ICIAM 99
5 - 9 July 1999

Wednesday, 7 July, Morning Session
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	Heinz W ENGL, *Nonlinear Inverse Problems, Regularisation Theory, Industrial Problems*	GS
	F P KELLY, *Mathematical Modelling of the Internet (Schlumberger Lecture)*	MH
	09.55 – 10.40 Plenary Lectures	
	H J PESCH, *Offline and Online Methods of Optimal Control and Differential Game Problems with Applications in Industrial Engineering*	GS
	S POPESCU, *What is quantum computation? (Schlumberger Lecture)*	MH
	11.00 – 13.00 Mini-Symposia	
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MSP-030	Electromagnetic Inverse Problems	AT-2B
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MSP-159	Infinite Networks and Continuous Transport Problem	DHT-4.18
MSP-164	Mathematical Modelling and Computational Aspects in Blood Flow I	WRB-1
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MSP-190	Spline Collocation Methods for Partial Differential Equations	AT-4
MSP-195	Phase Field Models and Prediction of Micro-Morphological Changes in Alloys I	WRB-2
MSP-199	Java for Computational Science and Engineering I	DHT-3.01
MSP-202	Spectral Problems in Differential Equations	AT-6
MSP-205	Methods of Dimension Reduction I	WRB-4
MSP-207	Warranty Modelling and Data Analysis	MS-5
MSP-211	Challenging Problems in Large-Scale Computing	MS-4
MSP-217	Differential Geometric Methods in Control and Design	AFB-10
MSP-218	Industrial Image Processing, Mathematics for Software Companies	AT-8
	11.00 – 13.00 Contributed Presentations: Lectures	
C-11	Numerical Methods in Differential Equations III	AFB-13
C-12	Fluid Mechanics III	AFB-14
C-13	Solid Mechanics	AFB-17

C-14	Asymptotics and Control Theory	AFB-18
C-32	Financial Mathematics and Probability	AT-2.A2
C-39	Signal and Image Analysis	WRB-3
C-42	Partial Differential Equations and Asymptotics	AT-2D
C-47	Medicine and Biology	DHT-3.18
	11.00 – 13.00 Contributed Presentations: Posters	
P-2	Posters II	DHT-LF

Also this morning		
09.45	**1999 Henrici Prize presentation**, see p. 223	McEwan Hall

Wednesday, 7 July, Morning Session
Details

09.00 – 09.45 Plenary Lectures

Plenary Lecture — George Square Lecture Theatre

Heinz W ENGL (Johannes Kepler University, Linz, Austria)

Nonlinear Inverse Problems, Regularisation Theory, Industrial Problems

Chair: H NEUNZERT (Institut fuer Techno- und Wirtschaftsmathematik, Germany)

Inverse problems, i.e., problems where one looks for causes for a desired or an observed effect, are quite important in many applications in science and technology. We describe such problems arising in fields like nondestructive testing and steel processing (inverse heat conduction and parameter identification problems in casting and rolling of steel). Many of these problems are, in addition to being ill-posed, nonlinear. In recent years, the mathematical theory of methods for attacking nonlinear inverse problems has undergone major development. We survey results about convergence (with rates) of Tikhonov regularization for nonlinear ill-posed problems and then present recent results about convergence of iterative regularization methods for nonlinear ill-posed problems. Finally, we show that these methods can be efficiently applied to the industrial problems outlined.

Plenary Lecture — McEwan Hall

F P KELLY (University of Cambridge, UK)

Mathematical Modelling of the Internet (Schlumberger Lecture)

Chair: R BURRIDGE (Schlumberger-Doll Research, Ridgefield, USA)

Modern communication networks are able to respond to randomly fluctuating demands and failures by allowing buffers to fill, by rerouting traffic and by reallocating resources. They are able to do this so well that, in many respects, large-scale networks appear as coherent, almost intelligent, organisms. The design and control of such networks present challenges of a mathematical, engineering and economic nature.
This talk will describe how mathematical models are being used to address current issues concerning the stability and fairness of rate control algorithms for the Internet and for developing broadband networks.
Further information and references are available at http://www.statslab.cam.ac.uk/ frank/TALKS/mi.html

09.55 – 10.40 Plenary Lectures

Plenary Lecture George Square Lecture Theatre

H J PESCH (University of Bayreuth, Germany)

Offline and Online Methods of Optimal Control and Differential Game Problems with Applications in Industrial Engineering

Chair: H NEUNZERT (Institut fuer Techno- und Wirtschaftsmathematik, Germany)

First an overview of the state of the art of numerical methods for optimal control problems is given, by which optimal solutions can be computed for a wide range of problems governed by systems of ordinary or differential-algebraic equations including different kind of constraints. Several applications from the fields of aerospace engineering, robotics, process engineering, and vehicle dynamics are given.
Methods for online computations are not as well developed as offline methods. An overview of different approaches is given here with the emphasis on synthesis methods by which closed-loop controls can be approximated from the open-loop controls along bundles of trajectories. This method is also applicable to zero-sum differential game problems. By these problems optimal control problems under uncertainties for worst case scenarios can be modelled by assuming that the uncertainties are controled by an antagonistic second player. Applications from aerospace engineering and vehicle dynamics are given.

Plenary Lecture McEwan Hall

S POPESCU (Isaac Newton Institute, Cambridge, UK)

What is quantum computation? (Schlumberger Lecture)

Chair: R BURRIDGE (Schlumberger-Doll Research, Ridgefield, USA)

An introduction in quantum computation at a popular level. The basic ideas of quantum computation and some simple quantum algorithms will be presented, and the architecture of a quantum computer - quantum logical gates, and an experimental proposal for building a quantum computer using linear ion traps - will be described. This will be followed by a brief discussion of the problem of noise in quantum computation and the fundamental idea behind quantum error correction codes.

11.00 – 13.00 Mini-Symposia

MSP-023 William Robertson Building, Seminar Room 11

New Developments in Partial Differential Equations, in the Calculus of Variations, in Simulation and Applications to Materials V

(see also Part I, MSP-019, p. 13; Part II, MSP-020, p. 29; Part III, MSP-021, p. 47; Part IV, MSP-022, p. 64; Part VI, MSP-024, p. 102)

Organisers: FONSECA, Irene (Center for Nonlinear Analysis, Carnegie Mellon University, Pittsburgh, USA)
KINDERLEHRER, David (Center for Nonlinear Analysis, Carnegie Mellon University, Pittsburgh, USA)

PIRONNEAU, Olivier (University of Paris 6, France) *Application of automatic differentiation of computer programs to PDEs* (p. 35)
BALL, John M (University of Oxford, UK) *Models for surface relaxation* (p. 31)
KOWALCZYK, Michał (Carnegie Mellon University, Pittsburgh, USA) *Dynamics of single spikes in the Gierer-Meinhardt system* (p. 33)
FONSECA, Irene (Department of Mathematical Sciences, Carnegie Mellon University, Pittsburgh, USA) *Relaxation results for constrained variational problems* (p. 32)

MSP-030 Appleton Tower, Room 2B

Electromagnetic Inverse Problems

Organiser: CHENEY, Margaret (Rensselaer Polytechnic Institute, USA)

Recovering the internal structure of a complex inhomogeneous medium or the shape of a scattering body, from data on scattered electromagnetic fields, are mathematical problems of significant interest. These problems lie at the core of such application areas as remote sensing, medical imaging, geophysical exploration, radar detection, and nondestructive testing. In this minisymposium, recent advances in mathematical techniques for addressing these problems will be presented.

WINEBRENNER, Dale P (University of Washington, USA) *Inversion of the 1-D Helmholtz equation: Application to the physical world* (p. 42)
CHENEY, Margaret (Rensselaer Polytechnic Institute, USA) *Acoustic and electromagnetic distinguishability in the half-space geometry* (p. 41)
CHERKAEVA, Elena (University of Utah, USA) *Inverse homogenization and the recovery of microstructural information in composite media* (p. 41)

MSP-048 David Hume Tower, Faculty Room North

Mathematical Modeling of Electromagnetics II

(see also Part I, MSP-047, p. 66; Part III, MSP-049, p. 102)

Organisers: AMMARI, Habib (Ecole Polytechnique, France)
BAO, Gang (University of Florida, USA)

BAO, Gang (University of Florida, USA) *Some mathematical issues in diffractive optics* (p. 53)
COSTABEL, Martin (Université de Rennes, France) *Nonsmooth electromagnetic problems and standard finite elements* (p. 54)
JOLY, Patrick (INRIA, France) *Space-time mesh refinement for Maxwell's equations* (p. 54)
NÉDÉLEC, Jean-Claude (Ecole Polytechnique, France) *Maxwell's equations in chiral media* (p. 55)

MSP-052 Adam Ferguson Building, Room 19

Impact and Friction in Contact Problems

Organiser: STEWART, David E (University of Iowa, Iowa City, USA)

The minisymposium is about the computational and mathematical treatment of contact problems with impact and Coulomb friction, which arise in robotics, manufacturing, realistic computer animations, and many other areas. Issues involved in these problems include: nonsmooth and/or discontinuous formulations; discontinuous velocities; and impulsive forces (with or without collisions). Typical approaches include complementarity problems, time-stepping methods, differential inclusions, and measure theory.

STIEGELMEYR, Andreas (Institute B for Mechanics, Technical University Munich, Germany) *Impacts with friction - Theory and practice* (p. 58)
KUNZE, Markus (Mathematisches Institut, Universitaet Koeln, Cologne, Germany) *On the application of Conley index theory to non-smooth dynamical systems* (p. 58)
STEWART, David E (Department of Mathematics, University of Iowa, Iowa City, USA) *Mathematics of impact and friction problems* (p. 58)
SCHATZMAN, Michelle (CNRS and Université Claude-Bernard Lyon 1, France) *Moreau's rule and penalty approximation* (p. 58)
ANITESCU, Mihai (Argonne National Labs, USA) *Time-stepping methods for stiff multi-rigid-body dynamics with contact and friction* (p. 57)

MSP-055 William Robertson Building, Seminar Room 10

Modelling and Analysis for Optical Communications; Beam and Pulse Propagation; Dispersion-Management I

(see also Part II, MSP-056, p. 103)

Organisers: SANDSTEDE, Björn (Ohio State University, Columbus, USA)
JONES, Christopher K R T (Brown University, Providence, USA)

The design of optical long-distance communication lines and all-optical signal-processing devices for reliable and high bit-rate transmission of information are important technological issues. Various schemes have recently been proposed to achieve higher transmission rates by compensating for dispersion and loss present in the fiber. Particularly exciting progress has been made in the dispersion-management of fibers. This minisymposium focusses the mathematical models, and their analysis, for these different mechanisms. Issues considered by presenters in the minisymposium include propagation of beams in waveguides, dispersion-managed fibers, spectral filtering and phase-sensitive amplification. Among the mathematical questions arising in the analysis of the relevant models are the existence, stability and interaction of localized waves to various equations. Most of the models involve nonlinear Schrödinger equations under various dissipative, conservative or non-local perturbations. In many cases, the PDEs are inhomogeneous due to jump conditions, which represent amplifiers or different materials used to assemble fibers. The analysis of these equations then requires the development of new techniques which are tailored to accommodate the particular features of the relevant PDEs. These needs have led to a considerable interaction between applied analysts and scientists working in nonlinear optics. Part I and II of this minisymposium focus on issues arising in the propagation of solitons in waveguides and fibers, and in dispersion-management, respectively.

ACEVES, Alejandro B (University of New Mexico, USA) *Pulse dynamics in nonlinear optical fibers with long and short period Bragg gratings* (p. 60)
KAPITULA, Todd (University of New Mexico, USA) *Stability of bright solitary-wave solutions to perturbed nonlinear Schrödinger equations* (p. 61)
TRILLO, Stefano (Fondazione ugo Bordoni, Italy) *Recent achievements in optical gap soliton theory* (p. 61)
YEW, Alice C (Ohio State University, USA) *Multiple pulses in dispersive quadratic media* (p. 61)

MSP-059 David Hume Tower, Lecture Theatre C

Mathematical Methods in Solid Mechanics I

(see also Part II, MSP-060, p. 103; Part III, MSP-061, p. 121; Part IV, MSP-062, p. 141)

Organisers: KAPLUNOV, Julius D (Institute for Problems in Mechanics, Russia)
WAN, Frederic Y M (University of California, Irvine, USA)

The minisymposium is dedicated to an outstanding scientist in the field of mechanics and applied mathematics Professor Eric Reissner (1913-1996). Among participants there are his friends, students and colleagues. The majority of presentations are concerned with the theory of shells and plates and related topics. Recent advances in non-linear wave propagation, computation mechanics, analysis of singularities and the theory of phase changes in solids are also discussed.

ALTENBACH, Holm (Martin-Luther-Universität Halle-Wittenberg, Halle, Germany) *On different approaches to the determination of the transverse shear stiffness in the plate theory* (p. 63)
GOLDENVEIZER, Alexei L (Institute for Problems in Mechanics, Russian Academy of Sciences, Russia) *Approaches for refining 2D shell theories* (p. 64)
GREGORY, R Douglas (Dept. of Mathematics, University of Manchester, UK) *A thick hollow sphere compressed by equal and opposite concentrated loads; An asymptotic solution* (p. 64)
KAPLUNOV, Julius D (Institute for Problems in Mechanics, Russian Academy of Sciences, Russia) *Edge and interfacial vibrations of shells and plates* (p. 64)
KIENZLER, Reinhold (University of Bremen, Department of Production Engineering, Germany) *On consistent higher-order plate and shell theories* (p. 64)

MSP-063 David Hume Tower, Room 4.01

Mathematics Applied to Quantum Chemistry: Theoretical, Computational and Experimental Aspects I

(see also Part II, MSP-064, p. 103; Part III, MSP-065, p. 121; Part IV, MSP-066, p. 141)

Organiser: LE BRIS, Claude (Ecole Nationale des Ponts et Chaussées, France)

These 4 mini-symposium are devoted to the mathematical analysis of the models of quantum chemistry. The purpose is to show to a large audience of applied mathematicians that quantum chemistry is a rich source of difficult and interesting mathematical problems, and can be a field of research that is still mostly unexplored. The lecturers come from both communities of mathematicians and chemists. Mathematical studies as well as examples of computations and open problems will be presented. The style of the talks will be deliberately pedagogic, and especially designed for a mathematician not familiar with this field of research.

BÉNARD, Marc (Universit'e de Strasbourg, France) *Algorithmic and numerical challenges in today's computational quantum chemistry* (p. 67)
SUTCLIFFE, Brian T (Lab. de Chimie Phys. Moleculaire, ULB, Bruxelles, Belgium) *Is a molecule in chemistry explicable as a broken symmetry in quantum mechanics?* (p. 70)
CAFFAREL, Michel (CNRS, Université Paris VI, France) *Solving the Schrödinger equation with probabilistic methods: Quantum Monte Carlo and quantum chemistry* (p. 67)
LE BRIS, Claude (Ecole Nationale des Ponts et Chaussées, France) *On the TDHF equations* (p. 69)
TURINICI, Gabriel M (Laboratoire ASCI-CNRS, Orsay, France) *Quantum control of chemical reactions* (p. 70)

MSP-068 Management School, Lecture Theatre 1

Dynamical Problems in Fuels Pipelining

Organisers: FASANO, Antonio (Ulisse Dini, University of Florence, Italy)
TERENZI, Alessandro (Snamprogetti, Italy)

The technology of fuels pipelining presents a considerable variety of physical, chemical and engineering problems of remarkable complexity, posing quite interesting questions also from the point of view of mathematical modelling. In this mini-symposium we want to illustrate some cases which are particularly interesting either because of the numerical techniques or because of the absolutely peculiar rheological properties of the fluid. The topics treated are: transport of gases at high Mach numbers, multiphase flow of diluted coal-water suspensions, the dynamics of liquid-liquid dispersions, and an overview of other classes of problems (rheological properties of coal-water slurries, sedimentation in pipelines, the flow of waxy crude oils).

TERENZI, Alessandro (Snamprogetti, BAPAC Dept., Italy) *Transient compressible flow at high mach numbers: A conservative method for pipline flow* (p. 73)
FASANO, Antonio (Dept.Math. "Ulisse Dini", University of Florence, Italy) *Fuels with peculiar rheological properties* (p. 72)
ROSSO, Fabio (Dept.Math. "Ulisse Dini", University of Florence, Italy) *Dynamics of liquid-liquid dispersions* (p. 72)
SPERANZA, Alessandro (Dept.Math. "Ulisse Dini", University of Florence, Italy) *Pipelining of diluted coal-water suspensions* (p. 73)
SONA, Giuliano (Dept.Math. "Ulisse Dini", University of Florence, Italy) *A mathematical model for gravity phase separation in liquid-liquid dispersions* (p. 72)

MSP-078 William Robertson Building, Lecture Theatre 8
Quasi-Monte Carlo Methods

Organisers: NIEDERREITER, Harald (Austrian Academy of Sciences, Austria)
TEZUKA, Shu (IBM Tokyo Research Laboratory, Japan)

Quasi-Monte Carlo methods are deterministic versions of Monte Carlo methods, in the sense that random samples in a Monte Carlo method are replaced by suitably chosen deterministic points. They are particularly effective in problems involving high-dimensional numerical integration. In recent years there have been spectacular applications in computational physics and mathematical finance in which they systematically outperformed Monte Carlo methods. The minisymposium will cover the error analysis of quasi-Monte Carlo methods, the generation of suitable deterministic points, and applications to mathematical finance. It will be of interest to numerical analysts and practitioners in scientific computing.

HICKERNELL, Fred J (Hong Kong Baptist University, China) *Error decay rates for Quasi-Monte Carlo quadrature* (p. 79)
NIEDERREITER, Harald (Austrian Academy of Sciences, Austria) *Constructions of quasirandom points* (p. 79)
PAPAGEORGIOU, Anargyros (Columbia University, USA) *Quasi-Monte Carlo for problems in mathematical finance* (p. 79)
SLOAN, Ian H (University of New South Wales, Australia) *On the tractability of Quasi-Monte Carlo integration* (p. 79)

MSP-096 William Robertson Building, Seminar Room 9
Models, Analysis and Algorithms for Superconductivity I
(see also Part II, MSP-231, p. 110)

Organiser: DU, Qiang (Hong Kong Univ of Science and Technology, Hong Kong, China)

Superconductivity is one of the grand challenges identified as being crucial to future economic prosperity and scientific leadership. In recent years, more and more applied mathematicians have started working on the analysis and numerical simulations of various mathematical models in superconductivity. There were plenary lectures and minisymposiums devoted to this subject in the 3rd ICIAM at Hamburg. Since then, many new studies have been made on topics ranging from the Ginzburg-Landau models to the mean field models. The works appeared so far can be categorized as follows: (1) the development or refinement of mezoscale and macroscale models for superconductivity so to enlarge the range of physical problems for which such models are valid; (2) the analysis of these models in order to gain further understanding of the properties of these models and of their solutions, and also to determine their validity and usefulness for solving physically interesting problems; (3) the development, analysis and the implementation of algorithms for the numerical simulation of solutions of the various models; (4) the application of the theoretical results, algorithms and codes in the practical study superconducting phenomena. The purpose of this minisymposium is to provide a forum for the experts in the area to present their latest research work. It also complements the plenary talk given by Dr. Chapman (Oxford University) at the Congress. The speakers come from different continents and their talks touch upon the mathematical, the numerical and the physical aspects of the problems in superconductivity.

ALMOG, Yaniv (Technion-I.I.T, Israel) *On the bifurcation and stability of periodic solutions of the Ginzburg-Landau equations in the plane* (p. 97)
BAUMAN, Patricia (Dept. of Mathematics, Purdue University, W. Lafayette, USA) *A three-dimensional superconductor in a strong magnetic field* (p. 97)
CHEN, Zhiming (Institute of Mathematics, Academina Sinica, Beijing, China) *Adaptive Galerkin methods for a dynamical GL model in superconductivity* (p. 97)
PHILLIPS, Daniel (Purdue University, USA) *Flux creep in High-Tc superconducting materials* (p. 97)
AFTALION, Amandine (DMI Ecole Normale Superieure, France) *On the solutions of the one dimensional Ginzburg-Landau equations for superconductivity* (p. 96)

MSP-113 Appleton Tower, Lecture Theatre 1
Impulse Formulation of Fluid Flow

Organiser: SUMMERS, David M (Napier University, UK)

The Hamiltonian formulation of the Navier-Stokes equation described by Oseledets in 1988 is attracting increasing interest. The equation of motion, expressed in terms of impulse density (alternatively described as: 'velicity', 'magnetization', 'impetus') is solved numerically using both lagrangian and eulerian methods. Recent application of these to Euler flow problems involving immersed boundaries will be presented. A gauge freedom attaches to the problem and the implication of this will be discussed. The formulation may be used to explore the statistical mechanics of fluid impulse. Problems associated with the treatment of viscous flow over solid boundaries will be examined.

OSELEDETS, Valery (Moscow State University, Russia) *Some remarks on velocity - impulse formulation* (p. 110)
CHORIN, Alexandre J (University of California, Berkeley, USA) *A new formulation of the near-equilibrium theory of turbulence* (p. 110)
RUSSO, Giovanni (Dipartimento di Matematica, Università dell'Aquila, Italy) *Impulse formulation of the Euler equations and fluid-membrane interaction* (p. 111)
CORTEZ, Ricardo (Tulane University, USA) *Computation of immersed boundary motions using impulse* (p. 110)
SUMMERS, David M (Napier University, UK) *Numerical impulse generation at a solid boundary* (p. 111)

MSP-119 Appleton Tower, Lecture Theatre 3
Large Numbers of Students of Mathematics: How to Assess I
(see also Part II, MSP-120, p. 105)

Organisers: BARRY, Michael DJ (University of Bristol, UK)
SIMS WILLIAMS, Jonathan H (University of Bristol, UK)
SUTHERLAND, Rosamund (University of Bristol, Graduate School of Education, UK)

More students than ever before study mathematics at university and most take it as a subsidiary subject. They find that mathematics is as difficult as it is vital and matters are not helped by the inevitable large classes. In some countries, notably the UK, teaching difficulties are aggravated due to a decline in traditional drill and practice. The minisymposium speakers will examine different methods of automatic assessment: that motivate students by aiming to teach via feedback, that direct study by targeting and pinpointing weaknesses, and that provide benchmarks of understanding whilst saving the time of over-pressed staff.

BEEVERS, Cliff E (Heriot Watt University, Edinburgh, UK) *The emerging philosophy behind computer based assessment* (p. 116)
LAWSON, Duncan A (Coventry University, UK) *Formative assessment using CAA* (p. 117)
GOLDFINCH, Judy (Napier University, Edinburgh, UK) *The Sumsman project and its implications for computer-based assessment* (p. 116)
SIMS WILLIAMS, Jonathan H (Bristol University, UK) *Open testing with a large databank of multiple choice questions* (p. 117)

MSP-127 Management School, Lecture Theatre 3
High Resolution Implicit Multiphysics Simulation with Slide Surfaces

Organiser: ARO, Colin J (Lawrence Livermore National Laboratory, USA)

High-resolution implicit multiphysics simulations require the solution of large, sparse, linear systems on massively parallel computers. The linear system is often nonsymmetric, indefinite, and can be very ill conditioned due to physical properties in the system, such as high aspect ratio elements, low material strength, very fine grid resolution, and the presence of slide (contact) surfaces. Nonstationary iterative methods can be very scalable and efficient in solving the linear system, but often break down for problems with "difficult" physical properties. Direct methods are more robust, but are difficult to implement in a scalable way for massively parallel simulations. This minisymposium will cover recent research toward the development of robust, reliable, scalable algorithms for massively parallel multiphysics simulations, and will be of interest to finite element modelers, and numerical mathematicians.

ARO, Colin J (Lawrence Livermore National Laboratory, USA) *Implicit hydrodynamics simulation in ALE3d* (p. 123)
FARHAT, Charbel (University of Colorado, Boulder, USA) *High-resolution and high performance implicit aeroelastic and acoustoelastic computations* (p. 123)
CHOW, Edmond (Center for Applied Scientific Computing, Lawrence Livermore National Laboratory, USA) *Implicit solution methods for multiphysics computations with sliding surfaces* (p. 123)

MSP-130 David Hume Tower, Lecture Theatre B
Advances in Numerical Methods for Wave Propagation I
(see also Part II, MSP-131, p. 106)

Organiser: HAGSTROM, Thomas (University of New Mexico, New Mexico, USA)

Problems in wave propagation have played and will continue to play a central role in the mathematical analysis of physical and biological systems. Crucial issues for time domain simulations of waves include the development of reliable, efficient solvers in complex geometries and for complex models as well as the derivation of accurate yet inexpensively implementable radiation boundary conditions at artificial boundaries. The speakers will discuss a range of exciting new developments on these fronts, and outline problems for future work as well.

HAGSTROM, Thomas (University of New Mexico, New Mexico, USA) *From integral formulas to numerical methods for solving the wave equation* (p. 126)
HESTHAVEN, Jan S (Division of Applied Mathematics, Brown University, Providence, USA) *Fast stable spectral methods on unstructured grids* (p. 126)
GOODRICH, John W (NASA Glen Research Center, Cleveland Ohio, USA) *Hermite methods for hyperbolic systems* (p. 125)
BECACHE, Eliane (INRIA-Rocquencourt, France) *Application of the fictitious domain to elastic waves* (p. 125)

MSP-141 Appleton Tower, Lecture Theatre 2
Magnetohydrodynamics: MHD in Materials Processing, MHD Turbulence, Modelling of MHD Processes III
(see also Part I, MSP-139, p. 51; Part II, MSP-140, p. 70)

Organiser: DAVIDSON, Peter A (University of Cambridge, UK)

ALBOUSSIÈRE, Thierry (University of Cambridge, UK) *Stability and transition to turbulence of the Hartmann layer* (p. 131)
PERICLEOUS, Koulis (University of Greenwich, UK) *Computations and experiments in MHD turbulence* (p. 134)
MÜLLER, Ulrich (Forschungszentrum Karlsruhe, Germany) *Heat transfer enhancement by MHD-control* (p. 134)
FAUTRELLE, Yves (INPG/MADYLAM, France and University of Waikato, New Zealand) *Stability of free surfaces submitted to an alternating magnetic field: A parametric resonance problem* (p. 133)
ETAY, Jacqueline (EPM-MADYLAM, France) *Hot film anemometer measurements in a continuous caster mercury model* (p. 133)

MSP-159 David Hume Tower, Room 4.18
Infinite Networks and Continuous Transport Problem

Organiser: GWINNER, Joachim (Institute of Mathematics, Department of Aerospace Engineering, University of the Federal Army Munich, Germany)

By the work of Beckmann (1952, 1976) and Iri (1980), together with Taguchi (1982) it became apparent that the study of continuous transport problems is not only interesting for its own sake, but is important for the understanding of dense networks and for the effective numerical solution of large flow problems, as encountered e.g. in metropolitan road traffic. This mini-symposium focuses on recent progress in the field of infinite networks and application to continuous transport problems. Benefits and shortcomings of different approaches in the extension of the classical Ford and Fulkerson network theory are discussed.

NOZAWA, Ryôhei (Department of Mathematics, School of Medicine, Sapporo Medical University, Japan) *A formulation of continuous network and Gale's feasibility theorem* (p. 149)
MAUGERI, Antonino (Dipartimento di Matematica, Universitá di Catania, Italy) *Lagrangean function and duality for continuous models of traffic equilibrium* (p. 148)
GWINNER, Joachim (University of the Federal Army Munich, Germany) *Feasible flows in continuous transport and related constrained variational problems* (p. 148)
CALVERT, Bruce D (University of Auckland, New Zealand) *1-networks* (p. 148)

MSP-164 William Robertson Building, Seminar Room 1
Mathematical Modelling and Computational Aspects in Blood Flow I
(see also Part II, MSP-252, p. 111)

Organiser: PONTRELLI, Giuseppe (IAC-CNR, Viale del Policlinico 137, Rome, Italy)

Fluid dynamics of blood in arteries plays a crucial role in the localization of deposits, formation of stenosis and aneurysms and in general in the genesis, development and prevention of cardiovascular diseases. Nowadays, computational hemodynamics has become an useful tool to evaluate the behaviour of blood flowing through natural vessels or artificial prosthesis and an accurate knowledge of the local flow field is important to prevent possible damage to the blood and to the vessel. Many challenging aspects are involved in this study: the deformability of the elastic vessel wall, the use of a reliable non-newtonian model for blood, the effect of curvature, tapering, variation of the artery section and artery bifurcations. The aim of this symposium is to provide an overview of the current status in this area and to build a bridge between mathematical/computational capabilities and biomedical demand.

PEIRÓ, Joaquim (Department of Aeronautics, Imperial College of Science, Technology and Medicine, UK) *Simulation of blood flow using high-order spectral elements on unstructured grids* (p. 153)
HILL, Nicholas A (Department of Applied Mathematics, University of Leeds, UK) *Modelling the interaction between blood flow and atherosclerosis* (p. 152)
PEDRIZZETTI, Gianni (Dept. Civil Engineering, University of Trieste, Italy) *Laminar separated flow in irregular ducts with elastic walls* (p. 153)
PONTRELLI, Giuseppe (IAC-CNR, Italy) *A mathematical model for wave propagation in elastic tubes* (p. 153)

MSP-169 Appleton Tower, Lecture Theatre 5
The Mortar Element Method for High Order Discretizations: The Mortar Spectral Element Method, Other High Order Discretizations with Mortars I
(see also Part II, MSP-170, p. 108)

Organisers: BERNARDI, Christine (CNRS and Université Pierre et Marie Curie, Paris, France)
BEN BELGACEM, Faker (MIP, Université Paul Sabatier, Toulouse, France)

The mortar element method is a domain decomposition technique which allows for working on general decompositions of the domain without conformity restrictions and also for using different discretizations of variational type on the subdomains. The aim of this minisymposium is to present the recent developments and applications of the mortar method for high order discretizations. Half of the talks are devoted to the spectral element methods, where the mortar technique is a key way for handling complex geometries. The other talks concern recent extensions to other types of discretizations, such as wavelets or $h-p$ version of finite elements.

AZAIEZ, Mejdi (Université Paul Sabatier, IMFT, France) *New Goda projection algorithm for the spectral element discretization of the Stokes equations* (p. 157)
BEN BELGACEM, Faker (MIP, Université Paul Sabatier, Toulouse, France) *Inf-sup conditions for the mortar spectral element discretization of the Stokes problem* (p. 157)
BERNARDI, Christine (Analyse Numérique, CNRS & Université Pierre et Marie Curie, Paris, France) *The mortar method in nonstandard Sobolev spaces* (p. 158)
MADAY, Yvon (Laboratoire ASCI-CNRS, Orsay France) *Introduction to the mortar element method for high order approximations* (p. 158)
OWENS, Robert (LMF, Ecole Polytechnique Fédérale de Lausanne, Suisse) *An error indicator for mortar element solutions to the Stokes problem* (p. 158)

MSP-190 Appleton Tower, Lecture Theatre 4

Spline Collocation Methods for Partial Differential Equations

Organisers: FAIRWEATHER, Graeme (Colorado School of Mines, USA)
BIALECKI, Bernard (Colorado School of Mines, USA)

Over the past twenty five years, spline collocation methods have evolved as valuable techniques for the efficient solution of partial (as well as ordinary) differential equations. Their efficacy is due in part to their high global accuracy and superconvergence properties, and ease of implementation. Presentations in this session describe recent advances in the development, analysis and implementation of spline collocation methods, including direct and iterative methods for the solution of spline collocation equations for elliptic problems, and alternating direction implicit spline collocation methods for initial-boundary value problems. Both orthogonal spline collocation and modified nodal spline collocation methods are discussed.

BIALECKI, Bernard (Colorado School of Mines, USA) *An orthogonal spline collocation alternating-direction implicit method for nonlinear parabolic problems on rectangular polygons* (p. 174)
CHRISTARA, Christina (Department of Computer Science, University of Toronto, Canada) *High-performance spline collocation methods for elliptic PDEs* (p. 174)
KARAGEORGHIS, Andreas (Department of Mathematics and Statistics, University of Cyprus, Cyprus) *Modified nodal spline collocation methods for elliptic boundary value problems* (p. 174)
KIM, Sangdong (Kyungpook Nat'l university, Taegu, Korea) *Preconditioning polynomial spline collocation method to elliptic equations* (p. 174)
SUN, Weiwei (City University of Hong Kong, Hong Kong) *Fast algorithms for solving high-order spline collocation discrete systems* (p. 174)

MSP-195 William Robertson Building, Seminar Room 2

Phase Field Models and Prediction of Micro-Morphological Changes in Alloys I

(see also Part II, MSP-196, p. 109)

Organisers: MULLER, Wolfgang H (Department of Mechanical & Chemical Engineering, Heriot-Watt University, UK)
DREYER, Wolfgang (Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany)

Many industrially relevant materials show micro-morpholocical changes as a consequence of their daily use, which directly influences their current material properties, reliability and lifetime. Examples of such materials are Ni-based single-crystal super-alloys which are used as turbine material, bio-compatible ceramics, which show an extremely high toughness, or tin-lead solders, which are used in micro-electronics applications. For a quantitative understanding of the influence of the factors which primarily lead to morphological changes it is necessary to develop physical theories which allow to compute the local concentrations of the various alloys as they develop over time as a consequence of internal as well as external thermo-mechanical stresses. From an engineering point of view the theories of the Cahn-Hilliard-Allan type are particularly suited to solve such problems. They only require physical parameters that can directly be linked to experiments, such as free energy curves, surface tensions and lattice constants. However, the engineering need is to find solutions of complex 2D and 3D initial boundary value problems and, due to time constraints, a rigorous mathematical treatment is hardly ever performed. On the other hand mathematicians concentrate on simplified forms of these equations (often in 1D) in order to be able to prove uniqueness and numerical stability. The objective of the symposium is to provide a forum, where mathematicians and engineers can meet to understand their concepts and needs in order to bridge the gap between practical requirements and stringent theoretical considerations.

MULLER, Wolfgang H (Department of Mechanical & Chemical Engineering, Heriot-Watt University, UK) *Trends in modelling micromorphologies of solids - a review (Part I)* (p. 179)
DREYER, Wolfgang (Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany) *Trends in modelling micromorphologies of solids, Part II: Statistical mechanics and molecular dynamics of tin/lead alloys* (p. 178)
NIETHAMMER, Barbara (University of Bonn, Germany) *Mathematics of the Lifshitz-Slyozov-Wagner theory of Ostwald ripening* (p. 179)
BLOWEY, James F (University of Durham, Department of Mathematical Sciences, UK) *Mathematical and numerical analysis of some models for phase separation of N-component alloys* (p. 178)

MSP-199 David Hume Tower, Room 3.01

Java for Computational Science and Engineering I

(see also Part II, MSP-244, p. 111)

Organisers: BOISVERT, Ronald F (National Institute of Standards and Technology, USA)
TREFETHEN, Anne E (The Numerical Algorithms Group, Ltd., UK)

Java has become a household word in the age of the World Wide Web. Behind all the press releases is a surprisingly capable general-purpose programming language and environment which is beginning to be applied to serious scientific applications. What are the advantages and disadvantages of using Java in these contexts? This minisymposium will focus on the use of the Java programming language for numerical and scientific computing. Java-based simulation and data-intensive applications and visualization tools will be presented, and on-going efforts to improve the language and develop standards for numerical computing will be discussed.

BOISVERT, Ronald F (National Institute of Standards and Technology, USA) *Java for numerical computing* (p. 181)
FERNANDEZ, Victor (Sun Microsystems Inc, USA) *A Java visualization and steering interface for the sun scalable scientific subroutine library (Sun S3L)* (p. 182)
RANA, Omer F (Cardiff University, UK) *Performance issues in the use of Java for distributed scientific applications* (p. 183)
WEIDMANN, Matthias (Technical University Munich, Germany) *Pure Java computational fluid dynamics: Collaborative engineering with a real-world application* (p. 183)

MSP-202 Appleton Tower, Seminar Room 6

Spectral Problems in Differential Equations

Organiser: MARLETTA, Marco (University of Leicester, UK)

This minisymposium will cover recent work on spectral problems in differential equations, including: - theoretical results for pencils of operators (i.e. eigenproblems of the form $Ny = \lambda Py$, where N and P are differential operators); - numerical methods for higher order problems; - non-selfadjoint problems; - problems which are nonlinear in the spectral parameter. Problems such as these arise in numerous applications, including fluid dynamics, elasticity and quantum mechanics.

MENNICKEN, Reinhard (University of Regensburg, Germany) *Spectral theory for systems of singular differential operators of mixed order and applications*
TRETTER, Christiane (University of Regensburg, Germany) *Boundary eigenvalue problems of Orr-Sommerfeld type* (p. 185)
HINZ, Andreas M (Technical University Munich, Germany) *Radially symmetric Schrödinger operators* (p. 185)
MARLETTA, Marco (University of Leicester, UK) *Non-selfadjoint ODE eigenproblems* (p. 185)

MSP-205 William Robertson Building, Seminar Room 4

Methods of Dimension Reduction I

(see also Part II, MSP-206, p. 109)

Organisers: KREUZER, Edwin (Technische Universitaet Hamburg-Harburg, Germany)
TROGER, Hans (Technical University Vienna, Austria)

From experiments and also from computer simulation of dynamical systems it is well known that for many dynamic phenomena in physics or engineering which are modelled by high dimensional or even infinite dimensional dynamical systems the asymptotic behavior can be very accurately described by replacing the original high dimensional system by a low dimensional system represented only by so-called essential variables. Such a dimension reduction of a dynamical system turns out to be central, both for a qualitative and quantitative understanding of its behavior. Besides mathematically well established standard methods like Center Manifold theory which, however, have certain limits concerning their applicability other approaches like Proper Orthogonal Decomposition or Inertial Manifold theory have been proposed and applied to practical engineering problems recently. The aim of this Minisymposium is twofold. First, to give an overview on various possibilities concerning the reduction of the dimension of high dimensional or even infinite dimensional dynamical systems to low dimensional systems which still possess all essential features of the original system. Second, to demonstrate by means of selected applications taken from physics or practical engineering problems the efficiency and accuracy of the proposed methods.

HOLMES, Philip J (Princeton University, USA) *The proper orthogonal decomposition and dimension reduction* (p. 187)
TITI, Edriss S (University of California, Irvine, USA) *Rigorous estimates for the number of degrees of freedom in dissipative systems and for the small scales in turbulent flows* (p. 188)
BLOCH, Tony (University Of Michigan, Ann Arbor, USA) *Reduction of constrained and interconnected mechanical systems* (p. 187)
KIRBY, Michael (Colorado State University, Ft Collins, USA) *Dimensionality reduction via well-conditioned mappings* (p. 187)

MSP-207 Management School, Lecture Theatre 5
Warranty Modelling and Data Analysis

Organisers: JACK, Nat (University of Abertay, Dundee, UK)
SCARF, Philip A (University of Salford, UK)

Product warranty studies are important to both manufacturers and buyers. Manufacturers need to know the costs of offering specific warranties, how to determine optimal servicing strategies, and how to collect claims data and perform proper analyses. Buyers have to choose between products with different characteristics and warranty terms and also have to decide whether optional warranties are worth the additional cost. The speakers at this mini-symposium are all leading researchers in the mathematical and statistical aspects of warranty analysis. Their talks will emphasise the importance of analytical modelling in tackling real-life problems.

MURTHY, D N P (University of Queensland, Australia) *Product warranty and mathematical modelling* (p. 189)
BLISCHKE, Wallace R (University of Southern California, Los Angeles, USA) *Cost analysis of warranties* (p. 189)
BROMBACHER, Aarnout (University of Technology, Eindhoven) *Developing Test Strategies For Time-Driven Product Creation*

MSP-211 Management School, Lecture Theatre 4
Challenging Problems in Large-Scale Computing

Organisers: KAPER, Hans G (Argonne National Laboratory, USA)
GARBEY, Marc (Université Claude Bernard - Lyon I, France)

We propose to address several issues in large-scale scientific computing. The issues have come up in computational fluid dynamics, combustion modeling, and sound synthesis, and offer an interesting array of challenging problems in scientific computing. The speakers will discuss modeling issues, numerical methods, and computing strategies, and illustrate their results with videos and sound clips.

GARBEY, Marc (Center for the Development of Parallel Scientific Computing, Univ-Lyon1, France) *A new algorithm for the parallel computation of Navier-Stokes and reaction-diffusion systems* (p. 189)
STEWART, D Scott (Department of Theoretical and Applied Mechanics, University of Illinois, USA) *Approximation of detonation dyanmics by the compressible Euler equations with singular source terms* (p. 190)
TROMEUR DERVOUT, Damien (Université Claude Bernard - Lyon I, France) *Domain decomposition with local Fourier basis methodology applied to the Navier-Stokes and reaction-diffusion systems* (p. 190)
FISCHER, Paul F (Argonne National Laboratory, Argonne IL, USA) *Robust high-order algorithms for unsteady flow applications* (p. 189)
KAPER, Hans G (Argonne National Laboratory, USA) *Sound synthesis for scientific sonification* (p. 190)

MSP-217 Adam Ferguson Building, Room 10
Differential Geometric Methods in Control and Design

Organisers: CAGNOL, John (Ecole des Mines de Paris, France)
ZOLÉSIO, Jean-Paul (Ecole des Mines de Paris and CNRS-INLN, France)

Over the past few years differential geometric methods have been introduced in the control of partial differential equations with variable coefficients. Good choices of variables can locally reduce the complexity of the equations by placing the original system on an appropriate manifold. At the same time new approaches have been developed for the modeling and control of differential equations on submanifolds of the Euclidean space. The objective is to bring together in a very timely way the two trends and investigate the their combined impact on control and geometric design.

CAGNOL, John (Ecole des Mines de Paris, France) *Shape control for hyperbolic problems via the second order shape derivative* (p. 194)
DELFOUR, Michel C (Centre de Recherches Mathématiques, Canada) *New intrinsic differential geometric methods in control and design: overview and examples* (p. 194)
TRIGGIANI, Roberto (University of Virginia, USA) *Riemann geometric methods in control theory for partial differential equations* (p. 194)
ZOLÉSIO, Jean-Paul (Ecole des Mines de Paris and CNRS, France) *Intrinsic geometry and variational principle in the Euler equation* (p. 194)

MSP-218 Appleton Tower, Seminar Room 8
Industrial Image Processing, Mathematics for Software Companies

Organisers: MAASS, Peter (University of Potsdam, Potsdam, Germany)
ENGL, Heinz W (Johannes-Kepler-Universitaet, Linz, Austria)

Over the last few years several 'mathematical' software companies have proved that the transition from mathematical research to industrial products can be a fruitful process, both for the involved universities and companies. The mathematical theory needed for these developments ranges from nonlinear PDE's and wavelet analysis to stochastic inverse problems. The talks in this minisymposium will be given by pairs from industry and the cooperating universities. They will highlight the mathematical background, the process of interaction and the resulting products.

BINDER, Andreas (MathConsult GmbH; Johannes Kepler University, Linz, Austria) *Mathematical modelling and numerical simulation of a process in ironmaking* (p. 194)
STARK, Hans-Georg (FH Schweinfurt and TecMath GmbH, Kaiserslautern, Germany) *Towards multimedia archives for broadcasting applications* (p. 195)
TALBOT, R (SIMULOG Inc., Paris, France) *Industrial mathematics*
MAASS, Peter (University of Potsdam, Math. Department and WiSenT GmbH, Potsdam, Germany) *Mathematics for automated archiving systems, the art of character recognition* (p. 194)

11.00 – 13.00 Contributed Presentations: Lectures

C-11 Adam Ferguson Building, Room 13
Numerical Methods in Differential Equations III
Chair(s): KEYES; ROLDAN

11.00–11.15 USHIJIMA, Takeo K (Graduate School of Mathematical Sciences, University of Tokyo, Japan) *Convergence of a crystalline algorithm for the generalized curvature flow* (p. 320)
11.15–11.30 USHIJIMA, Teruo (University of Electro-Communications, Tokyo, Japan) *Finite element determination of 2D perfect fluid around a wing* (p. 320)
11.30–11.45 KEYES, David E (Old Dominion University and ICASE (NASA Langley Res. Ctr.), USA) *Parallel implicit methods for CFD and diffusive radiation transport* (p. 277)
11.45–12.00 STEFANICA, Dan (Courant Institute of Mathematical Sciences, USA) *Domain decomposition methods for mortar finite elements* (p. 313)
12.00–12.15 YAZAKI, Shigetoshi (Graduate School of Mathematical Sciences, University of Tokyo, Japan) *On the crystalline algorithm for the curvature-dependent motion* (p. 330)
12.15–12.30 ARULIAH, Dhavide A (University of British Columbia, Canada) *A method for the forward modelling of 3D electromagnetic quasi-static problems* (p. 237)
12.30–12.45 ROLDAN, Teo (Universidad Publica de Navarra, Spain) *Irk methods for index-2 DAE: Starting algorithms* (p. 304)
12.45–13.00 ROOSE, Dirk (Dept. of Computer Science, K U Leuven, Belgium) *Travelling pulse solutions and their stability in anisotropic media* (p. 304)

C-12 Adam Ferguson Building, Room 14
Fluid Mechanics III
Chair(s): PEGO; CRAIK

11.00–11.15 PUGH, Mary C (Math Department, University of Pennsylvania, USA) *Long-wave instabilities in thin film equations - blow-up, saturation, and steady-states* (p. 300)
11.15–11.30 MARTEL, Carlos (ETSI Aeronáuticos, Universidad Politécnica de Madrid, Spain) *Parametrically forced counterpropagating waves in weakly dissipative systems* (p. 286)
11.30–11.45 PEGO, Robert L (University of Maryland, College Park, USA) *Spatial wave dynamics of traveling wave surfaces* (p. 297)
11.45–12.00 SUGIMOTO, Takeshi (Kanagawa University, Japan) *Stability and self-organization of formation flight* (p. 315)
12.00–12.15 TASSO, Henri (Max-Planck-Institut fuer Plasmaphysik, Germany) *On Lyapunov stability of dissipative mechanical systems* (p. 317)
12.15–12.30 CHANG, Chien-Cheng (Institute of Applied Mechanics, National Taiwan University, Taipei, Taiwan) *Numerical study of flow about a finite body by a three-dimensional hybrid vortex method* (p. 246)
12.30–12.45 CRAIK, Alex D D (University of St Andrews, UK) *Second-harmonic resonance with Faraday excitation: Degenerate "bouncing" solutions* (p. 250)
12.45–13.00 KHAN, Winston (UPR-Mayaguez, Puerto Rico, USA) *Extension of Danckwert's surface renewal theory to all interfacial conditions* (p. 277)

C-13 Adam Ferguson Building, Room 17
Solid Mechanics
Chair(s): MOLOKOV; MORRO

11.00–11.15 CAVIGLIA, Giacomo (University of Genoa, Italy) *Existence and uniqueness in the reflection-transmission process* (p. 246)
11.15–11.30 POBEDRIA, Boris E (Moscow State University, Russia) *The problems of computational mechanics of composites* (p. 298)
11.30–11.45 MOLOKOV, Sergei (Coventry University, UK) *Propagation of stress waves in wires carrying electric current* (p. 289)
11.45–12.00 TWEED, John (Old Dominion University, USA) *Stress intensification due to an edge crack in an anisotropic elastic solid* (p. 319)
12.00–12.15 MELROSE, Gordon (Old Dominion University, Norfolk, USA) *The bending problem for a simply supported strip with internal supports* (p. 287)
12.15–12.30 MONTANARO, Adriano (Dipartimento di Metodi e Modelli Matematici per le Scienze Applicate, University of Padua, Italy) *On small-amplitude waves in internally constrained and prestressed linearly elastic materials* (p. 289)
12.30–12.45 MORRO, Angelo (University of Genoa, Italy) *Reflection and transmission through a stratified slab* (p. 289)
12.45–13.00 BUELLESBACH, Juergen (Universitaet der Bundeswehr Muenchen, Germany) *On the influence of geometrical imperfections on stability behaviour of shell constructions* (p. 244)

C-14 Adam Ferguson Building, Room 18
Asymptotics and Control Theory
Chair(s): GROSS; DEBNATH

11.00–11.15 KAY, Anthony (Loughborough University, UK) *Finite-time blow-up in an inviscid buoyancy-driven flow* (p. 276)
11.15–11.30 VARGAS, C Arturo (IIMAS-UNAM, Mexico) *Thermistor effects on tuned circuit* (p. 321)
11.30–11.45 GROSS, Laura K (The University of Akron, USA) *Stability of uniform bend Fréedericksz configuration in nematic liquid crystals* (p. 265)
11.45–12.00 KUMAGAI, Teruo (Science University of Tokyo, Japan) *Revaluation of Oseen's approximation for prediction of rotating motions of a cluster of spheres in fluid at low Reynolds numbers* (p. 281)
12.00–12.15 IRAGO, Hipólito (Dpto. Matemática Aplicada, Universidade de Santiago de Compostela, Spain) *Convergence of high frequency modes in thin rods* (p. 272)
12.15–12.30 DELGADO-ROMERO, Juan J D (Instituto Tecnológico de Morelia, México) *Robust analysis of physical systems: Application conditions* (p. 253)
12.30–12.45 DEBNATH, Joyati (Winona State University, USA) *Associated pairs via an automated system* (p. 253)
12.45–13.00 TOKARZEWSKI, Jerzy (Industrial Institute of Motorization, Poland) *Dynamical interpretation of invariant zeros in degenerate Mimo LTI systems* (p. 317)

C-32 Appleton Tower, Room 2.A2
Financial Mathematics and Probability
Chair(s): GRANDITS; KRIVONOZHKO

11.00–11.15 FIBICH, Gadi (Tel-Aviv University, Israel) *Dynamic optimal pricing decisions in the presence of reference-price effects* (p. 259)
11.15–11.30 WYATT, Katherine (Logic Based Systems Lab, Brooklyn College, City University of New York, USA) *Maximizing hedge effectiveness under* FASB 133 *accounting standards* (p. 327)
11.30–11.45 GRANDITS, Peter (Statistical Laboratory, University Cambridge, UK) *Leland's approach to option pricing: the evolution of a discontinuity* (p. 264)
11.45–12.00 VORONIN, Albert N (Space Research Institute, Ukraine) *Multi-objective design of combined effect of biologically active substances* (p. 324)
12.00–12.15 YÚNUSI, Mahmadyusuf K (Tajik State National University, Dushanbe, Tajikistan) *Workers potential function and its applications* (p. 330)
12.15–12.30 ANGULO, Oscar (Universidad de Valladolid, Spain) *A characteristic method for nonlinear size-structured population equations* (p. 236)
12.30–12.45 KRIVONOZHKO, Vladimir Egorovich (Institute For Systems Analysis, Russia) *The optimization models to efficiency analysis of the complex systems* (p. 281)
12.45–13.00 LIN, Jen-Jen (Dept. of Statistics, Ming Chuan University, Taipei, Taiwan) *A new algorithm of independent component analysis with application* (p. 284)

C-39 William Robertson Building, Seminar Room 3
Signal and Image Analysis
Chair(s): HORNE; FAVELLA

11.00–11.15 LI, Shidong (San Francisco State University, USA) *Subspace signal expansions with off-the-space sequences and applications* (p. 283)
11.15–11.30 TURNER, Peter R (US Naval Academy, USA) *Image and moving object identification in computer vision* (p. 319)
11.30–11.45 HORNE, Rudy L (University of Colorado USA) *A comparison between lumped and distributed filter models in WDM soliton systems* (p. 271)
11.45–12.00 ZHELUDEV, Valery A (School of Mathematical Sciences, Tel Aviv University, Israel) *On classification and recognition of acoustic signals by wavelet methods* (p. 331)
12.00–12.15 TOPIWALA, Diven (Dept of Mathematics, De Montfort University, UK) *The phase retrieval algorithm: A dynamical systems approach* (p. 318)
12.15–12.30 DONATINI, Pietro (University of Bologna, Italy) *Natural size distances for comparison of shapes* (p. 255)
12.30–12.45 FAVELLA, Luigi (Department of Physics, University of Torino, Torino, Italy) *Mathematical model of Eigenfunctions for image Loève-Karhunen recostruction* (p. 258)
12.45–13.00 BRÉE, David S (University of Manchester, UK) *Most-perfect magic squares* (p. 243)

C-42 Appleton Tower, Room 2D
Partial Differential Equations and Asymptotics
Chair(s): RICHARDSON; BROADBRIDGE

11.00–11.15 LOZIER, Daniel W (National Institute of Standards and Technology, USA) *The DLMF project: a new initiative in special functions* (p. 284)
11.15–11.30 MOURA NETO, Francisco D (Instituto Politécnico, Universidade do Estado do Rio de Janeiro, Brazil) *Heterogeneous porous medium and Darcy's law* (p. 290)
11.30–11.45 RICHARDSON, Giles W (Laboratoire Phys. Stat, Ecole Normale Superieure, France) *Bifurcations in the Little-Parks experiment* (p. 303)
11.45–12.00 DOMNYTSKY, Vladymyr (State Kiev University, Ukraine) *On the asymtotic solution of a system of integro-differential equations with lagging argument* (p. 254)
12.00–12.15 CHEREDNICHENKO, Kirill D (Department of Mathematical Sciences, University of Bath) *On derivation of the "higher order" effects in the overall behaviour of heterogeneous media from microstructure* (p. 247)
12.15–12.30 TUREK, Zbigniew (ZTUREK Research-Scientific Institute, Warsaw, Poland) *Another alternative approach of getting solutions to some PDEs* (p. 319)
12.30–12.45 BROADBRIDGE, Philip (University of Wollongong, Australia) *Symmetry analysis of equations of solute transport in soil* (p. 244)
12.45–13.00 CHERNIHA, Roman M (Institute of Mathematics, Ukrainian Academy of Science, Kyiv, Ukraine) *New exact solutions of non-linear reaction-diffusion equations arising in population dynamics* (p. 247)

C-47 David Hume Tower, Room 3.18

Medicine and Biology

Chair(s): JOHNSTON; WAN

11.00–11.15 DE PILLIS, L G (Department of Mathematics, Harvey Mudd College, Claremont, USA) *Modeling cancer tumor growth with immune resistance and an optimal control approach to treatment* (p. 252)

11.15–11.30 KIM, Mi-Young (Dept of Math, Yonsei University, Seoul, Korea) *Characteristic Galerkin finite element methods for diffusion epidemic models* (p. 278)

11.30–11.45 JOHNSTON, Clifton Reed (University of Calgary, Canada) *Solitary wave solution for axially and radially deforming arteries* (p. 274)

11.45–12.00 KOZYREVA, Ekaterina (1, 1st Dorozhny pr., Moscow 113545, Russia) *Elastic rod model of 3D structure of RNA* (p. 280)

12.00–12.15 FDEZ-GARCÍA, José R (Depto. Matemática Aplicada, Universidade de Santiago de Compsotela, Spain) *A finite element contact model for the reduction of Mandibular fractures* (p. 258)

12.15–12.30 DUBINSKY, Andrej Yu (Keldysh Institute of Applied Mathematics, Moscow, Russia) *Mathematical modelling of electron transport and proton transfer in chloroplasts* (p. 255)

12.30–12.45 WAN, Honghui (Computational Biology Branch, National Center For Biotechnology Information, Bethesda, USA) *Longest chains in the composite lattices of integer partitions ordered by majorization* (p. 325)

12.45–13.00 No talk

11.00 – 13.00 Contributed Presentations: Posters

P-2 David Hume Tower, Lower Foyer

Posters II

ABELL, Martha L (Georgia Southern University, USA) *Multiple comparisons for means* (p. 234)
FEGAN, George R (Santa Clara University, School of Engineering. USA) *A relationship between the compound Poisson distribution and the swap-up distribution* (p. 259)
ASCH, Mark (Analyse Numérique et EDP, Université Paris-Sud, France) *Exact controllability of wave equations on complex geometries using a composite grid method* (p. 238)
BRAAMS, Bastiaan J (Courant Institute, NYU, USA) *Electronic structure calculations via semidefinite optimization* (p. 243)
ITOH, Shoji (University of Tsukuba, Ibaraki, Japan) *Some fast methods for periodic block pentadiagonal linear systems on vector processor* (p. 272)
GALLICE, Gerard (CEA/CESTA, France) *Positive ROE matrices for Eulerian and Lagrangian MHD equations* (p. 261)
KIMURA, Hiroshi (University of Tokyo, Japan) *Multifractal analyses of the derived measures on FM method* (p. 278)
MITSUI, Taketomo (Nagoya University, Nagoya, Japan) *GP-stability of two-step implicit Runge-Kutta methods for delay differential equations* (p. 288)
REPETSKI, Oleg (State Technical University, Irkutsk, Russia) *Numerical integration in the 3-D finite element analysis* (p. 303)
VAARMANN, Otu (Institute of Cybernetics at Tallinn TU, Estonia) *Some methods for nonlinear ill-posed equations* (p. 321)
DIAMANTAKIS, Michalis (Centre for Process Systems Engineering, Imperial College, London, UK) *An implicit Runge-Kutta code for large, sparse differential algebraic systems* (p. 254)
IKUNO, Soichiro (University of Tsukuba, Ibaraki, Japan) *Numerical method for MHD equilibrium of Troidal plasma in arbitrary shaped FC* (p. 272)
KAMITANI, Atsushi (Faculty of Engineering, Yamagata University, Japan) *Magnetic shielding performance of HTS plates with arbitrary cross section* (p. 275)
SKINNER, Iain M (University of New South Wales, Australia) *Third harmonic generation and modal effects in optical waveguides* (p. 311)
MIHÁLYKÓ, Csaba (University of Veszprém, Veszprém, Hungary) *Approximate method for solving a stochastic model of batch grinding* (p. 288)
PANOVSKI, Sotir (Faculty of Technical Sciences, St Kliment Ohriski University, Bitola, Macedonia) *A method for regulation of work of thermal power plants cooling system* (p. 296)
ADINTSOVA, Antonina I (Belarus State Economic University, Belarus) *Monotone graphs with threshold survival* (p. 234)
VINCENT, Christian (Université de la Réunion, France) *On a comparison of discretization schemes for the Stokes problem* (p. 323)