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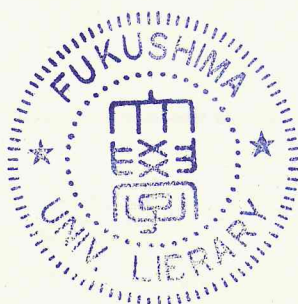
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Preface

For the four days 26 - 29 June, 1979, around 230 people from 26 countries attended the 8th Dundee Biennial Conference on Numerical Analysis at the University of Dundee, Scotland. Invitations to give talks at the meeting were accepted by 13 prominent numerical analysts, representative of a wide variety of fields of activity, and their papers appear in these notes. In addition to the invited papers, short contributions were solicited, and 66 of these, given in three parallel sessions, were presented at the conference. A complete list of these submitted papers, together with authors' addresses, is also given here.

I would like to take this opportunity of thanking the speakers, including the invited after dinner speaker at the conference dinner, Professor J Crank, all chairmen and participants for their contributions. I would also like to thank the many people in the Department of Mathematics of this University who assisted in various ways with the preparation for, and running of, this conference. In particular, I am once more indebted to Mrs R Hume for attending to the considerable task of typing the various documents associated with the conference, and some of the typing in this volume.

Financial support for this conference was obtained from the European Research Office of the United States Army. This support is gratefully acknowledged.

G A Watson

Dundee, November 1979.

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INVITED SPEAKERS

- O Axelsson: Department of Mathematics, Catholic University, Nijmegen, The Netherlands.
- J C Butcher: Department of Mathematics, University of Auckland, Auckland, New Zealand.
- E W Cheney: Department of Mathematics, RLM 8-100, The University of Texas at Austin, Austin, Texas 78712, USA.
- L Collatz: Institut für Angewandte Mathematik, Universität Hamburg, 2 Hamburg 13, Bundesstr 55, West Germany.
- J Crank: School of Mathematical Studies, Brunel University, Kingston Lane, Uxbridge, Middlesex UB8 3PH, England.
- J Cullum: IBM Thomas J Watson Research Center, Yorktown Heights, New York 10598, USA.
- J D Lambert: Department of Mathematics, University of Dundee, Dundee, Scotland.
- J W Jerome: Department of Mathematics, Northwestern University, Evanston, Illinois 60201, USA.
- D Q Mayne: Department of Computing and Control, Imperial College, London SW7, England.
- K W Morton: Department of Mathematics, University of Reading, Whiteknights, Reading, England.
- S P Nørsett: Department of Mathematics, Institute for Numerical Analysis, N.T.H., N-7034 Trondheim, Norway.
- H J Stetter: Institut für Numerische Mathematik, Technische Hochschule Wien, A-1040 Wien, Gusshausstr, 27-29, Austria.
- E L Wachspress: General Electric Company, Schenectady, New York, USA.
- P Wesseling: Delft University of Technology, Julianalaan 132, Delft, The Netherlands.

SUBMITTED PAPERS

J Albrecht: Institute for Mathematics, Technical University of Clausthal, Germany.
Inclusion theorems for eigenvalues.

C Andrade: Department of Mathematics, University of Sao Paulo, Brazil and
S McKee: The Computing Laboratory, University of Oxford, England.
On optimal high accuracy linear multistep methods for first kind Volterra integral
equations.

C T H Baker: Mathematics Department, University of Manchester, England.
Structure of recurrence relations.

J W Barrett: Mathematics Department, University of Reading, England.
An optimal finite element method for a non self-adjoint elliptic operator.

K E Barrett: Mathematics Department, Lanchester Polytechnic, England.
Optimal control methods for heat transfer calculation.

R H Bartels and A R Conn: Department of Combinatorics & Optimization, University of
Waterloo, Canada.
An exact penalty algorithm for solving the nonlinear ℓ_1 problem.

H Brunner: Mathematics Department, Dalhousie University, Canada.
The variation of constants formula in the numerical analysis of Volterra equations.

T D Bui: Department of Computer Science, Concordia University, Canada.
Some new L-stable methods for stiff differential systems.

S J Byrne and R W H Sargent: Mathematics Department, Imperial College, London,
England.
An algorithm for linear complementarity problems using only elementary principal
pivots.

T H Clarysse: Department Wiskunde, University of Antwerp, Belgium.
Rational predictor-corrector methods for nonlinear Volterra integral equations of
the second kind.

D B Clegg: Mathematics Department, Liverpool Polytechnic, England.
On Newton's method with a class of rational functions for solving polynomial
equations.

J Crank: School of Mathematical Studies, Brunel University, England.
Numerical solution of free boundary problems by interchanging dependent and
independent variables.

P E M Curtis: National Physical Laboratory, Teddington, England.
The calculation of optimal aircraft trajectories.

F D'Almeida: Mathematics Department, IMAG, Grenoble, France.
Methods for solving the unsymmetric generalized eigenvalue problem with large
matrices issued from the French economy models.

A Davey: Mathematics Department, University of Newcastle upon Tyne.
On the numerical solution of stiff boundary value problems.

L M Delves and C Phillips: Department of Computational and Statistical Science,
University of Liverpool, England.
The Global element method - a progress report.

J de Pillis: Mathematics Department, University of California, USA and
 M Neumann: Mathematics Department, University of Nottingham, England.
 The acceleration of iterative methods via k-part splittings.

W Dickmeis: Rheinisch-Westfälische Technische Hochschule, Aachen, W Germany.
 On the Lax-Type equivalence theorems with orders.

S Ellacott: Mathematics Department, Brighton Polytechnic, England.
 Numerical conformal mapping - Why bother?

G H Elliott: Mathematics Department, Portsmouth Polytechnic, England.
 Economisation in the complex plane.

R Fletcher: Mathematics Department, University of Dundee, Scotland.
 An exact L_1 penalty function method for nonlinear equations and nonlinear programming.

H Foerster: G.M.D., St Augustin, W Germany.
 Reduction methods for the fast solving of linear elliptic equations.

W Gander: NEU-Technikum, Switzerland.
 Least squares with a quadratic constraint.

C R Gane: Central Electricity Research Laboratories, Leatherhead, England.
 A R Gourlay: IBM United Kingdom Scientific Centre, Winchester, England and
 J Ll Morris: Department of Applied Analysis and Computer Science, University of
 Waterloo, Canada.
 From Humble beginnings

J-L Gout: Faculty of Science, University of Pau, France.
 On a Hermite rational 3^{th} degree finite element.

M H Gutknecht: Mathematics Department, ETH Zurich, Switzerland.
 Fast methods to solve Theodorsen's integral equation for conformal mappings.

R J Hanson and K H Haskell: Sandia Laboratories, Albuquerque, USA.
 Constrained least squares curve fitting to discrete data using B-splines.

P J Hartley: Mathematics Department, Lanchester Polytechnic, England.
 On using curved knot lines.

W D Hoskins: Department of Computer Science, University of Manitoba, Canada and
 D J Walton: Department of Mathematical Sciences, Lakehead University, Ontario,
 Canada.
 Improved fourth order methods for the solution of matrix equations of the form
 $XA + AY = F$.

A Iserles: Department of Applied Mathematics and Theoretical Physics, University
 of Cambridge, England.
 Quadrature method for the numerical solution of O.D.E.

B Kågström: Institute of Information Processing, University of Umeå, Sweden.
 How to compute the Jordan normal form - the choice between similarity transform-
 ations and methods using the chain relations.

R Kersner: Computer and Automation Institute of Hungarian Academy of Sciences,
 Budapest, Hungary.
 On the properties of solutions of the nonsteady filtration equations with absorption.

D Kraft: Institut für Dynamik der Flugsysteme der DFVLR, Oberpfaffenhofen, West Germany.

Comparing mathematical programming algorithms based on Lagrangian functions for computing optimal aircraft trajectories.

D P Laurie: CSIR, Pretoria, South Africa.

Automatic numerical integration over a triangle.

A V Levy and A C Segura: Universidad Nacional Autónoma de Mexico, Mexico.

Stabilization of Newton's method for the solution of a system of nonlinear equations.

P Lindström: Institute of Information Processing, University of Umeå, Sweden.

A working algorithm based on the Gauss-Newton method for nonlinear least squares problems with nonlinear constraints.

T Lyche: Institute of Informatics, University of Oslo, Norway.

A Newton form for trigonometric Hermite interpolation.

M Mäkelä: Mathematics Department, University of Helsinki, Finland.

On some nonlinear modifications of linear multistep methods.

J C Mason: Mathematics Branch, Royal Military College of Science, Shrivenham, England.

The vector Chebyshev Tau method - A new fast method for simple partial differential equations.

R M M Mattheij: Mathematical Institute, Katholieke Universiteit, Nijmegen, Holland.

A stable method for linear boundary value problem.

S F McCormick: Mathematics Department, Colorado State University, USA.

Mesh refinement methods for $Ax = \lambda Bx$.

J V Miller: Mathematics Department, University of Reading, England.

Adaptive meshes in free and moving boundary problems.

R N Mohapatra: Mathematics Department, American University of Beirut, Lebanon.

Order and class of saturation for some linear operators.

G Moore and A Spence: School of Mathematics, University of Bath, England.

The computation of nontrivial bifurcation points.

N Munksgaard: CE-DATA, Denmark.

Solving sparse symmetric sets of linear equations by preconditioned conjugate gradients.

S Nakazawa: Department of Chemical Engineering, University College of Swansea, Wales.

A note on finite element approximations of convection-diffusion equations.

M R O'Donohoe: Computer Laboratory, Cambridge University, England.

An automatic variable-transformation quadrature scheme for singular integrals.

G Oluremi Olaofe: Mathematics Department, Ibadan, Nigeria.

Quadrature solution of the double eigenvalue problem.

T N Robertson: Mathematics Department, Occidental College, Los Angeles, USA.

Gaussian quadrature applied to Cauchy principal value integrals.

Y Saad: Applied Mathematics Information, University of Grenoble, France.

The method of Arnoldi for computing eigenvalues of large unsymmetric matrices.

J M Sanz-Serna: Mathematics Department, University of Valladolid, Spain.
Some aspects of the boundary locus method.

K Schaumberg and J Wasniewski: Mathematics Department, University of Copenhagen and
Z Zlatev: The Royal University for Veterinary and Agriculture, Copenhagen, Denmark.
Some results obtained in the numerical solution of oscillatory linear systems of
ODE's arising from a chemical problem.

A H Sherman: Department of Computer Science, University of Texas at Austin, USA.
Practical experience with a multi-level method for finite element equations.

A Sidi: Department of Computer Science, Israel Institute of Technology, Israel.
A unified approach to the numerical treatment of integrals with end-point singular-
ities.

S T Sigurdsson: Faculty of Engineering and Science, University of Iceland, Iceland.
A second look at Nørsetts modification of the Adams method.

R B Simpson: Mathematics Department, University of Waterloo, Canada.
A finite element mesh verification algorithm.

S Skelboe: Danish Research Centre for Applied Electronics, Denmark.
Backward differentiation formulas with extended regions of absolute stability.

K Sørli: Institute for Numerical Mathematics, NTH Trondheim, Norway.
An analysis of some explicit alternating direction methods for the numerical
solution of the diffusion equation.

G S Stelling: Delft Hydraulics Laboratory, Holland.
Frequency and damping errors of ODE solvers.

P G Thomsen: Institute for Numerical Analysis, The Technical University of Denmark,
Denmark.
Jump discontinuities in initial value problems for ordinary differential equations.

R von Seggern: Central Institute for Angewandte Mathematics, KFA, Jülich, West
Germany.
Superconvergence by application of the finite element method to linear integro-
differential equations.

P-A Wedin: Institute of Information Processing, University of Umeå, Sweden.
Theoretical convergence behaviour of the Gauss-Newton method for nonlinear least
squares problems with nonlinear constraints.

K Witsch: G.M.D.-I.M.A., St Augustin, West Germany.
On the condition of discrete boundary value problems.

P H M Wolkenfelt: Mathematical Centre, Amsterdam, Holland.
Stability analysis of numerical methods for second kind Volterra equations by
imbedding techniques.

R S Womersley: Mathematics Department, University of Dundee, Scotland.
Uses of a minimax model for nondifferentiable functions.

Y S Wong: Department of Computer Science, University of British Columbia, Canada.
Preconditioned conjugate gradient methods for biharmonic problems.