FOURTH ILAS CONFERENCE - ROTTERDAM

Report by Harm Bart

The Fourth Conference of the International Linear Algebra Society will be held at Erasmus University Rotterdam, The Netherlands on August 15 – 19, 1994. The organizing committee for the conference consists of H. Bart (Chair), L. Elsner, D. Hershkowitz, M. A. Kaashoek, T. J. Laffey, P. Lancaster, A. C. M. Ran, H. Schneider, and I. Zaballa.

INVITED TALKS

There will be ten invited 50 minute lectures. The invited speakers for these lectures are R. A. Brualdi, J. A. Dias da Silva, H. Dym, I. Gohberg, T. Kailath, V. Klee, L. Rodman, F. van Schagen, L. N. Trefethen, and P. Van Dooren

There is also a full slate of invited 30-minute lectures. These lectures will be given by J. A. Ball, A. Ben-Artzi, M. Boyle, R. Bru, A. Bunse-Gerstner, F. H. Chatelin, R. L. Ellis, S. Friedland, R. D. Grone, D. Handelman, G. Heinig, J. W. Helton, C. R. Johnson, I. Koltracht, A. J. Laub, D. C. Lay, L. Lerer, R. Loewy, M. Neumann, G. N. de Oliveira, F. Puerta Sales, A. C. M. Ran, U. G. Rothblum, G. Ph. A. Thijsse, R. C. Thompson, W. Watkins, H. Wimmer, and H. Woerdeman.

MINISYMPOSIA:

Linear Algebra and Systems Theory (organized R. Ober)
Perturbation Theory (organized L. Elsner)
Topics in Norm Theory (organized M. Goldberg)
Economic and Econometric Applications of Matrix Theory (organized T. J. Wansbeek)

CONTRIBUTED TALKS:

Call for papers. Parallel Sessions of 20-minute talks.
DEADLINE FOR ABSTRACTS: (max. 1 page) 31 March 1994.

SOCIAL ACTIVITIES: In addition to a free reception, the following optional activities are planned.

Conference Dinner, Speaker: J.J. Seidel (Eindhoven)
Excursion to the Delta Works: the ultra-modern, intricate system of dikes that protects the southwest of The Netherlands from the sea.
Family Members' Program.

SPECIAL ACTIVITIES:

Ceremony to present the Hans Schneider PRIZE to I. Gohberg (Tel Aviv/Amsterdam)
ILAS Business Meeting

PROCEEDINGS:

A special issue of the journal *Linear Algebra and its Applications* will be devoted to the meeting. Special editors are: H. Bart, L. Elsner, A. C. M. Ran. Only papers that meet the standards of the journal will be accepted. The DEADLINE for submitting papers is 30 November 1994.

INFORMATION:

For further information contact:

> ILAS 94 Local Arrangements Committee
> Econometric Institute
> Erasmus University Rotterdam
> Postbus 1738
> 3000 DR Rotterdam
> The Netherlands
> E-mail: bart@wis.few.eur.nl
> Fax: (++31)10.4527746

ILAS NEWS

ILAS Election Results

Report by Danny Hershkowitz

On the basis of a report received from the committee appointed to count the ballots for the recent ILAS elections (Jose da Silva and Philp Miles), the following have been elected to ILAS offices for a two year term beginning 1 March 1994:

President:	Hans Schneider
Treasurer:	James Weaver
Board of Directors:	Richard Brualdi and Thomas Laffey

We wish to thank all candidates for agreeing to stand for election to ILAS offices and extend are warmest congratulations to the winners.

ILAS Bylaws Committee is formed

Report by James R. Weaver

A committee consisting of Richard Brualdi and James Weaver (chair) has been appointed by President Hans Schneider to examine the ILAS bylaws in light of our past experience, and to consider recommendations for revision. As with other committees, the president is an ex-officio member of the committee. If you have any concerns about the bylaws and/or recommendations for changes, please communicate them to any member of the committee by March 1, 1994.

NEXT ISSUE OF $\mathcal{IMAGE}$ PLANNED FOR JULY 1994

The next issue of $\mathcal{IMAGE}$ will be edited by S. J. Leon and George Styan. The Production Editor is Ann Cox. News items for the next issue should be sent no later than June 1, 1994 to:

Steven J. Leon
Dept. of Mathematics
University of Massachusetts Dartmouth
North Dartmouth, MA 02747
E-mail: SLEON@UMASSD.EDU
FAX: (508) 999–8901

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 $\mathcal{IMAGE}$ will contain feature articles on linear algebra activities in other countries. Articles should be no more than four pages in length. If you're a member of ILAS then $\mathcal{IMAGE}$ is your publication. It needs your support. Please keep us informed about the linear algebra activities in your country.

ILAS-NET

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

Corrected Citations for Hans Schneider Prize Winners

In the rush to go to press with issue 11 of $\mathcal{IMAGE}$ we inadvertently transposed some of the material in the article about the Hans Schneider Award winners. As a result some of the information about the contributions of Shmuel Friedlund were listed under the citation for Miroslav Fiedler. The editor of $\mathcal{IMAGE}$ takes full responsibility for this mistake and apologizes to both parties. The citation for Israel Gohberg was correct in $\mathcal{IMAGE}$ 11. The following are the corrected citations for Fiedler and Friedlund.

Miroslav Fiedler was born in Prague in 1926. His future greatness was foreshadowed early on by his brilliance at problem-solving. Already while in secondary school he won a mathematical competition run by the Razhledy matematicko přirodovědecké. He graduated in Mathematics and Physics form Charles University in 1950. His thesis treated questions on algebraic curves. As a research student he worked at the Central Mathematical Institute, now part of the Czechoslovak Academy of Sciences and this has been his base ever since. He did his (senior) doctorate under the supervision of Cech on the theory of simplices. Gradually, he broadened his interests from geometry into matrix theory, numerical analysis, mathematics of economics, graph theory. He was appointed full professor at Charles University in 1964. The significance of his work has been recognized internationally through associate editorships of LAA, LAMA, Numerische Mathematik. He has accepted invitations to visit several prestigious universities. He has been Editor-in-Chief of the Czechoslovak Mathematical Journal. In Czechoslovakia, his influence on the whole mathematical spectrum has been profound. He has given lectures in several of its cities to encourage mathematical research and given his own early display of brilliance in Mathematics, he has actively helped in the training program for the very successful Czech involvement in the annual international mathematical olympiads.

Fiedler's first significant research was in the theory of simplices. In the light of his later fundamental contribution to algebraic graph theory it is interesting to note that he was one of the innovators of their combinatorial study and obtained several results characterizing graphs in terms of their interpretability as graphs of simplices.

Because of the role of positive definite matrices in the theory of simplices, he began his examination on the influence of the diagonal entries of a matrix on its spectrum. Again a foretaste of major contributions to the problem of localization of the spectrum of general matrices - that is, determining the smallest complex domain containing all the eigenvalues.

He extended the theory of M-matrices and successfully applied it to get information on the spectra of general matrices. His joint papers with Ptak in Czech Math J. (1962) are of particular importance. He has made major contributions to the theory of nonnegative matrices and in 1975 with Ptak, obtained a quantitative version of the Perron-Frobenius theorem for doubly stochastic matrices. One of his greatest contributions is the solution of the inverse eigenvalue problem for nonnegative symmetric matrices LAA 5 (1972) to LAA 9 (1974) the problem is still open for general nonnegative matrices.

Fiedler's development of matrix methods to study graphs has been most significant and original. The deep results contained in his papers in Czech Math J. 23 (1973), ibid 25 (1975) opened a new chapter in the subject. In particular, he obtained some astonishing results on the Laplacian matrix (his first encounter with this goes back to 1958 when with Sedlaček, he reproved and generalized the classical theorem of Kirchhoff). He identified the importance of its second largest eigenvalue. His work in this area has greatly influenced the direction of research in the field and the Laplacian matrix continues to provide surprises.

He has made significant contributions to mathematical economics and numerical linear algebra. He has made a fundamental study of tridiagonal matrices and Hankel matrices, and several other areas of linear algebra. He has also been interested in the application of his results, a particularly of graph theory in the study of electric circuits.

Fiedler's first significant research was in the theory of simplices. In the light of his later fundamental contribution to algebraic graph theory, it is interesting to note that he was one of the innovators of their combinatorial study and obtained several results characterizing graphs in terms of their interpretability as graphs of simplices. Because of the role of positive definite matrices in the theory of simplices, he began his examination on the influence of the diagonal entries of a matrix on its spectrum. Again a foretaste of major contributions to the problem of localization of the spectrum of general matrices, that is, determining the smallest complex domain containing all the eigenvalues.

Shmuel Friedland was born in Tashkent, USSR, in 1945. He emigrated to Israel, where he received his academic degrees at the Technion, Haifa. He has been a faculty member at the Hebrew University, Jerusalem. Currently he is a professor at the University of Illinois, Chicago.

He has made fundamental contributions in analysis, algebra and geometry. A number of the deepest and most elegant results in linear algebra are due to him and he has enriched the subject through the introduction of powerful analytic and algebraic tools.

Among his striking results are:

1. Given any complex $n \times n$ matrix A, there exists a diagonal matrix D such that $A + D$ has given complex spectrum. He has also proved a multiplicative analog and made significant contributions to several other inverse eigenvalue problems, including those for nonnegative matrices. In this connection he proved a refinement of Pringsheim's theorem or rational functions and applied it to show the existence of a eventually nonnegative matrix whose spectrum is the union of given self-conjugate Frobenius sets.

2. He has found an effective solution to the simultaneous (linear) similarity problem for matrices. He has also extended Wasow's Theorem on the relation between the pointwise and analytic similarity of matrices whose entries are complex valued analytic functions.

3. He has obtained best possible bounds for the permanent and related functions on certain classes of matrices.

4. A lovely theorem of Motzkin and Taussky states that if A and B are given $n \times n$ complex matrices such that $xA + yB$ is diagonalizable for all x, y then $AB = BA$. Friedland has generalized it and in the process obtained a very elegant analytic proof.

5. He has made very significant contributions to combinatorial matrix theory. Examples are a combinatorial lower bound for the index of a matrix, and the relation of combinatorial structure of a nonnegative matrix to the growth of its powers. Recently, he has proved an upper bound for the spectral radius of even sized tournament matrices.

6. He has developed a powerful method of attack on the graph isomorphism problem through the congruence theory for rational and integer matrices. As a by-product, he has obtained very interesting results on the sublattices of integral lattices.

Friedland's methods of proof are innovative and inspiring and employ ideas from many areas of mathematics.

The ILAS Education Committee

Report
on
Graduate Linear Algebra Courses

March/November 1993

Based on our survey of US graduate course offerings in Linear Algebra last fall, we have drawn up three separate course outlines for graduate year–long courses in

Theoretical Linear Algebra,
Numerical Linear Algebra, and
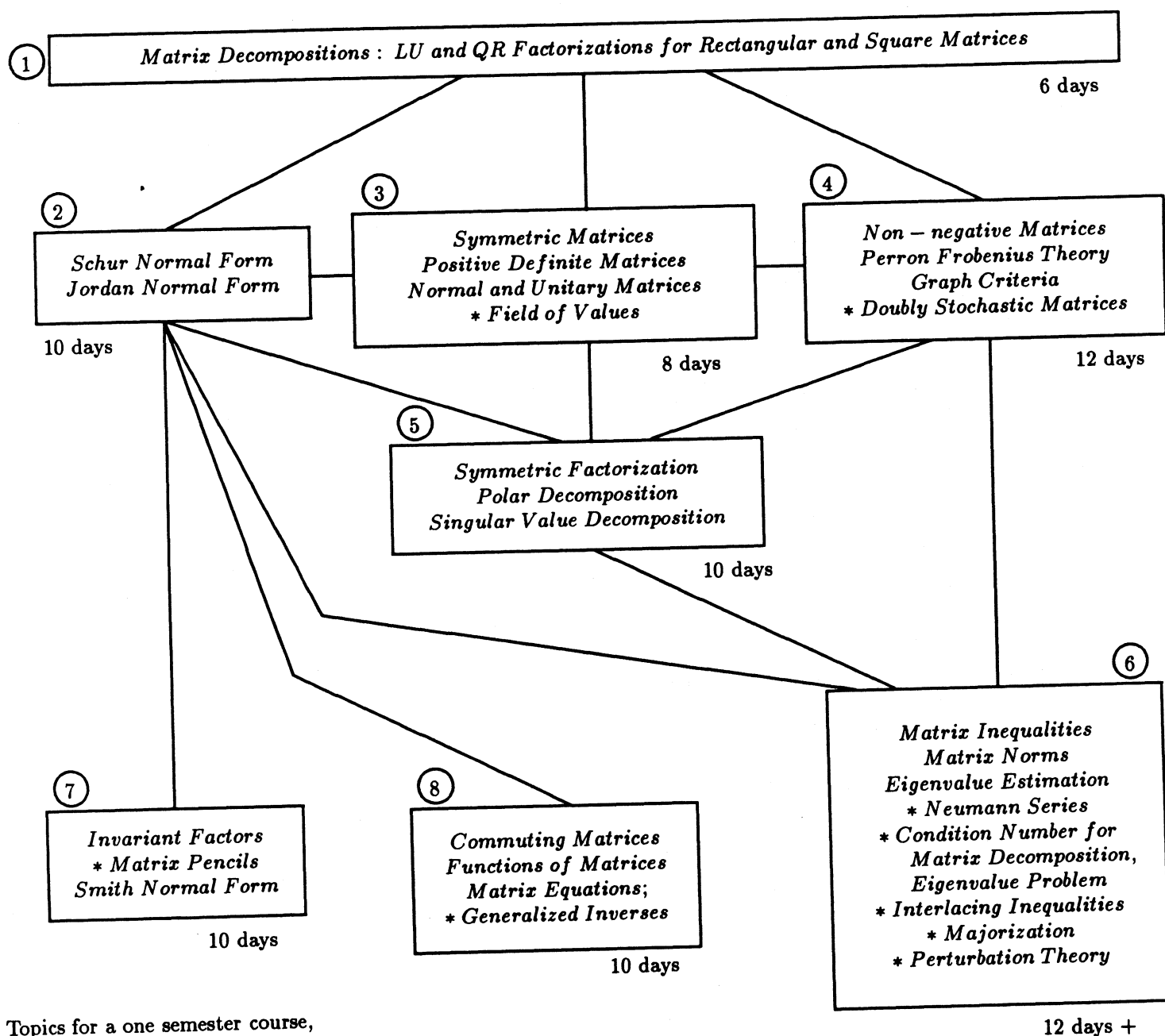Applied Linear Algebra.

These outlines contain a large number of significant modern topics in our field combined with basic and more classical results. Several of the chosen topics occur in more than one course. Take the LU decomposition for example: a theoretical treatment of the LU decomposition would maybe emphasize the lower triangular – upper triangular group factorization of GL_n and could possibly give a short introduction into Della–Dora type group factorizations in a theoretical vein. The numerical course would instead emphasize explicit index manipulations and computations, as well as the operations count for LU, while the applied course might use it to establish rank, solvability and redundancy criteria for linear systems of equations and integrate the LU factorization thus with its applications.

We have chosen our outlined topics and their interconnectedness in order to reflect the importance of our subject to modern abstract and applied mathematics and to make graduate courses based on our syllabi highly valuable to any modern mathematics, science or engineering graduate program.

We shall refrain from specific textbook recommendations, but want to assert that there has recently been a renaissance of excellent texts in our field, well suited to achieve a higher level of awareness and usefulness for Linear Algebra throughout the scientific community.

Chair : Frank Uhlig (UHLIGFD@MAIL.AUBURN.EDU)
David Carlson, Biswa N. Datta, Charlie Johnson, Steve Leon, Miki Neumann
Hans Schneider, President
The INTERNATIONAL LINEAR ALGEBRA SOCIETY

Suggested Topics for a year long graduate course in
Theoretical Linear Algebra

(1) **Matrix Decompositions** : *LU and QR Factorizations for Rectangular and Square Matrices*

6 days

(2) **Schur Normal Form**
Jordan Normal Form

10 days

(3) **Symmetric Matrices**
Positive Definite Matrices
Normal and Unitary Matrices
*** Field of Values**

8 days

(4) **Non − negative Matrices**
Perron Frobenius Theory
Graph Criteria
*** Doubly Stochastic Matrices**

12 days

(5) **Symmetric Factorization**
Polar Decomposition
Singular Value Decomposition

10 days

(6) **Matrix Inequalities**
Matrix Norms
Eigenvalue Estimation
*** Neumann Series**
*** Condition Number for**
Matrix Decomposition,
Eigenvalue Problem
*** Interlacing Inequalities**
*** Majorization**
*** Perturbation Theory**

12 days +

(7) **Invariant Factors**
*** Matrix Pencils**
Smith Normal Form

10 days

(8) **Commuting Matrices**
Functions of Matrices
Matrix Equations;
*** Generalized Inverses**

10 days

Topics for a one semester course, or the first semester of a year long course:

(1) , (2) , (3) , (4)

Suggestions for quarter systems :

First quarter : (1) , (2) , (3)
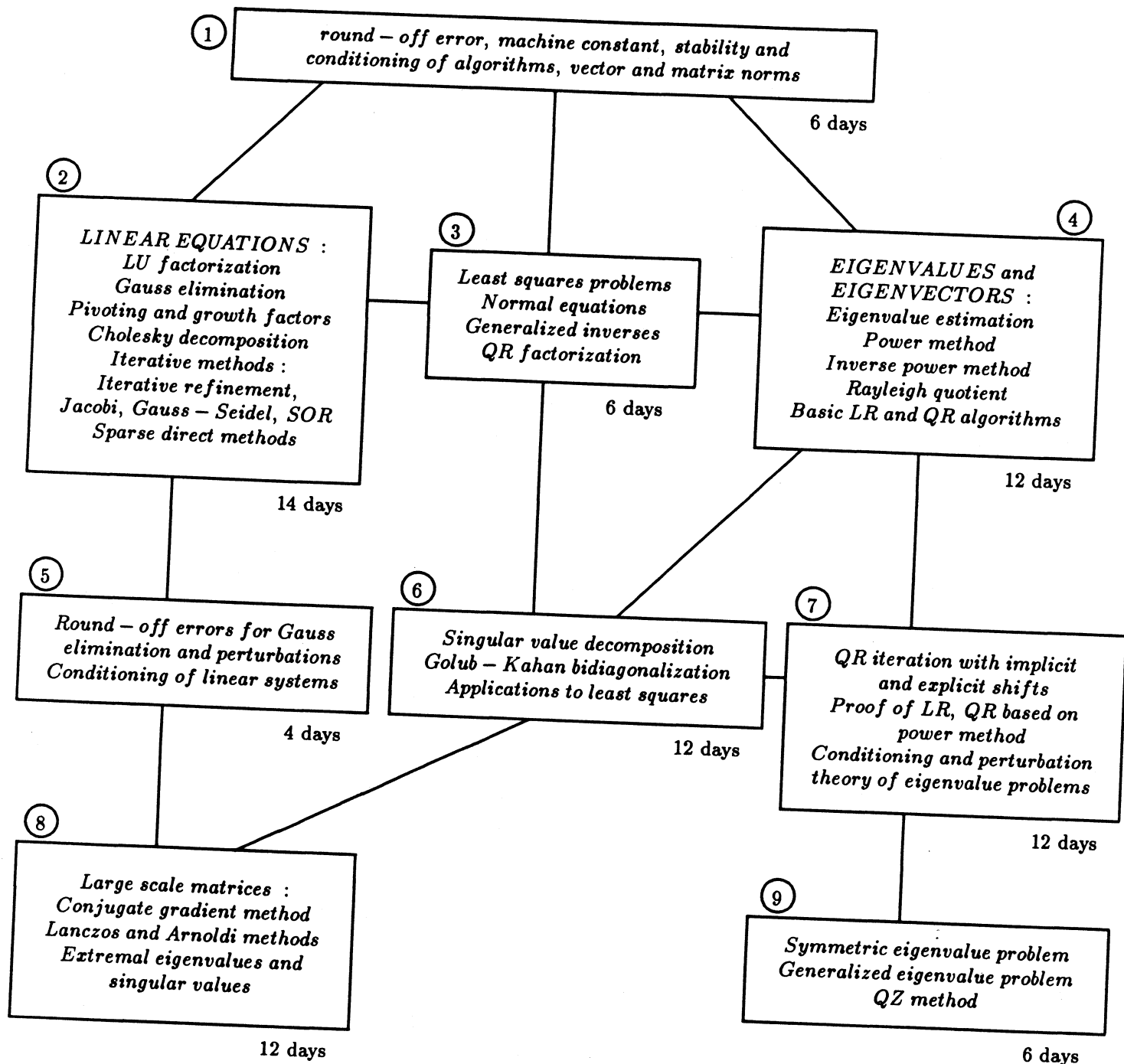
Second quarter : (4) , (5)

Third quarter : (6) , (7) , (8)

Topics preceded by an asterisk *
are considered optional and
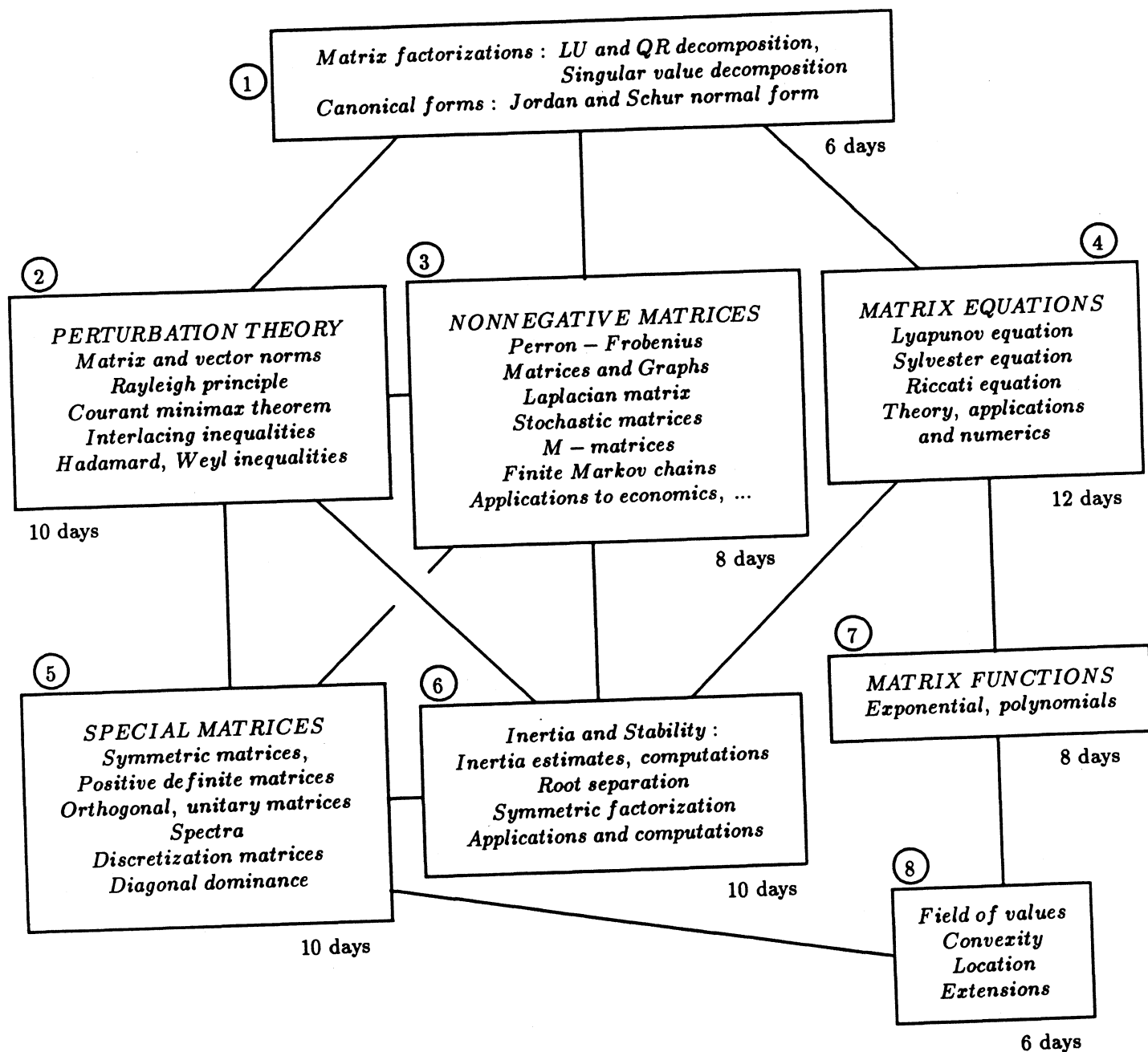should be covered only if desired
and time permits.

6

Suggested Topics for a year long graduate course in Numerical Linear Algebra

(1) round − off error, machine constant, stability and conditioning of algorithms, vector and matrix norms

6 days

(2) LINEAR EQUATIONS :
LU factorization
Gauss elimination
Pivoting and growth factors
Cholesky decomposition
Iterative methods :
Iterative refinement,
Jacobi, Gauss − Seidel, SOR
Sparse direct methods

14 days

(3) Least squares problems
Normal equations
Generalized inverses
QR factorization

6 days

(4) EIGENVALUES and EIGENVECTORS :
Eigenvalue estimation
Power method
Inverse power method
Rayleigh quotient
Basic LR and QR algorithms

12 days

(5) Round − off errors for Gauss elimination and perturbations
Conditioning of linear systems

4 days

(6) Singular value decomposition
Golub − Kahan bidiagonalization
Applications to least squares

12 days

(7) QR iteration with implicit and explicit shifts
Proof of LR, QR based on power method
Conditioning and perturbation theory of eigenvalue problems

12 days

(8) Large scale matrices :
Conjugate gradient method
Lanczos and Arnoldi methods
Extremal eigenvalues and singular values

12 days

(9) Symmetric eigenvalue problem
Generalized eigenvalue problem
QZ method

6 days

A one semester course or the first semester of a year long course should cover topics numbered 1, ... , 4, as well as actual numerical computations.

For a quarter system the first quarter would cover topics 1, 2, and 3 combined with actual numerical computations. The second quarter would cover topics 4, 5, and 6, with the remaining topics covered in the third quarter.

Suggested Topics for a year long graduate course in
Applied Linear Algebra

① Matrix factorizations : *LU and QR decomposition, Singular value decomposition*
Canonical forms : *Jordan and Schur normal form*

6 days

② PERTURBATION THEORY
Matrix and vector norms
Rayleigh principle
Courant minimax theorem
Interlacing inequalities
Hadamard, Weyl inequalities

10 days

③ NONNEGATIVE MATRICES
Perron − Frobenius
Matrices and Graphs
Laplacian matrix
Stochastic matrices
M − matrices
Finite Markov chains
Applications to economics, ...

8 days

④ MATRIX EQUATIONS
Lyapunov equation
Sylvester equation
Riccati equation
Theory, applications and numerics

12 days

⑤ SPECIAL MATRICES
Symmetric matrices,
Positive definite matrices
Orthogonal, unitary matrices
Spectra
Discretization matrices
Diagonal dominance

10 days

⑥ *Inertia and Stability :*
Inertia estimates, computations
Root separation
Symmetric factorization
Applications and computations

10 days

⑦ MATRIX FUNCTIONS
Exponential, polynomials

8 days

⑧ *Field of values*
Convexity
Location
Extensions

6 days

A one semester course or the first semester of a year long course could be made of topics labelled 1, 2, 3, and 4, or alternately of topics 1, 2, 3, and 5.

For a quarter system, the first quarter could comprise topics 1, 2, 3, the second could cover topics 4 and 5, with the remainder left for the third quarter.

NEWS ITEMS

Fifth SIAM Conference on Applied Linear Algebra

Announcement by John Lewis

The Fifth SIAM Conference on Applied Linear Algebra will be held on June 15-18, 1994 at the Snowbird Ski and Summer Resort in Snowbird, Utah. The conference is sponsored by the SIAM Activity Group on Linear Algebra

Linear algebra is subject to ever-widening demands because of its central role in mathematics and applications. The same fundamental problems occur in many disciplines – solving a sequence of linear systems, for example, or finding an invariant subspace – but, it is often highly desirable to exploit special structure that arises from the particular application. New applications lead to new challenges. New computer architectures motivate new algorithms, and fresh ways to look at old ones.

People struggling with the various applications of linear algebra have a lot to talk about; this conference aims to bring them together for their mutual benefit.

In response to concerns about conflicts between parallel sessions, this conference will experiment with a new format for contributed papers. The new format is described below.

Conference Topics and Plenary Speakers

Eigenvalue Computation, James Demmel, University of California, Berkeley

Geometry and Eigenvalues, Persi Diaconis, Harvard University

Matrix Theory, Israel Gohberg, Tel Aviv University, Israel

Iterative Methods for Large Sparse Systems, Anne Greenbaum, Courant Institute of Mathematical Sciences, New York University

Nonnegative Matrices: Can the Next Century Top this One?, Charles R. Johnson, College of William and Mary

Parallel Matrix Computations, Robert S. Schreiber, RIACS-NASA Ames Research Center

Invited Minisymposia

Analytic Matrix Functions, Angelika Bunse-Gerstner, University of Bielefeld, Germany

Linear Algebra in Optimization, Thomas F. Coleman, Cornell University

Direct Methods for Large Sparse Systems, Iain Duff, Rutherford Appleton Laboratories, United Kingdom and CERFACS, France

Iterative Methods for Large Sparse Systems, Roland Freund, AT&T Bell Laboratories

The Algebraic Riccati Equation and Applications, Peter Lancaster, University of Calgary, Canada

Graph Theory and Linear Algebra, Alex Pothen, University of Waterloo, Canada

Teaching of Linear Algebra, Gilbert Strang, Massachusetts Institute of Technology

Contributed Minisymposia

Six minisymposia will be selected from contributed proposals to complete the set of conference themes. Minisymposia will be two-hour sessions, intended to provide a high-level survey of current research in an important area of applied linear algebra. This conference will have significantly fewer minisymposia than previous Applied Linear Algebra conferences; most of the topics that would otherwise be minisymposia will instead be discussed in the common-interest sessions (see below).

Contributed Papers

As an experiment, this conference has been organized so that the presentation of contributed papers will be a dialogue rather than a monologue. Each paper may be presented in three forms: in a proceedings volume, as a poster display, and as part of a 2-hour "common interest" discussion session. We expect most of the contributed papers to be presented in all three forms, though this is not required.

Authors are invited to contribute a paper of at most five pages to a published proceedings, which will be available at the conference. The author will also assign such a paper to a common-interest session as described below, and will be expected to attend that session and participate in the discussion. Participants should register in advance. If the registration is not received by March 21, 1994, the paper will not be included in the proceedings. Instructions for submitting papers for the proceedings will be mailed to those who fill out and return the attached postage-paid reply card. Camera-ready papers for the proceedings must be received at the SIAM office by March 7, 1994. Any paper which exceeds the 5-page limit or does not conform to the format will be excluded from the proceedings.

Authors may also choose to participate in the structured poster sessions that precede the common-interest sessions. Each author is permitted a 4' by 6' area during the poster session. Posters can be used in the traditional manner, as independent contributions. They can also be used by authors of proceedings papers in several new ways: to amplify details or issues for which the page limit on papers prevents full discussion, to display additional graphics or test cases, to allow alternative pedagogic approaches, or simply to call attention to the work in the paper. If the poster is "just" an amplification of the paper, the poster abstract will not appear in the proceedings. Authors who choose to make a poster presentation, but not contribute a paper to the proceedings, must submit a 100-word abstract for their poster by March 7, 1994. A prize for the poster judged best in both form and content will be awarded at the conference banquet.

A new feature of the 1994 conference is the 25 moderated common-interest sessions. All attendees are invited to join these sessions. The common-interest sessions are intended for discussion, primarily of the proceedings papers and posters. The discussion will be conducted by a session chair, who has seen the papers in advance, has prepared an introductory survey of the papers and is prepared to lead discussion. Authors are forewarned that the sessions will not consist of short presentations of results; the proceedings and poster sessions are the primary mechanism for promulgating new ideas to a wide audience at this conference. The common-interest sessions will consist of a 1/2 hour attended poster session, followed by 1-1/2 hours of moderated discussion.

The combination of a hard-copy proceedings, a poster, and discussion in a common-interest session will permit broader and more complete presentation of a contributed paper than is possible in the conventional 12-minute contributed talk. In addition, we hope that this format will reduce the conflicts between parallel sessions of contributed talks, since most papers will be available in several forms.

Organizing Committee

The organizing committee for the conference consists of Beresford N. Parlett (Chair), Harm Bart, Richard A. Brualdi, John R. Gilbert, Sven Hammarling, John G. Lewis, and Paul Van Dooren.

Workshop on Numerical Ranges and Numerical Radii

Announcement from Natalia Bebiano

The Department of Mathematics, University of Coimbra, Portugal is offering a Workshop on Numerical Ranges and Numerical Radii, August 8–12, 1994.

The aim of the proposed workshop is to bring researchers on numerical ranges and numerical radii from different (research and geographic) areas together to exchange ideas on the subject. In particular, there are four primary objectives for the workshop.

(a) To study and further explore applications of various kinds of generalized numerical ranges and numerical radii in different branches of science.

(b) To discuss existing mathematical tools and techniques and try to generate new methods to handle problems on numerical ranges and numerical radii.

(c) To discuss possible research projects or computer projects on numerical ranges and numerical radii appropriate for the undergraduate or graduate level.

(d) To exchange research problems, ideas and experience on the subject.

While the main theme of the workshop is on numerical ranges and numerical radii, discussion will be focused on the relations and applications of the subject to several specific topics.

1. Operator theory and C*-algebras

2. Norms and Matrix inequalities

3. Decomposable numerical ranges and Quantum physics

4. Systems theory and Computer generation of numerical ranges

5. Location of eigenvalues

6. Other related subjects such as completion problems, linear preserver problems, etc.

For more information concerning the workshop please contact:

Dr. Natalia Bebiano or Dr. A. Leal Duarte
Department of Mathematics
University of Coimbra
P3ooo Coimbra, Portugal
e-mail: bebiano@ciuc2.uc.pt, Leal@Mat.UC.PT
tel: (351) 39-28097

Note: People planning to attend the second ILAS meeting at Rotterdam, August 15 – 19, 1994, may be able to include a stop at Portugal on their tickets.

Meeting on Matrix Analysis and Applications

Report by Juan M. Gracia

It is a pleasure to announce that the Linear Algebra Group of the Basque Country University will hold a conference on "Matrix Analysis and Applications" in Vitoria-Gasteiz, Spain on September 21–23, 1994. This meeting will continue a series of conferences held in Portugal and Spain since 1982.

The conference will consist of seven invited talks of 45–60 minutes each. There will also be sessions for 15–20 minute contributed papers. The scientific committee consists of Ion Zaballa (chair), Juan M.Gracia (secretary), Rafael Bru, José A. Dias da Silva, Mariano Gasca, Vicente Hernández, Francisco Marcellán, Eduardo Marques de Sá, Graciano de Oliveira, Fernando Puerta and José Vitóia. The organizing committee for the conference consists of Juan M. Gracia (chair), Inmaculada de Hoyos (secretary), Itziar Baragaña, $M^{\underline{a}}$ Asunción Beitia, Carmen Sodupe, Francisco E. Velasco, and Ion Zaballa.

The invited speakers are: Natalia Bebiano (Portugal) (tentative), Fernando C. Silva (Portugal) (tentative), Rafael Cantó (Spain), and G. Philip A. Thijsse (The Netherlands) (tentative).

The deadline for abstract submission is March 31, 1994. If you are interested in participating in the meeting and presenting a paper, please contact:

Juan M. Gracia
Departamento de Matematica Aplicada y Estadistica
Universidad del Pais Vasco
Apartado 450
E-01080 Vitoria-Gasteiz, Spain
fax: 34–45–130756
email: mepgrmej@lg.ehu.es

IMA Linear Algebra Conference in Manchester

Announcement from Nick Higham

The Institute of Mathematics and Its Applications announces a Conference on Linear Algebra and its Applications. This conference will be held at the University of Manchester, England, on July 10–12, 1995. This is the week following the Third ICIAM Conference, which is being held July 3–7 1995 in Hamburg, Germany.

The Organizing Committee for the conference consists of N. J. Higham (Chairman, University of Manchester), I. S. Duff (Rutherford Appleton Laboratories), R. Fletcher (University of Dundee), T. L. Freeman (University of Manchester), S. J. Hammarling (NAG Ltd., Oxford), N. K. Nichols (University of Reading).

A call for papers will be issued shortly. For more information please contact:

Miss Pamela Irving
The Conference Officer
The Institute of Mathematics and Its Applications
16 Nelson Street
Southend-on-Sea
Essex, SS1 1EF
UK
tel: 0702 354020 fax: 0702 354111

CALENDAR OF COMING CONFERENCES

April 5–9, 1994, The Colorado Conference on Iterative Methods, Breckenridge, Colorado
Information: Send e-mail message to: cciminfo@newton.colorado.edu

April 10–16,1994, Numerical Linear Algebra with Applications, Oberwolfach, Fed. Republic of Germany
Information: Mathematisches Forschunginstitut Oberwolfach Geschäftsstelle: Alberstrasse 24 W-7800 Freiburg im Breisgau

August 8–12, 1994, Workshop on Numerical Ranges and Numerical Radii, University of Coimbra, Portugal
Information: See article in this issue of *IMAGE*

August 15–19, 1994, ILAS Conference, Erasmus University, Rotterdam
Information: See article in this issue of *IMAGE*

September 21–23, 1994, Conference on Matrix Analysis and Applications, Vitoria-Gasteiz, Spain
Information: See announcement in this issue of *IMAGE*

July 3–7 1995, Third ICIAM Conference, Hamburg, Germany
Information: GAMM Office, Univ. Regensburg, NWFI-Mathematik, D–93053 Regensburg, Germany

July 10–12, 1995, IMA Linear Algebra Conference, Manchester, England
Information: See announcement in this issue of *IMAGE*

August 16–19, 1995 ILAS Conference, Atlanta, Georgia, U.S.A.
Information: See future issues of *IMAGE*.

Summer, 1996 ILAS Meeting in Chemnitz (tentative)
Information: Contact Volker Mehrman

1998, ILAS Meeting in Madison Wisconsin (tentative)
Information: Contact Richard Brualdi

LINEAR ALGEBRA AND ITS APPLICATIONS (LAA)

Special Issues in Progress

Title:	Proc. of the Second Conference of the ILAS, Lisbon
Special Editors:	J. A. Dias Da Silva, Chi-Kwong Li, and Graciano de Oliveira
Publication Date:	To appear as Volumes 197 & 198, Jan-Feb, 1994

Title:	Special Issue Honoring Ingram Olkin
Special Editors:	Friedrich Pukelsheim, George P. H. Styan, Henry Wolkowicz, and Ion Zaballa
Publication Date:	To appear as Volume 199, March 1994

Title:	Special Issue Honoring Marvin Marcus
Special Editors:	Bryan E. Cain, Moshe Goldberg, Robert Grone, Nicholas J. Higham
Publication Date:	To appear as Volume 201, April, 1994

Title:	Third Special Issue on Linear Systems and Control
Special Editors:	A. C. Antoulas, P. A. Fuhrmann, M. L. J. Hautus and Y. Yamamoto
Submission Deadline:	February 28, 1993

Title:	Workshop on Generalized Inverses (A special section of one issue will be devoted to this workshop.)
Special Editors:	R. P. Bapat, Robert E. Hartwig, and S. K. Mitra
Submission Deadline:	March 15, 1993

Title:	Special Issue honoring Chandler Davis
Special Editors:	Rajendra Bhatia, Shmuel Friedlund, and Peter Rosenthal
Submission Deadline:	March 31, 1993

Title:	Special Pensacola Conference Issue
Special Editors:	Diane P. O'Leary, Leiba Rodman, and Helene Shapiro
Submission Deadline:	June 30, 1993

Title:	Special Issue Honoring Miroslav Fiedler and Vlastimil Ptak
Special Editors:	Wayne Barrett, Angelika Bunse-Gerstner, and Nicholas Young
Submission Deadline:	December 31, 1993

Title:	Proceedings of the conference "Matrices and Graphs" in honor of John Maybee's 65th birthday, Boulder, Colorado, May, 1993
Special editors:	C. R. Johnson and J. R. Lundgren
Submission Deadline:	August 31, 1993

Title:	Fourth Special Issue on Linear Algebra and Statistics
Special Editors:	Jeffrey J. Hunter, Simo Puntanen, and George P. H. Styan
Submission Deadline:	June 30, 1993

Title: Proceedings of the workshop "Nonnegative Matrices, Applications and Generalizations" and the Eighth Haifa Matrix Theory

Special editors: S. Friedland, D. Hershkowitz, and R. Loewy

Submission Deadline: September 15, 1993

Title: Special Issue honoring J. J. Seidel

Special Editors: Aart Blokhuis, Willem H. Haemers, and Alan J. Hoffman

Submission Deadline: August 30, 1994

Title: Proceedings of the Fourth Conference of the International Conference at Rotterdam

Special Editors: Harm Bart, Ludwig Elsner, Harm Bart

Submission Deadline: November 30, 1994

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LINEAR AND MULTILINEAR ALGEBRA (LAMA)

Special Issues in Progress

Title: Special Issue on Algebraic Graph Theory

Special Editors: D. Cvetkovic, R. Merris, and P. Rowlinson

Submission Deadline: November 1, 1993

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Linear Algebra with Applications, 4e

Steven J. Leon, University of Massachusetts - Dartmouth

Linear Algebra with Applications, 4e continues to offer students and instructors a thorough and distinctively accessible treatment of the subject. It covers all the topics listed in the core syllabus for the matrix oriented linear algebra course that has been recommended by the Linear Curriculum Study Group (LACSG).

Explanations and concepts are presented clearly so that students at a variety of levels can read and understand the material. The balanced coverage of mathematical theory and applied topics is augmented by numerous worked examples. Professor Leon has included several key organizational refinements in the new edition that make the material even more "user-friendly", and new exercises and examples have been integrated throughout. The extensive set of well-developed computer exercises, based on the MATLAB software package, has been expanded. The text also includes general vector space theory and function spaces for those who wish to teach a more traditional course.

New to this Edition:

- The MATLAB computing exercises have been greatly expanded to include exercises at the end of each chapter. Carefully designed to meet a number of teaching objectives, the exercises bring out the mathematical significance of the computations and provides students with experience performing matrix computations. (Note: MATLAB software is available through Math Works, Inc.)

- An increased emphasis on geometric motivation makes the material seem less abstract. Concepts such as linear systems, vector spaces, linear operators, orthogonality, and Eigenvalues are all made more accessible.

- New exercises in several of the chapters augment this already outstanding feature of the text.

- Revisions made in Chapter 2 provide better motivation for the definition of a determinant of a matrix. Revisions in the section on "Inner Product Spaces" and "Orthonormal Bases" in Chapter 5 have been revised for greater clarity.

- Chapter 7 now contains the bulk of the material on matrix norms. Section 4 of this chapter has been retitled "Matrix Norms and Condition Numbers".

- The "Change of Basis" section has been revised and moved from Chapter 4 to Chapter 3.

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