colorado at Denver, Computational Mathematics Group, 1200 Larimer Street, Campus Box 170, Denver, CO 80204

June 11–14, 1990 The Sixth Haifa Matrix Conference, Technion - Israel Institute of Technology, Haifa, Israel
Information: Contact Avi Berman or Daniel Hershkowitz, Technion, Department of Mathematics, 32000 Haifa, Israel, e-mail: MAR23AA@TECHNION.BITNET (See also article in *IMAGE* #3)

June 18–22, 1990 Householder Symposium XI, Tylosand, Halmstad, Sweden
Information: Contact Ake Bjorck, Dept of Mathematics, Linkoping University, S-581 83 Linkoping, Sweden, e-mail: na-bjorck (See also article in *IMAGE* #3)

June 25–27, 1990 Second International Workshop on Singular Value Decomposition and Signal Processing, University of Rhode Island, Kingston, RI
Information: R. J. Vaccaro, Dept of Electrical Engineering, University of Rhode Island, Kingston, RI, 02881, e-mail: vaccaro@quahog.uri.edu. (See article in this issue)

August 20–25, 1990 Janos Bolyai Mathematical Society, 5th Conference on Numerical Methods, Technical University for Heavy Industry Miskolc, Hungary (Miskolc is about 180 km northeast of Budapest)
Focus of Conference: Survey recent results in Numerical Algebra and in Numerical Solution of Differential Equations.

Information: Katalin Balla, Janos Bolyai Mathematical Society, H 1368 Budapest, Pf. 240, Hungary

September 9-22, 1990, NATO Advanced Study Institutes Course — Computer Algorithms for Solving Linear Algebraic Equations: The State of the Art, Centro Congressi Il Ciocco, Tuscany, Italy

Application deadline: May 15, 1990. Attendance by invitation only.

Information: Emilio Spedicato, Dipartimento di Matematica, Università, Piazza Rosate, 24100 Bergamo, Italy

November 5-7, 1990, SIAM Conference on Linear Algebra in Signals, Systems and Control, San Francisco, CA. A short course is planned for Nov. 4.

Focus: The interrelationship between theoretical and computational linear algebra with application areas such as signal processing and control and systems theory.

Information: Contact David Carlson, Dept. Math., CSU San Diego, CA 92182 or Biswa N. Datta, Dept. Math., Northern Illinois Univ., DeKalb, IL 60115

April 25-28, 1991, ILAS Conference: Linear Algebra, Numerical Linear Algebra and Applications, Northern Illinois University

Information: See article in this issue of *IMAGE*

Summer 1991, International Conference on Linear Algebra and Applications, Fudan University, Shanghai, China

Information: B. Datta, Dept of Math., Northern Illinois Univ., DeKalb, IL 60115, (niuvax!datta@mcs.anl.gov)

1991-92 Applied Linear Algebra Year, IMA, University of Minnesota

Emphasis: Fall Quarter: Discrete Matrix Analysis, Winter Quarter: Matrix computations, Spring Quarter: Signal Processing, Systems and Control

Information: R.A. Brualdi, Dept. of Math., Univ. of Wisconsin, Madison, WI 53706, e-mail: brualdi@vanvleck.math.wisc.edu (See also *IMAGE* #2)

September 14-19, 1991, SIAM Conference on Applied Linear Algebra, Minneapolis, Minnesota

Summer 1992 Third ILAS Conference, Lisbon University, Portugal

Information: See future issues of *IMAGE*

REPORTS ON CONFERENCES ATTENDED

NIU Conference on Linear Algebra, Numerical Linear Algebra and Applications

Report by Biswa Nath Datta

A conference entitled *Linear Algebra, Numerical Linear Algebra and Applications* was held at Northern Illinois University, DeKalb, Illinois, April 29-30, 1989. The conference was organized by Biswa Nath Datta (Chair), Greg Ammar, and Karabi Datta, all from NIU.

The conference was sponsored and supported by the Institute for Mathematics and its Applications (Minnesota) and Northern Illinois University's Dept of Mathematical Sciences, Graduate School, College of Liberal Arts and Sciences, and College of Continuing Education.

The purpose of the conference was to bring together researchers in linear algebra, numerical linear algebra, and those working in various areas such as Control and Systems Theory and Signal Processing for an effective exchange of ideas and discussion of recent developments and future directions of research. A special effort was made to strengthen the ties and enhance communications between two subgroups: theoretical and computational linear algebraists. These two groups often work independently without much interaction. However, a rapidly growing interest in interdisciplinary research which gives rise to both theoretical and computational problems in linear algebra has fueled the needs of mutual interactions and collaborations. A conference was a step forward in this direction. It is believed that both groups were benefited by the conference.

About fifty people from all across the country attended the conference. The opening remarks were made by the conference chairman Biswa Nath Datta, Dr. J. Norris, Dean of the Graduate School and Associate Provost for Research, and Dr. J. Norris, Dean of the College of Arts and Sciences at NIU. There was an evening dinner for the conference participants at a local Chinese restaurant followed by a reception at the University.

The following is a list of the speakers with their affiliations and titles of talks. The speakers are listed in the order the talks were given.

H. Schneider, Univ. of Wisconsin, *Towers and Cycle Covers for Max-balanced Graphs*

W. Trench, Trinity University, San Antonio, *Spectral Properties of Real Symmetric Toeplitz Matrices*

R. Brualdi, Univ. of Wisconsin, *Some Generalizations of the Exponent of a Primitive Matrix*

W. Gragg, Naval Postgraduate School, Monterey, California, *Going around on Circles*

G. Cybenko, Univ. of Illinois, *Hyperbolic Householder Algorithms for Factoring Structured Matrices*

P. Eberlein, SUNY at Buffalo, *Jacobi Sets and Convergence Behavior of Jacobi-type Algorithms*

C. Johnson, College of William and Mary, *Some Matrix Problems that have Frustrated Me*

W. Hager, University of Florida, Gainesville, *Updating the Inverse of a Matrix*

L. Rodman, College of William and Mary, *Rate of Convergence of Invariant Subspaces*

E. Houstias, Purdue University, *Parallel ELLPACK*

H. Walker, Utah State Univ., *The GMRES Method*

B. DeMoor, Stanford Univ., *The Restricted Singular Value Decomposition: Properties and Applications*

- C. K. Li, College of William and Mary, *Linear Operators Preserving Certain Equivalent Relations on Matrices*
- A. Sameh, Univ. of Illinois, *A Robust Parallel Solver for Non-self Adjoint Elliptic Partial Differential Equations*
- D. Sorensen, Argonne National Laboratory, *On the Orthogonality of Eigenvectors Computed by a Divide and Conquer Method*
- M. Neumann, Univ. of Connecticut, *Parallelizing ARTSQR*
- S. Friedland, Univ. of Illinois at Chicago, *Coherent Algebras and the Graph Isomorphism Problem*
- D. Carlson, San Diego State University, *Linear Matrix Equations*
- R. Mathias, Johns Hopkins University, *Cauchy-Schwarz Inequalities for Positive Semi-definite Matrices*
- B. Ghosh, Washington University, St. Louis, *Robust Stabilization of Linear Time-Varying Systems*
- R. Byers, Univ. of Kansas, *Detecting Nearly Uncontrollable Pairs*
- N. Nichols, North Carolina State University, *Robust Eigenvalue-Assignment by Output Feedback*
- L. T. Grujic, University of Notre Dame and University of Belgrade, *Algebraic Conditions for Algebraic Tracking Control of Discrete-time Lurie System*
- T. E. S. Raghavan, Univ. of Illinois at Chicago, *On Scaling Multidimensional Matrices*
- L. Reichel, University of Kentucky and IBM Bergen Research Center, *Fast QR Decomposition of Vandermonde-like Matrices and Polynomial Least Squares Approximation*
- C. T. Pan, Northern Illinois University, *A Faster and Stable Downdating Cholesky Factorization Algorithm*
- Y. P. Hong, Northern Illinois University, *ϕ -equivalence of Complex Matrices*

Linear Algebra at the MTNS '89

Report by B. N. Datta

Linear Algebra was well represented at the last International Symposium on Mathematical Theory of Networks and Systems (MTNS '89) held in Amsterdam, the Netherlands, June 19-23, 1989. On the invitation by the conference, Chairman Biswa Nath Datta organized and chaired two invited sessions on Large-scale and Parallel Matrix Computations and their applications to control, systems and signal processing. Gene H. Golub, Beresford Parlett, Ahmed Sameh, Youcef Saad, George Cybenko, Dan Boley, and Israel Koltracht participated

and gave talks in these sessions. Paul Van Dooren also organized several invited sessions on Numerical Methods for systems and Control. The speakers in these sessions included Greg Ammar, Dan Boley, Bo Kagstrom, George Miminis, Nancy Nichols, A. Bunse-Gerstner, Volker Mehrmann, Lothar Reichel, S. Van Huffel, Youcef Saad and Ralph Byers. Two invited special sessions on Matrix Equations and their Applications were organized by L. Lerer. Peter Lancaster, E. Emre, P. Agathoklis, Danny Hershkowitz and A. Ben-Artzi gave talks in these sessions.

In addition, there were several contributed sessions on Linear Algebra and its Applications. Tom Kailath gave a one-hour plenary talk on *Fast Algorithms: From Riccati Differential Equations to Linear Algebraic Equations*.

Datta, Van Dooren, Kailath, Lerer, A. Laub, and L. Rodman were members of the Program Committee for this conference.

Matrix and Operator Theory Workshop

Report by Harm Bart

The workshop was held at the Erasmus University in Rotterdam, during the period June 26-29, 1989. There were 61 participants from 12 different countries. It is worth noticing that six mathematicians from Eastern Europe visited the meeting (one from DDR and five from the Soviet Union). The number of lectures (some plenary, some in parallel sessions) was 48. A special feature was the lecture by Louis de Branges on his recent work concerning the Riemann hypothesis. Proceedings will appear in the Birkhäuser series *Operator Theory: Advances and Applications*

JOURNAL NEWS

LINEAR ALGEBRA AND ITS APPLICATIONS (LAA) Special Issues

- | | |
|----------------------|---|
| Title: | Matrix Valued Functions |
| Special Editors: | J.A. Ball, L. Rodman, P. Van Dooren |
| Full Announcement: | LAA vol. 106, August 1988 |
| Submission deadline: | July 1989 |
| | |
| Title: | Interior Point Methods for Linear Programming |
| Special Editors: | D. Gay, M. Kojima, R. Tapia |
| Full Announcement: | LAA vol. 110, November 1988 |
| Submission Deadline: | August 1989 |
| | |
| Title: | Matrix Canonical Forms |
| Special Editors: | R.A. Horn, R.J. Laffey, R.L. Merris |
| Full Announcement: | LAA vol. 113, February 1989 |
| Submission Deadline: | November 1989 |

Title: Iterations in Linear Algebra and in Applications
Special Editors: Owe Axelsson, John de Pillis, Michael Neumann,
Wilhelm Niethammer, Robert J. Plemmons
Full Announcement: LAA Vol. 116, April 1989
Submission Deadline: March 1990

Title: Algebraic Linear Algebra
Special Editors: R.M. Guralnick, W.H. Gustafson, L.S. Levy
Full Announcement: LAA Vol. 119, July 1989
Submission Deadline: August 1990

Title: Proceedings of Auburn 1990 Conference
Special Editors: Frank Uhlig, David Carlson
Full Announcement: See *IMAGE* #3
Submission Deadline: August 1, 1990

Title: Proceedings of the First Conference of the International
Linear Algebra Society
Special Editors: W. Barrett, D. Hershkowitz, and D. Robinson
Full Announcement: See article in this issue of *IMAGE*
Submission deadline: January 31, 1990

LINEAR AND MULTILINEAR ALGEBRA (LAMA)

The special issue on Algebraic Graph Theory is still accepting papers. The editor for this special issue is Russell L. Merris, Dept. of Math., California State University, Hayward, Hayward, CA 94542

Special Henryk Minc issues. Henryk Minc will be retiring in June, 1990. To commemorate this event **LAMA** is planning one or more special issues honoring Professor Minc. Interested parties should submit papers to R. C. Thompson, Dept. of Mathematics, Univ. of California, Santa Barbara, CA 93106

MULTIDIMENSIONAL SYSTEMS AND SIGNAL PROCESSING

Kluwer Academic Publishers announces a new international journal *Multidimensional Systems and Signal Processing* edited by Nirmal K. Bose, Pennsylvania State University (e-mail: NKB@PSUECL.BITNET). Co-editors are: Marwan Simaan, University of Pittsburgh and Jan Biemond, Delft University of Technology. A brochure describing the journal and containing subscription order forms can be obtained from the publisher: Kluwer, P.O. Box 358, Accord Station, Higham, MA, USA 02018-0358. A complete set of instructions for authors for the preparation of figures and the style of the manuscript will be supplied upon request. Letters to the Editors are also encouraged, will not be peer reviewed, and will be published on a space available basis.

NEWS ON BOOKS

Matrix Computations, Second Edition by Gene H. Golub and Charles F. Van Loan, Johns Hopkins University Press, 1989

Review by S. J. Leon

The first edition of *Matrix Computations* (1983) was a monumental work that took approximately six years to write. It has become the standard reference on the subject and the standard textbook to use for graduate courses. Now six years later the second edition appears with a wealth of new material.

The primary emphasis of the new material is to try to give an overview of the rapidly growing field of parallel matrix computations. To this end, the second edition contains two new chapters. Chapter 1 (Matrix Multiplication Problems) introduces notation and fundamental concepts necessary for exploiting new high performance computer architectures. Topics covered include: Basic Algorithms and Notations, Exploiting Structure, Block Matrices and Algorithms, and Aspects of Vector Pipeline Computing. Chapter 6 (Parallel Matrix Computations) has six sections covering the following topics: Distributed Memory Gaxpy, Shared Memory Gaxpy, Parallel Matrix Multiplication, Ring Factorization Procedures, Mesh Factorization Procedures, Shared Memory Factorization Methods. New material related to parallel computing has also been added to Chapters 3, 4, 7, 8.

The authors have rewritten and clarified many of the proofs and derivations from the first edition. They have also added new topics such as Arnoldi iteration, domain decomposition methods, and hyperbolic downdating. Clearly the second edition is an invaluable reference book that should be in every university library. With the new proofs and derivations, it should remain the text of choice for graduate courses in matrix computations.

Other Books of Interest

- *Nonnegative Matrices in Dynamic Systems* by Abraham Berman, Michael Neumann, and Ronald J. Stern, Wiley, 1989
- *The Gohberg Anniversary Collection, Volume I: The Calgary Conference on Matrix Theory Papers* edited by Harry Dym, Seymour Goldberg, Peter Lancaster, and Marinus Adriaan Kaashoek, Birkhäuser, 1989
- *Topics in Matrix Analysis* by Roger A. Horn and Charles R. Johnson, scheduled for publication in 1990 by Cambridge University Press. Their earlier book *Matrix Analysis* (1985) will be published in paperback form in February, 1990 by Cambridge University Press.

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