

**THE INSTITUTE OF MATHEMATICS AND ITS
APPLICATIONS**

IMANA NEWSLETTER

**Newsletter of the Numerical Analysis Group of the
Institute of Mathematics and its Applications**

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Contents

1	Comments	1
2	Remembering Gene Golub Around the World on 29 February	1
3	Meet the Numerical Analysis Group ... Liverpool	1
4	CERFACS Twentieth Anniversary Meeting	2
5	Who's Visiting Whom	3
6	Technical Reports	3
7	Diary of Seminars	6
8	Forthcoming Meetings and Conferences	9
9	Highlighted Conferences	11
10	Fortran 2003 for Fortran 95 Programmers - 24-25 April 2007	14
11	2007 Wilkinson Prize for Numerical Software	14
12	PhD Theses	15
13	Recent Appointments	15
14	Vacant positions and studentships	15
15	IMA Journal of Numerical Analysis	17
16	Software News	17
17	Postgraduate Courses	18
18	Acknowledgements	18

1 Comments

November 2007 was a sad month for the numerical analysis community in the UK, with the sudden death of Gene Golub on 16 November followed by the death of Ron Mitchell on 22 November. Both were preeminent numerical analysts of their generation and had a significant and long-lasting influence on numerical analysis in the UK and worldwide. Gene Golub will be fondly remembered at a series of events around the world (see below for details). An appreciation of the life of Ron Mitchell may be found on the web at <http://www-groups.dcs.st-and.ac.uk/history/Printonly/Mitchell.html>

In this issue of the Newsletter, we continue our series of articles that aim to introduce the members, interests and activities of NA groups in the UK, this time focusing on Liverpool (with thanks to Ke Chen). We also have an article by Iain Duff on the 20th anniversary of CERFACS, a report on the 2007 Wilkinson Prize, and a varied selection of highlighted conferences, indicating in part the wide range of interests and expertise of numerical analysts in the UK.

The copy date for the next Newsletter will be **Monday 24 March**. As always, regular or one-off contributions from individuals and from NA groups are very welcome. So too are comments, feedback, and suggestions for articles in forthcoming Newsletters.

With best wishes for 2008.

Jennifer Scott
 Group Leader, Numerical Analysis Group
 Rutherford Appleton Laboratory.
 Didcot, Oxfordshire OX11 0QX
 Tel: 01235 441531 email: j.a.scott@rl.ac.uk

2 Remembering Gene Golub Around the World on 29 February

Gene Golub's friends and colleagues will gather around the globe on Friday 29 February 2008, the date that would have been his 19th birthday, to mourn his passing and celebrate his life. In addition to a memorial and a technical day at Stanford, events will also take place in Adelaide, Canberra, Hong Kong, Leuven and Oxford. All friends and colleagues of Gene are invited to attend any of these events. More details are available at <http://www.cs.nyu.edu/overton/genearoundtheworld/> and see <http://web.comlab.ox.ac.uk/oucl/research/na/golub08.html> for the Oxford event.

If you would like to organize an event to celebrate Gene in your corner of the globe on February 29, you should send an email to Michael Overton (overton@cs.nyu.edu) with the subject header "Gene" (to make sure it gets past Michael's spam filter). He will put you in touch with anyone else "in your neighborhood" who also writes, and add a link to your event on this page. There are no constraints on the kind of event: anything Gene would have enjoyed, from a day of scientific talks dedicated to Gene, to a special party in your home that is open to his friends and colleagues.

Michael Overton (overton@cs.nyu.edu)

3 Meet the Numerical Analysis Group ... Liverpool

The Numerical Analysis Group at Liverpool has a long history, going back to the 1960s. Up until the end of the 1980s, Liverpool had a large number of NA staff members, comparable (and closely linked) to Manchester. Then came a gradual decline in the number of NA members, largely due to the difficulties of trying to retain a separate identity (the Department of Computational Mathematics), away from Computer Science, Applied and Pure Mathematics.

Since the merger in 1996 of all the mathematical departments into a single department, the Group has benefited from various active interactions within the Division of Applied Mathematics. The combined research group of Asymptotic and Numerical Analysis of Partial Differential Equations (<http://www.liv.ac.uk/maths/Applied/Research/index.html>) currently has the following members:

- Professor Ke Chen – Numerical PDEs, Numerical linear and nonlinear algebra;
- Professor Alexander Movchan – PDEs, Asymptotic methods, Computational mechanics;
- Professor Vladimir Mazya – PDEs, Analysis and Approximation methods;
- Dr Sebastien Guenneau – PDEs, Asymptotic methods, Numerical modelling;
- Dr Natalia Movchan – PDEs, Asymptotic methods, Models of material;
- Dr Ozgur Selsil – PDEs, Asymptotic methods, Multi-structures.

There are also four Honorary Research Fellows (two numerical analysts Dr Brian Doman and Dr Martyn Hughes from Liverpool; an analyst Prof G Schmidt from Berlin and another numerical analyst Dr Paul Harris from Brighton). At any one time, we have about 12 PhD students and postdocs and we jointly supervise around 14 (departmental) MSc students each year.

The Numerical Analysis Group benefits from a regular stream of international students joining the PhD programme (e.g. from Pakistan, Thailand, Iran, Mexico, China), which has helped to enrich the Group's activities. In the last 5 years, our collaborative work with Prof T F Chan (UCLA), Prof R H Chan (CUHK) and Prof X C Tai (Bergen) has enabled us to focus more of our research activities on nonlinear variational problems arising from image processing. Yet our leading NA subject is in developing new, fast and novel numerical algorithms for these problems. A recently organized Multidisciplinary Workshop at Liverpool (Nov 2007) on Image Processing Techniques and Applications attracted 80 local people and more challenging imaging problems and researchers were identified for local collaboration. Several collaborative links are being established with Chinese Universities, well beyond Liverpool University's Su-Zhou campus XJTLU.

We anticipate that 2008 will be an exciting time for numerical analysis at Liverpool. Two research centres will be established, namely, the 'Research Centre for Mathematical Modelling (RCMM) led by Prof A B Movchan and the 'Centre for Mathematical Imaging Techniques (CMIT) led by Prof K Chen. Both will provide excellent environments for hosting visitors and organizing workshops and conferences. Researching new variational models, new fast algorithms and new analysis for emerging imaging problems will be the aim of CMIT. Our current work, which is unique within the UK, is centred on automatic image segmentation, image inpainting and multimodality image registration methods for 2D, 3D, 4D and video image applications from medical and dental imaging. More information can be found at http://www.liv.ac.uk/info/research/computational_maths/

Ke Chen (k.chen@liverpool.ac.uk)

4 CERFACS Twentieth Anniversary Meeting

CERFACS celebrated its twentieth anniversary with a meeting from 10–12 October 2007. We held our regular Sparse Days meeting on the 10th and 12th, with the latter day hosting contributions from alumni of the Parallel Algorithms Team. There was a general meeting on the middle day organized at the CERFACS level with contributions on the algorithm side from Gene Golub, Gérard Meurant, Philippe Toint, and Alan Edelman. The event finished with a memorable dinner on the Friday night attended by over fifty people representing every year of the Team's history. The excellent duck-based regional cuisine was admirably supplemented by a poetry recital by Tim Davis recorded in his nadigest articles. Perhaps digest readers were lucky that Tim did not join us for the karaoke session afterwards!

CERFACS (European Centre for Research and Advanced Training in Scientific Computation) started in October 1987 and was initially housed in the School of Meteorology at their campus in Toulouse, moving via an algeco to our current building on the Meteo France campus in 1991. The first members of the Parallel Algorithms (Algo) Team of which I was and still am the Project Leader were a senior scientist Jean-Claude Dunyach (seconded from Aerospatiale), a postdoc Michel Daydé, and PhD students: Patrick Amestoy, Marc Bui, and Eskil Dekker. Michel and Patrick are now professors in the "Grande Ecole" ENSEEIHT in Toulouse and still actively collaborate with CERFACS. There were 25 people in total at CERFACS at that time, rising now to 97 of whom 17 are in the Algo Team. Over the last twenty years, the Algo Team have had 112 long-term visitors or team members, have published 385 reports and 32 theses, 6 at the habilitation level.

CERFACS is a unique centre that combines top level internationally recognized research with a very strong involvement with our industrial partners giving experienced researchers and students alike the chance to experience the relevance of their research to real world problems. The main application areas of CERFACS are led by the other teams viz. Computational Fluid Dynamics (aerodynamics and combustion), Climate Modelling and Global Change, Electromagnetics, and Aviation and Environment. Further information can be obtained from the CERFACS web page (www.cerfacs.fr) and in the publications [1] and [2].

I am planning to write a history of CERFACS from the Algo perspective but let me at this point pay tribute to Pierre-Henri Cros and his AECT CERFACS organization whose vision and energy in a campaign of over four years made the dream a reality.

Abstracts, pdf files, and photos of the Anniversary meeting are available from the Algo web site: <http://www.cerfacs.fr/algos/PastWorkshops/SparseDays2007/index.html>

[1] M.J. Daydé and I.S. Duff. (1994). The CERFACS Experience. In Proceedings PARA '94, Lecture Notes in Computer Science 879, edited by J. Dongarra and J. Waśniewski, Springer Verlag, 169-176.

[2] I.S. Duff and S. Gratton. (2006). The Parallel Algorithms Team at CERFACS. SIAM News 39 (10), 10-11.

Iain Duff
RAL and Chef de Project, CERFACS

5 Who's Visiting Whom

Prof. Y. Ya-Xiang (Chinese Academy of Sciences, Beijing). CAMBRIDGE (Host: Arieh Iserles email: ai@damtp.cam.ac.uk). October 2007 - August 2008.

Dr Suying Zhang (Shanxi University, China). CAMBRIDGE (Host: Arieh Iserles email: ai@damtp.cam.ac.uk). December 2007 - July 2008.

Prof. Toby Driscoll (University of Delaware). OXFORD (Host: Nick Trefethen email: LNT@comlab.ox.ac.uk). January - June 2008.

Prof. Folkmar Bornemann (TU Munich). OXFORD (Host: Nick Trefethen email: LNT@comlab.ox.ac.uk). Last week in February 2008.

Prof. Beresford Parlett (UC Berkeley). OXFORD (Host: Andy Wathen email: Andy.Wathen@comlab.ox.ac.uk). Trinity term 2008.

Oleg Batraev (University of Tartu in Estonia). BATH (Hosts: Ivan Graham, Robert Scheichl and Jan Van Lent). 10 - 23 February 2008.

6 Technical Reports

University of Bath

BICS reports: Available from <http://www.bath.ac.uk/math-sci/bics/preprints/>

16/07 Low and high frequency approximations to eigenvibrations in a medium with double contrasts. Natalia Babych and Yuri Golovaty .

15/07 Re-entrant corner flows of PTT fluids in the Cartesian stress basis. J. D. Evans and D. N. Sibley.

14/07 Asymptotic analysis of vibrating system containing stiff-heavy and flexible-light parts. Natalia Babych and Yuri Golovaty.

- 13/07 Asymptotics of resonances in a thermoelastic model with light local mass perturbations.
Natalia Babych and Johannes Zimmer.
- 12/07 A Two Cities Theorem for the Parabolic Anderson Model.
Wolfgang Knig, Hubert Lacoïn, Peter Mrters and Nadia Sidorov.
- 11/07 Condition Number Estimates for Combined Potential Boundary Integral Operators in Acoustic Scattering. Simon N. Chandler-Wilde, Ivan G. Graham, Stephen Langdon, and Marko Lindner.
- 10/07 Weak and almost sure limits for the parabolic Anderson model with heavy tailed potentials.
Remco van der Hofstad, Peter Mrters and Nadia Sidorova.
- 9/07 Estimating exposure response functions using ambient pollution concentrations.
Gavin Shaddick, Duncan Lee, James V. Zidek and Ruth Salway.
- 8/07 Homogenization of spectral problems in bounded domains with doubly high contrasts.
Natalia O. Babych, Ilia V. Kamotski and Valery P. Smyshlyayev.
- 7/07 A Framework for Predicting Personal Exposures to Environmental Hazard.
James V. Zidek, Gavin Shaddick, Jean Meloche, Chris Chatfield and Rick White.

University of Edinburgh

Reports available from <http://www.maths.ed.ac.uk/ERGO/preprints.html>

- MS 07-001 Operations risk management by planning optimally the qualified workforce capacity.
E. Fragnire, J. Gondzio and X. Yang.
- MS 07-002 Exploiting separability in large scale support vector machine training.
K. Woodsend and J. Gondzio.
- MS 07-003 Convergence analysis of inexact infeasible interior point method for linear optimization.
G. Al-Jeiroudi and J. Gondzio.
- MS 07-004 Regularization and preconditioning of KKT systems arising in nonnegative least-squares problems. S. Bellavia, J. Gondzio and B. Morini.
- MS 07-005 Warm starting for interior point methods applied to the long-term power planning.
A. Pags, J. Gondzio and N. Nabona.
- MS 07-006 Adaptive cubic overestimation methods for unconstrained optimization.
C. Cartis, N.I.M. Gould and Ph.L. Toint.
- MS 07-007 Parallel support vector machine training with nonlinear kernels.
K. Woodsend and J. Gondzio.

University of Cambridge

Reports available from <http://www.damtp.cam.ac.uk/user/na/reports.html>

- NA2007/04 Operator theory and C*-algebras in infinite dimensional numerical linear algebra.
Anders Hansen.
- NA2007/05 Developments of NEWUOA for unconstrained minimization without derivatives.
M.J.D. Powell.

- NA2007/06 Interpolation in special orthogonal groups. T. Shingel.
- NA2007/07 From high oscillation to rapid approximation IV: Accelerating convergence.
D. Huybrechs, A. Iserles and S. Nørsett.
- NA2007/08 Spectral methods and modified Fourier series. B. Adcock.

University of Liverpool

Reports available from http://www.liv.ac.uk/~cmchenke/chen_pub.html

- 08/01 Fast multilevel algorithm for a minimization problem in impulse noise removal
Raymond H Chan and Ke Chen.
- 08/02 Multigrid method for the Chan-Vese Model in variational segmentation
Noor Badshah and Ke Chen.

University of Manchester

MIMS EPrints from <http://www.manchester.ac.uk/mims/eprints>

- 2007.208: How Elegant Code Evolves with Hardware: The Case of Gaussian Elimination.
Jack Dongarra and Piotr Luszczek
- 2007.126: Efficient Solvers for a Linear Stochastic Galerkin Mixed Formulation of Diffusion
Problems with Random Data.
O. G. Ernst, C. E Powell, D. J. Silvester and E. Ullmann.
- 2007.125: Recovery Patterns for Iterative Methods in a Parallel Unstable Environment.
G Bosilca, Z Chen, J Dongarra and J Langou .
- 2007.124: Mixed Precision Iterative Refinement Techniques for the Solution of Dense Linear Systems.
Alfredo Buttari, Jack Dongarra, Julie Langou, Julien Langou, Piotr Luszczek and
Jakub Kurzak.
- 2007.123: Netlib and NA-Net: building a scientific computing community.
Jack Dongarra, G Golub, C Moler and K Moore.
- 2007.122: A Class of Parallel Tiled Linear Algebra Algorithms for Multicore Architectures.
Alfredo Buttari, Julien Langou, Jakub Kurzak and Jack Dongarra.
- 2007.121: Computing the Conditioning of the Components of a Linear Least Squares Solution.
Marc Baboulin, Jack Dongarra, Serge Gratton and Julien Langou.
- 2007.120: Optimal scaling of generalized and polynomial eigenvalue problems.
T. Betcke.
- 2007.117: Detecting and Solving Hyperbolic Quadratic Eigenvalue Problems.
Chun-Hua Guo, Nicholas J. Higham and Franoise Tisseur.

University of Oxford

Reports available from <http://web.comlab.ox.ac.uk/oucl/publications/natr/index.html>

- 07/19 Numerical approximation of corotational dumbbell models for dilute polymers.
J. W. Barrett, E. Sli.

- 07/20 Adaptive cubic overestimation methods for unconstrained optimization. C. Cartis, N. I. M. Gould and P. L. Toint.
- 07/21 Linear instability of asymmetric Poiseuille flows. D. Kachuma, I. Sobey.
- 07/22 Approximation of the scattering amplitude. G. H. Golub, M. Stoll, A. Wathen.

Rutherford Appleton Laboratory

Reports available from <http://www.numerical.rl.ac.uk/reports/reports.html>

- RAL-TR-2007-007 Adaptive cubic overestimation methods for unconstrained optimization. C. Cartis, N.I.M. Gould and Ph.L. Toint.
- RAL-TR-2007-014 An efficient out-of-core multifrontal solver for large-scale unsymmetric element problems. J.K. Reid and J.A. Scott.
- RAL-TR-2007-016 Nonlinear programming without a penalty function or a filter. N.I.M. Gould and Ph.L. Toint.
- RAL-TR-2007-020 An approximate minimum degree algorithm for matrices with dense rows. P. Amestoy, H.S. Dollar, J.K. Reid and J.A. Scott.
- RAL-TR-2007-021 HSL_MI20: an efficient AMG preconditioner. J. Boyle, M.D. Mihajlovic and J.A. Scott.

7 Diary of Seminars

BATH : Seminars take place on Fridays at 12:15pm in Department of Mathematical Sciences, Building 1 West, Room 1W3.6. The timetable has not been finalised yet, but will be available at <http://www.maths.bath.ac.uk/~jv120/na-seminars>

BATH BICS series: Seminars take place at 1:15pm in Department of Mathematical Sciences, Building 1 West, Room 1W3.6. A timetable is available at <http://www.bath.ac.uk/math-sci/bics/seminars/>

BIRMINGHAM : Seminars take place on Thursdays at noon in LRC, Watson Building, Edgbaston Campus. A timetable is available at http://www.mat.bham.ac.uk/research/applied/ona_seminar.htm

BRUNEL : Two seminar series are held in the Department of Mathematical Sciences, John-Crank Building, Room M128. The Applied Mathematics Research Seminars take place on Mondays at 14:00, and the Seminars on Mathematical Physics and Random Matrices are held on Tuesdays at 16:00. More details are available at <http://www.brunel.ac.uk/about/acad/siscm/mathsevents>

CARDIFF : Seminars take place on Mondays at 3pm in School of Mathematics room M/2.06. Contact: Tim Phillips (phillipstn@cardiff.ac.uk).

CAMBRIDGE : There are three relevant seminar series in Cambridge, all held on Thursdays at 3pm, in Meeting Room 14, Centre for Mathematical Sciences: seminars in numerical analysis (organised by Alexei Shadrin, details at <http://www.damtp.cam.ac.uk/user/na/seminars.html>) seminars in applied and computational analysis (organised by Thanasis Fokas, Arieh Iserles and Peter Markowich, details at <http://www.damtp.cam.ac.uk/user/na/ACA/>), and graduate seminars in Applied and Computational Analysis (if interested, contact Tania Shingel at ts380@cam.ac.uk).

DURHAM : All seminars take place at 2pm and interested parties are invited to contact m.p.j.jensen@durham.ac.uk

EDINBURGH : The Edinburgh Research Group in Optimization (ERGO) runs seminars on Optimization and Numerical Analysis. Unless stated otherwise, seminars are held at 3.30pm in the James Clerk Maxwell Building. More details are available from: <http://www.maths.ed.ac.uk/ERGO/ERGOSeminars.html>

MANCHESTER : Numerical Analysis and Scientific Computing Seminars 2007/08 The seminars are held in the in the Alan Turing Building, Frank Adams Room 1, at 3pm. For more details and abstracts, see <http://www.mims.manchester.ac.uk/events/seminars/numerical-analysis.php>

OXFORD : Seminars take place on Thursdays at 2pm in the Lecture Theatre of Oxford University Computing Laboratory, Wolfson Building, Parks Road. A timetable and abstracts are available from <http://web.comlab.ox.ac.uk/oucl/news/>

RAL : Seminars are held in the Atlas Centre, Rutherford Appleton Laboratory and start at 2pm. Contact: s.dollar@rl.ac.uk

READING : Seminars take place on Fridays promptly at 3pm in room 113 of the Mathematics Department. External audiences are advised to contact Brigitte Calderon on 0118 378 5002 (afternoons) or email b.calderon@reading.ac.uk to confirm the programme before attending.

JANUARY 2008

January 10 : OXFORD. Ben Leimkuhler (University of Edinburgh), Molecular Dynamics and the Accuracy of Averages.

January 10 : OXFORD. Zdenek Strakos (Academy of Sciences of the Czech Republic), Nonlinear problems in analysis of Krylov subspace methods.

January 17 : CAMBRIDGE. Emmanuel Candes (California Institute of Technology), Compressive sampling.

January 18 : DURHAM. Omar Lakkis (Sussex), to be announced.

January 18 : READING. Dimitri Pinotsis (Reading), Extensions of the Fourier Transform and a new approach to plane elasticity.

January 21 : BATH BICS. Michael Levitin (Cardiff), Spectral pollution.

January 28 : BATH BICS. Mauro Mobilia (Warwick), Modelling cyclic co-evolution and pattern formation in microbial communities with rock-paper-scissors games.

January 31 : CAMBRIDGE. Hans Georg Feichtinger (Vienna), From conceptual to computational harmonic analysis and back (Gabor analysis, time-frequency methods and applications).

January 31 : OXFORD. Tom Melham (Oxford), Formal verification of an industrial floating-point adder.

FEBRUARY 2008

February 1 : MANCHESTER. Omar Lakkis (Sussex), to be announced.

February 1 : READING. Yuri Kondratiev (Reading) (to be confirmed), Infinite particle Markov semigroups: a constructive approach.

February 4 : BATH BICS. Peter Ashwin (Exeter), Cluster synchrony and spatio-temporal encoding in a simple model of a neural system.

February 7 : RUTHERFORD. Paul Van Dooren (Catholic University of Louvain, Belgium), Some graph optimization problems in data mining.

February 8 : READING. John Mason (Open University), Thinking Mathematically 25 years on.

February 11 : BATH BICS. Steffen Dereich (Bath), to be announced.

- February 13 : EDINBURGH. Tamas Terlaky (McMaster University, Canada), to be announced.
- February 14 : CAMBRIDGE. Shi Jin (University of Wisconsin), Computational high frequency waves in heterogeneous media.
- February 14 : OXFORD. Ya-xiang Yuan (Chinese Academy of Sciences, Beijing), Distance Geometry Problem for Protein Modeling via Geometric Buildup.
- February 15 : MANCHESTER. Toby Driscoll (University of Delaware), to be announced.
- February 15 : READING. Tom Bridges (Surrey), Numerical methods for Hamiltonian PDEs.
- February 18 : BATH BICS. Alexander Gorban (Leicester), Branching principal components and topological grammars for data analysis and dimension reduction.
- February 21 : OXFORD. Holger Wendland (Sussex), to be announced.
- February 22 : DURHAM. Claire Heaney (Durham), to be announced.
- February 25 : BATH BICS. Paul Childs (Schlumberger, Cambridge), to be announced.
- February 28 : OXFORD. Folkmar Bornemann (TU Munich, Germany), to be announced.
- February 28 : CAMBRIDGE. Benoit Perthame (Universite Paris VI), Adaptive evolution and concentrations in parabolic PDEs.
- February 29 : OXFORD. Gene Golub Day. See Section 2.
- February 29 : MANCHESTER. Jared Tanner (Edinburgh), to be announced.
- February 29 : READING. Christophe Geuzane (Liege). High-Frequency Integral Equation Solvers for Acoustic and Electromagnetic Scattering Problems.

MARCH 2008

- March 3 : BATH BICS. Saiful Islam (Bath), to be announced.
- March 6 : RUTHERFORD. Volker Mehrmann (TU Berlin, Germany), Nonlinear eigenvalue problems with structure. A challenge for current computational methods.
- March 7 : DURHAM. Ian Wilson (Cambridge), to be announced.
- March 7 : EDINBURGH. Ya-xiang Yuan (Chinese Academy of Sciences, China), to be announced.
- March 7 : READING. Martin Ehrendorfer (Reading), Recent Developments in Data Assimilation.
- March 10 : BATH BICS. Manuchehr Soleimani (Bath), Multi-scale multiphysics tomography.
- March 13 : CAMBRIDGE. Nick Trefethen (Oxford), to be announced.
- March 14 : DURHAM. Andrea Cangiani (Consiglio Nazionale delle Ricerche, Rome), to be announced.
- March 14 : READING. Chris Budd (Bath), Parabolic Monge Ampere methods for mesh generation.
- March 18 : EDINBURGH. Andy Wathen (Oxford), to be announced.

APRIL 2008

- April 11 : MANCHESTER. Joab Winkler (University of Sheffield), to be announced.
- April 25 : MANCHESTER. Beresford Parlett (UC Berkeley), to be announced.
- April 30 : EDINBURGH. Michael J.D. Powell FRS (Cambridge), to be announced.

8 Forthcoming Meetings and Conferences

JANUARY 2008

International Workshop on Recent Advances in Numerical Methods for Eigenvalue Problems 2008 (RANMEP2008), January 4-8

National Tsing Hua University, Taiwan. <http://math.cts.nthu.edu.tw/Mathematics/RANMEP2008.htm>

Winter School on Computational Science (WSCS 2008), January 7-11

The University of Texas at El Paso. http://www.math.utep.edu/wscs_2008/

18th International Conference on Domain Decomposition Methods, January 12-17

Hebrew University, Jerusalem. <http://www.cs.huji.ac.il/dd18/>

ACM-SIAM Symposium on Discrete Algorithms (SODA08), January 20-22

San Francisco, California. <http://www.siam.org/meetings/da08/>

GAMM-Seminar on Tensor Approximations, January 25-26

Leipzig, Germany <http://www.mis.mpg.de/scicomp/gamm24/index.html>

FEBRUARY 2008

Remembering Gene Golub Around the World, February 29

Various venues. <http://www.cs.nyu.edu/overton/genearoundtheworld/>

MARCH 2008

SIAM Conference on Parallel Processing for Scientific Computing, March 12-14.

Atlanta, Georgia. <http://www.siam.org/meetings/pp08/>

International Workshop on Advanced Computing and Applications, March 12-14.

Ho Chi Minh City, Vietnam. <http://www.cse.hcmut.edu.vn/ACOMP2008>

9th IMACS International Symposium on Iterative Methods in Scientific Computing, March 17-20.

Lille, France. <http://www-lmpa.univ-littoral.fr/IMACS09/>

32nd South African Symposium on Numerical and Applied Mathematics (SANUM 2008), March 26-28.

Stellenbosch, Cape Town. <http://dip.sun.ac.za/sanum/>

GAMM 2008, March 31- April 4.

Bremen, Germany. <http://www.zarm.uni-bremen.de/gamm2008/>

SIAM International Conference on Numerical Combustion (NC08) March 31- April 2.

Monterey Bay, Monterey, California <http://www.siam.org/meetings/nc08/>

APRIL 2008

Tenth Copper Mountain Conference on Iterative Methods, April 6-11.

Copper Mountain, Colorado. <http://amath.colorado.edu/faculty/copper/>

International Parallel and Distributed Processing Symposium (IPDPS08), April 14-18.

Miami, Florida. <http://www.ipdps.org>

First Workshop on Parallel and Distributed Computing in Finance (PDCoF08-Computational Finance, April 18.

Miami, Florida. <http://www.cs.umanitoba.ca/pdcof>

SIAM International Conference on Data Mining (SDM08), April 24-26.

Atlanta, Georgia. <http://www.siam.org/meetings/sdm08/>

MAY 2008**SIAM Conference on Optimization, May 10-13.**

Boston, Massachusetts. <http://www.siam.org/meetings/op08/>

Seventh CTW on Graphs and Combinatorial Optimization, May 13-15.

Gargnano, Italy <http://ctw08.dti.unimi.it>

PARA'08, Workshop on State-of-the-Art in Scientific and Parallel Computing, May 13-16.

Trondheim, Norway. <http://www.idi.ntnu.no/~elster/para2008/>

JUNE 2008**Householder Symposium XVII, June 1-6**

Zeuthen, Germany. http://www3.math.tu-berlin.de/householder_2008/

Second International Conference on Control and Optimization with Industrial Applications, June 2-4.

Baku, Azerbaijan. www.ciuit.az/coia2008

13th International Conference on Mathematical Modelling and Analysis (MMA2008), June 4-7.

Tartu, Estonia. <http://www.iam.ut.ee/mma-amoe2008/>

International Symposium on Finite Volumes for Complex Applications, June 8-13.

Aussois, France. <http://www.latp.univ-mrs.fr/fvca5/>

International Workshop on Accurate Solution of Eigenvalue Problems VII (IWASEP VII), June 9-12.

Dubrovnik, Croatia. <http://www.fesb.hr/iwasep7/>

Numerical Geometry, Grid Generation and Scientific Computing, June 10-13.

A.A. Dorodnicyn Computing Center of Russian Academy of Sciences, Moscow.
<http://www.ccas.ru/gridgen/numgrid2008>

Structural dynamical systems workshop, June 17-20.

Bari, Italy. <http://www.portogiardino.it>

Foundations of Computational Mathematics, June 16-26.

Hong Kong. <http://www.damtp.cam.ac.uk/user/na/FoCM/FoCM08/>

Parallel Matrix Algorithms and Applications (PMAA'08), June 20-22.

Neuchatel, Switzerland. <http://www.dcs.bbk.ac.uk/pmaa08/>

IEEE Conf. on Computational Science and Engineering, June 25-27.

Sao Paulo, Brazil. <http://cse.stfx.ca/cse08/>

JULY 2008**SIAM Conference on Imaging Science (IS08), July 7-9.**

San Diego, California. <http://www.siam.org/meetings>

13th International Congress on Computational and Applied Mathematics (ICCAM-2008), July 7-11.

Leuven, Belgium. <http://www.iccam.ugent.be/>

SIAM Annual Meeting, July 7-11.

San Diego, California. <http://www.siam.org/meetings>

Conference on The Legacy of John Crank, July 10-11.

Brunel University, England. www.people.brunel.ac.uk/~icsrsss/bicom/johncrank2008.

CTAC'08 - The 14th Biennial Computational Techniques and Applications Conference, July 13-16.

Australian National University, Canberra. <http://www.maths.anu.edu.au/events/ctac08/>

London Mathematical Society Durham Symposium: Computational Linear Algebra for Partial Differential Equations, July 14-24.

Durham, UK. <http://maths.dur.ac.uk/events/Meetings/LMS/2008/CLAPDE/>

Stochastic and Global Optimization (SAGO 2008), July 19-23.

19-23 July 2008 Kruger National Park. <http://www.wits.ac.za/conferences/sago/>

International Symposium on Symbolic and Algebraic Computation, July 20-23.

Hagenberg, Austria. <http://www.risc.uni-linz.ac.at/issac2008/>

Modeling, Simulation and Optimization of Complex Processes, July 21-25.

Heidelberg, Germany. <http://mosocop08.uni-hd.de>

AUGUST 2008

Fifth International Conference on Automatic Differentiation, August 11-15.

Bonn, Germany. <http://www.autodiff.org/ad08/>

International Conference Approximation and Computation, August 25-29.

Faculty of Electronic Engineering, Nis, R. of Serbia. <http://euler.elfak.ni.ac.yu/appcom08>

SEPTEMBER 2008

8th GAMM Workshop Applied and Numerical Linear Algebra with special emphasis on regularization of Ill-posed Problems, September 11-12.

Hamburg, Germany. <http://www.tu-harburg.de/mat/gamm08/>

EURO-CBBM Conference on Computational Biology, Bioinformatics and Medicine, September 15-17.

Rome, Italy. <http://euro-cbbm.ku.edu.tr/RomeConference/homepage.htm>

OCTOBER 2008

International Conference on Applied Mathematics and Approximation Theory 2008, October 11-13.

University of Memphis, USA. <http://www.mscl.memphis.edu/AMAT2008/>

9 Highlighted Conferences

**Conference on the Legacy of John Crank
Developments in Time Dependent PDEs, Diffusion and Free Boundary Problems.
10 - 11 July 2008
Brunel University, Uxbridge, UK.**

A two day conference will be held at Brunel University to consider the influence the work of John Crank has had on the numerical solution of time dependent PDEs, on the modelling of diffusive processes and on free boundary problems. The focus of the meeting will be on the state-of-the-art of the subject and on future developments and applications, including industrial applications.

John Crank (1915 - 2006) originally worked in industry on the modelling and numerical solution of diffusion in polymers. In 1943, working with Phyllis Nicolson on finite difference methods for the time dependent heat equation, he proposed the Crank-Nicolson method which has since been incorporated universally for the solving of time dependent problems. John Crank, who was the first professor of mathematics at Brunel University, died in October 2006 and the purpose of this meeting is to consider

the legacy that he left to the numerical solution of partial differential equations and in particular to consider future developments and applications in the field.

The conference is funded in part by a grant from the London Mathematical Society. This grant contains a component for supporting research students studying at universities in the UK and the Republic of Ireland, who do not have other means of support (e.g. from their Doctoral Training Awards).

The main speakers will be:

- Karl-Heinz Hoffman (TU Munich, Germany)
- Mary Wheeler (University of Texas at Austin, USA)
- Omar Lakkis (University of Sussex, UK)
- Gerd Dziuk (University of Freiberg, Germany)
- John Barrett (Imperial College, UK)
- Jrgen Sprekels (Weierstrass Institute, Berlin, Germany)
- Mario Primicerio (University of Florence, Italy)
- Henri Berestycki (EHESS, France)
- Pierluigi Colli (University of Pavia, Italy)
- David Edwards (University of Delaware, USA)
- Andrew Lacey (Herriot Watt University, UK)
- John King (University of Nottingham, UK)
- William Shaw (King's College, UK)

Organisers: J. Ockendon, C.M. Elliott and J. R. Whiteman.

For further details, see <http://people.brunel.ac.uk/~icsrsss/bicom/johncrank2008>
or contact Carolyn.sellers@brunel.ac.uk

Foundations of Computational Mathematics 2008

The next Foundations of Computational Mathematics conference will take place at the City University of Hong Kong at Hong Kong, China, on 16-26 June 2008.

The conference, organised by the Society for Foundations of Computational Mathematics, is the sixth in a sequence that commenced with the Park City, Rio de Janeiro, Oxford, Minneapolis and Santander FoCM meetings.

The conference will follow a format tried and tested to a great effect in former FoCM conferences: plenary invited lectures in the mornings, theme-centred parallel workshops in the afternoons. Each workshop extends over three days and the conference will consist of three periods, comprising of different themes. Although some participants choose to attend just one or two periods, on past experience the greatest benefit follows from attending the conference for its full eleven days: the entire idea of FoCM is that we strive to break out of narrow boundaries of our specific research areas and open our minds to the broad range of exciting developments in computational mathematics.

Each workshop will include a daily “semi-plenary” lecture, of an interest to a more general audience, as well as (typically shorter) talks aimed at more technical audience. The choice of speakers in a workshop is the responsibility of workshop organisers. Many (but by no means all) workshop talks will be by invitation.

We have every intention to build upon previous FoCM conferences and to make FoCM'08 into a unique meeting point of workers in computational mathematics and of theoreticians in mathematics and in computer sciences. While presenting plenary talks by foremost world authorities and maintaining the highest technical level in the workshops, the emphasis, like in Park City, Rio de Janeiro, Oxford, Minneapolis and Santander, will be on multidisciplinary interaction across subjects and disciplines, in an informal and friendly atmosphere. We hope that it will be an opportunity to meet colleagues from different subject-areas and identify the wide-ranging (and often surprising) common denominator of our research.

Further details, see <http://www.damtp.cam.ac.uk/user/na/FoCM/FoCM08/>

Bath Institute for Complex Systems (BICS) Conferences: University of Bath
<http://www.bath.ac.uk/math-sci/BICS/conferences/index.html>

11 January 2008. Localisation Meeting.

The objective of this 'open-forum' meeting is to bring together researchers working on localisation phenomena in solid mechanics, structural dynamics, and nonlinear systems. The main goals are to look at the interplay between linear/nonlinear and discrete/continuous facets of localisation.

6 February 2008. BICS PDRA Day.

The Maths of Complex Systems: Where are we heading?

30 June - 2 July 2008. Lattice meeting.

The selected topics for this conference are Hamiltonian Systems, dissipative systems, travelling waves, statics, geometric integration and continuum limits of lattices. Applications include: crystals, optics, mechanics, neurons and traffic models.

7 - 9 July 2008. Postgraduate Summer Workshop on Probabilistic Techniques in Population Genetics.

9 - 11 September 2008. Emergence in Complex Systems.

BICS will hold a three day multi-disciplinary international conference on topics related to emergence in complex systems. The provisional themes of the conference include network models, complex physical and mechanical systems, the social sciences and economics. The meeting will be led by a series of invited presentations and there will be opportunities for contributed talks and posters. We aim to encourage lively interaction between researchers in different fields, with emergence as a common theme.

CARIPLO Workshop on Numerical Linear and Nonlinear Stochastic Programming
 – An ICMS Associated Meeting –
September 3 – 5, 2008
THE UNIVERSITY OF EDINBURGH, EDINBURGH, United Kingdom

Many real-life problems involve uncertainty in their data, such as portofolio optimization with uncertain future stock price. Stochastic programming is a popular approach to decision making under uncertainty, leading to very large-scale problems with challenging solutions. It is also highly interdisciplinary, involving researchers that work on scenario generation, computational and theoretical linear and nonlinear optimization, modelling, etc. The focus of the workshop is to bring together — for training and networking purposes — PhD students, young researchers and experts in these diverse aspects of stochastic programming, to present and discuss in an accessible manner promising mathematical and computational avenues for tackling the current challenges in this area.

Keynote plenary lectures given by

- Giorgio Consigli, University of Bergamo, Italy
- Michael Dempster, University of Cambridge, UK
- Gautam Mitra, Brunel University, UK
- Georg Pflug, University of Vienna, Austria
- Alex McNeil, Heriot-Watt University, UK
- Marc Steinbach, University of Hannover, Germany

Scientific committee:

- Giorgio Consigli, University of Bergamo (Italy)
- Jacek Gondzio, University of Edinburgh (UK)

- Andreas Grothey , University of Edinburgh (UK)
- Gautam Mitra, Brunel University (UK)
- Georg Pflug, University of Vienna (Austria)
- Alexei Gaivoronski, University of Trondheim (Norway)

Organizing committee: Andreas Grothey (chairman), Coralia Cartis, Marco Colombo, Jacek Gondzio,

Supporting institutions: This workshop is supported by the Cariplo Foundation (<http://www.fondazionecariplo.it>), as part of a network of stochastic programming research and training meetings, with the first edition being held at the University of Bergamo (Spring School in Stochastic Programming, <http://www.unibg.it/SPS2007>). More information will soon be available at: <http://www.icms.org.uk>

10 Fortran 2003 for Fortran 95 Programmers - 24-25 April 2007

If you want to find out more about the new features of the Fortran 2003 standard then consider attending this 2 day course run by Cranfield's Shaun Forth and the ISO Fortran Committee Convenor John Reid. This course is timely since most Fortran compilers already support a number of the new features and expectations are high that the first fully Fortran 2003 compliant compiler will be released in 2008. Targeted at proficient Fortran 95 programmers, the course introduces features such as floating point exception handling, interoperability with C, and object oriented programming and covers a myriad of incremental improvements from the Fortran 95 standard. Lectures will be supported by hands-on practicals for compiler supported features.

For details, see <http://www.cranfield.ac.uk/dcmt/shortcourses/page7906.jsp>

11 2007 Wilkinson Prize for Numerical Software

The 2007 Wilkinson Prize for Numerical Software was awarded to Wolfgang Bangerth (Texas A&M University), Guido Kanschat (Texas A&M University), and Ralph Hartmann (DLR Braunschweig) for deal.II, a software library for computational solution of partial differential equations using adaptive finite elements (www.dealii.org). The presentation took place at the 6th International Congress on Industrial and Applied Mathematics (ICIAM 2007) in Zurich, Switzerland.

deal.II is a large, object-oriented software library that facilitates the implementation of finite element algorithms with mesh adaptivity and complex shape functions. A unified interface provides support for applications with one, two, and three space dimensions. The library includes extensive documentation, an impressive number of examples, and a website tutorial, all of which aim to make the data structures and algorithms used as transparent as possible.

deal.II is open source and can be downloaded from the Internet. With its emphasis on generality and ease of implementation, deal.II has already been used in a wide range of applications, including fluid flow, magnetohydrodynamics, biomedical inverse imaging problems, fuel cell modeling, and simulation of crystal growth. More than 60 publications show results obtained with deal.II.

The Prize is awarded every four years to the entry that best addresses all phases of the preparation of high-quality numerical software, and is sponsored by Argonne National Laboratory (US), the National Physical Laboratory (UK) and the Numerical Algorithms Group (UK).

Maurice Cox
Chair, Board of Trustees

12 PhD Theses

University of Bath

Melina Freitag Inner-outer Iterative Methods for Eigenvalue Problems - Convergence and Preconditioning.

Brunel University

Norbert Bauermeister. Finite Element Methods for Non-Fickian Diffusion in Viscoelastic Polymers, December 2007. http://people.brunel.ac.uk/~icsrsss/bicom/tech_rep.html

Oxford University

Ivana Drobnjak. FMRI Simulator: Development and Applications.

Dick Kachuma. Fast Moving Waves in Two - Dimensional Channel Flow.

Thomas Schmelzer. The Fast Evaluation of Matrix Functions for Exponential Integrators.

13 Recent Appointments

University of Bath

Melina Freitag, GWR fellow working on Data Assimilation in collaboration with the Met Office.

David Barton, GWR fellow working on “Modelling MEMS devices for power scavenging” at the Bristol Centre for Applied Nonlinear Mathematics (BCAMN) and Electrical Energy Management Group (EEMG), University of Bristol, jointly with the Bath Institute for Complex Systems (BICS), University of Bath.

Cambridge University

Peter Markowich, Professor of Applied Mathematics (main areas of specialisation: partial differential equations, from theory to computation and to applications, with emphasis on equations occurring in kinetics, semiconductors, solid mechanics, fluid dynamics, image processing, porous media, ...)

Oxford University

Dr Rodrigo Platte, post-doc on the chebfun project (since October 2007).

Dr Daniel Robinson, post-doc on SQP methods for constrained optimization (since November 2007).

14 Vacant positions and studentships

University of Bath: Professor/Reader in Applied Mathematics

Professor/Reader in Applied Mathematics ref. 07H458A CP

Department: Mathematical Sciences

Closing date: 28 February 2008

Applications are invited for a newly-established senior post in the Department of Mathematical Sciences at the University of Bath. The appointment will be made at either the Professor or the Reader level and applicants should have an established international track record of research excellence. Current applied mathematics research strengths include: analysis and applications of differential equations, continuum mechanics and waves, control theory, mathematical biology, numerical analysis and industrial applied mathematics. There is a strong culture of interdisciplinary and industrial collaboration and a substantial research programme in complex systems, supported by the Bath Institute for Complex Systems. We seek strong applications in all areas of applied mathematics which both resonate with, and complement, our existing research interests. The new appointment will be expected to maintain a world class research programme and to attract substantial external research funding. Candidates at Professor level should

possess in addition research leadership and administrative skills. An appointment to a Readership may be made to a candidate with outstanding research leadership potential. Candidates should also have a commitment to excellence in undergraduate and postgraduate teaching.

Informal enquiries may be made to the Head of Department, Professor N.F. Britton (nfb@maths.bath.ac.uk), or to Professor C.J. Budd, cjb@maths.bath.ac.uk or Professor I.G. Graham (igg@maths.bath.ac.uk).

Further details available at <http://www.bath.ac.uk/jobs>

SENIOR RESEARCHER POSITION AT CERFACS

A senior researcher position will be available at CERFACS to work in the Parallel Algorithms Team led by Iain Duff. This permanent position is available from 1st February 2008, but a later start date would be possible. The Parallel Algorithms Team is looking for a bright, motivated person with a good research record and the ability to supervise research projects and students. The applicant would be expected to join existing projects in numerical optimization and linear algebra as well as showing initiative in pursuing new research directions. Applications in the areas of massively parallel algorithms and/or robust optimization for problems with uncertain data are preferred.

Additional benefits of the position include a competitive salary, travel opportunities, access to state-of-the-art computational facilities (including both SMP/MPP parallel architectures and high-performance workstations). A particular strength of CERFACS is its access to real-life applications through strong and well developed academic/industrial collaborations within a very active research program in advanced scientific computing.

Relevant information on the application procedure can be found at <http://www.cerfacs.fr/Admin/rules.html> Please note that a one-page summary of your research plan at CERFACS is highly recommended.

For detailed information about the Parallel Algorithms Project at CERFACS:
<http://www.cerfacs.fr/algor>

For more information about Toulouse, the city where CERFACS is located:
<http://www.cerfacs.fr/Links/index.html>

Applications should be sent before January 25, 2008 to Xavier Vasseur (vasseur@cerfacs.fr)

POSTDOC POSITION AT CERFACS

A postdoc position will be available at CERFACS to work in the Parallel Algorithms Team led by Iain Duff. This post is available from 1 February 2008, but a later start date would be possible. This position is for one year and can be extended for another year. The Parallel Algorithms Team is looking for a bright, motivated person with a good research background. The applicant would be expected to join existing projects in numerical linear algebra and optimization but should be able to also work independently. Applications in the areas of massively parallel algorithms and/or robust optimization for problems with uncertain data are preferred.

Additional benefits of the position include a competitive salary, travel opportunities, access to state-of-the-art computational facilities (including both SMP/MPP parallel architectures and high-performance workstations), and access to real-life applications through fruitful academic/industrial collaborations in a very active research program in advanced scientific computing.

Relevant information on the application procedure can be found at:
<http://www.cerfacs.fr/Admin/rules.html> Please note that a one-page summary of your research plan at CERFACS is highly recommended.

Applications should be sent before 25 January, 2008 to Xavier Vasseur (vasseur@cerfacs.fr)

15 IMA Journal of Numerical Analysis

Contents of Volume 27, Number 4.

- 631 X. WANG and I. H. SLOAN Brownian bridge and principal component analysis: towards removing the curse of dimensionality
- 655 J. DICK, G. LEOBACHER and F. PILLICHSHAMMER Randomized Smolyak algorithms based on digital sequences for multivariate integration
- 675 H. ELMAN and D. FURNIVAL Solving the stochastic steady-state diffusion problem using multigrid
- 689 C. CHAINAIS-HILLAIRET and F. FILBET Asymptotic behaviour of a finite-volume scheme for the transient drift-diffusion model
- 717 S. DAHLKE, T. RAASCH, M. WERNER, M. FORNASIER and R. STEVENSON Adaptive frame methods for elliptic operator equations: the steepest descent approach
- 741 F. KARAKATSANI and C. MAKRIDAKIS A posteriori estimates for approximations of time-dependent Stokes equations
- 765 A. BRADJI and A.-S. CHIBI Optimal defect corrections on composite nonmatching finite-element meshes
- 781 B. BUJANDA and J. C. JORGE Order conditions for linearly implicit fractional step RungeKutta methods
- 798 J. VIGO-AGUIAR and H. RAMOS A family of A-stable RungeKutta collocation methods of higher order for initial-value problems
- 818 I. P. GAVRILYUK, A. V. KLIMENKO, V. L. MAKAROV and N. O. ROSSOKHATA Exponentially convergent parallel algorithm for nonlinear eigenvalue problems

For further details see: www.imanum.oupjournals.org

16 Software News

NAG

As we start a new year it is heartening to realise that NAG is recruiting extra staff to develop software and meet its commitments to the HECToR project.

In general we always welcome enquiries from skilled software developers with a mathematical background who feel they may be able to contribute to NAG. To encourage this we have recently devoted some specific pages on our web site to highlight the benefits of working for NAG. If you are interested, or know of colleagues who might be interested, then please look at: www.nag.co.uk/about/careers/overview.asp

Whilst some of the successful applicants will primarily be involved in developing our numerical optimisation and our XML capabilities, others will be mainly working on HECToR project. This is the UK's new high-end computing resource, funded by the Research Councils and available for researchers at UK universities. NAG's role is to provide training, web-based resources, and assistance with porting, optimisation and tuning of software for the Cray XT4-based system supercomputer.

For more details of the HECToR project see <http://www.hector.ac.uk/> and for particular details of the Computational Science and Engineering (CSE) activity please see <http://www.hector.ac.uk/support/cse/>

David Sayers (David.Sayers@nag.ac.uk)

HSL 2007: New solvers for very large sparse linear systems

Direct methods for solving linear systems $Ax = b$, where the matrix A is large and sparse, are popular because of their generality and robustness. Their main weakness is that the memory they require usually increases rapidly with problem size. John Reid and Jennifer Scott of the Numerical Analysis Group at the Rutherford Appleton Laboratory have recently designed and developed a new symmetric direct solver that aims to circumvent this limitation by allowing the system matrix, intermediate data, and the matrix factors to be stored externally. The code, HSL_MA77, is one of the major new packages included in HSL 2007. To make the code applicable to a wide range of problems, the matrix A may either be in assembled form or held as a sum of element matrices. The first release of HSL_MA77 is for positive-definite systems and it performs a Cholesky factorization using a multifrontal algorithm; the second release (which will be available shortly) will have an option that incorporates numerical pivoting using 1×1 and 2×2 pivots, allowing the package to be used to solve indefinite problems. Special attention has been paid to the use of efficient dense linear algebra kernel codes that handle the full-matrix operations on the frontal matrix and to the input/output operations. The input/output operations are performed using a new HSL package, HSL_OF01, that provides a virtual-memory system and allows the data to be spread over many files; for very large problems these may be held on more than one device.

HSL_MA77 has been tested on problems from practical applications. For problems that can be solved without the use of files, a built-in option for in-core working is provided. Tests with this option have shown the code to be competitive (or better) than existing direct solvers. An attractive feature of the package is that, if the user requests in-core working but insufficient memory is available, the code automatically switches to out-of-core working, without the need to restart the computation.

A version for unsymmetric element problems, called HSL_MA78, is also available. We expect to develop a version for complex arithmetic in the future.

Reports on the new codes are available from www.numerical.rl.ac.uk/reports/reports.shtml

All HSL codes are freely available to UK academics for research and teaching purposes. Full details of the contents of HSL 2007 and how to obtain the software are available at <http://www.cse.scitech.ac.uk/nag/hsl/hsl.shtml> (or contact Jennifer Scott email: j.a.scott@rl.ac.uk)

17 Postgraduate Courses

This information is unchanged since the last Newsletter (Volume 32, Number 1), which is available at http://www.ima.org.uk/learned_soc/interestgroups.htm

18 Acknowledgements

I would like to thank the following people for contributing to this issue of the Newsletter.

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