THE AUSTRALIAN NATIONAL UNIVERSITY

CENTRE FOR MATHEMATICAL ANALYSIS

ANNUAL REPORT 1986

The Centre proceeded along similar lines in 1986 to those of previous years. During the second semester there was a special concentration on Inverse Problems in applications, which is described later in this report. The research achievements of the Centre featured prominently in lectures presented at the International Congress of Mathematicians at Berkeley in August. Towards the end of 1986 the Centre, along with the other 8 Commonwealth Special Research Centres, was reviewed by a committee appointed by the Commowealth Tertiary Education Commission to make recommendations on future funding.

ADMINISTRATION

The Director is responsible to the Vice-Chancellor, through the Chairman of the Board of the Faculties, for the administration of the Centre. In planning and executing the academic program he is assisted by an advisory group comprising Professor R.P. Brent, Department of Engineering Physics, Research School of Physical Sciences, A.N.U., Professor L.M. Simon, Department of Mathematics, Research School of Physical Sciences, A.N.U., Dr. R.S. Anderssen and Dr. F.R. de Hoog, Division of Mathematics and Statistics, C.S.I.R.O., and Professor A.G.R. McIntosh, School of Mathematics and Physics, Macquarie University.

STAFFING MATTERS

Drs. Holmes and Roberts were appointed as postdoctoral fellows from January. Professor Yan returned to Jilin University, China, in April. Dr. R.S. Anderssen was seconded from the C.S.I.R.O. for the second semester and directed the special programme on Inverse Problems during this period as well as being Acting Director during the oversas absence of the Director. Dr. Urbas took up a Queen Elizabeth II Fellowship in the Centre in June. Professor Amano arrived from Josai University, Japan in August, to spend a sabbatical year working in the Centre. Dr. Bonner, from the Mittag-Leffler Institute, Stockholm and Dr. Overton from the Courant Institute, New York commenced appointments as long term Visiting Fellows in September and October respectively. In addition 26 mathematicians held short term Visiting Fellowships in the Centre, 14 of these being associated with the Inverse Problems activities.

Mrs. Joyce Heinz was employed as an additional typist during the year.

RESEARCH ACTIVITIES

As described in previous reports, the reseach of the Centre is divided into two interwoven areas: (i) theoretical mathematics with emphasis on partial differential equations: and (ii) computational and applied mathematics. The following is a brief summary of Centre supported research in 1986. Research by associate members supported by the Centre is also taken into account.

Professor N.S. Trudinger continued investigations into degenerate Monge-Ampère equations [Report R09] as well as further writing of Lecture Notes arising from his 1985 lectures in China.

Dr. Bartnik continued his research in Lorentzian manifolds and relativity. In particular he settled the major regularity question for the variational Lorentz mean curvature equations [Report R22] and made consequent applications to cosmology [Report R38] and singularities [Report R39].

Dr. Urbas continued his work on the Monge-Ampère equations and in particular proved the solvability of the general oblique derivative problem in two dimensions, [to appear 1987]. Professor Amano also studied the Dirichlet problem for degenerate Monge-Ampère equations, through application of Nash-Moser iteration [to appear 1987].

Dr. Bonner's research on convolution operators was embodied in the reports R47, R51, R52.

Associate members of the Centre were also heavily involved in the overall research programme. Professor Simon continued his research activity on a variety of questions involving singular behaviour of solutions of geometric variational problems. During this period he completed work on development of an existence and regularity theory for variational problems of Willmore type, introducing new techniques which in turn opened up exciting new territory in the calculus of variations. [Publication 40, 1986]. During this period Simon also brought to a

satisfactory conclusion the first stage of his work on non-linear entire solutions of the minimal surface equation-constructing a large class of non-linear entire examples and obtaining the first significant growth estimates, [Report R08-87]. Dr. Hutchinson continued his research on curvature integrals and elliptic systems and Dr. Huisken his work on geometric evolution equations, [Report R45].

Short term Visiting Fellows also made substantial contributions to the Centre's research output in functional analysis [Reports R05, R08], geometric calculus of variations [Reports R07, R10, R19, R23, R24, R25, R28, R32, R33] ordinary differential equations [Reports R17, R49], partial differential equations [Reports R21, R26, R27, R30, R31, R40] and differential geometry [Report R18].

(ii) COMPUTATIONAL AND APPLIED MATHEMATICS

The main activity was the Inverse Problems programme. Apart from this, Dr. Newsam continued his work on the numerical solution of ill-posed problems, partly in collaboration with R. Barakat [Reports R06, R16]. Dr. Roberts continued previous work on the numerical solution of stochastic differential equations [Report R37] and the random vortex method and began developing finite element methods for problems in plasticity. Dr. Holmes' research mainly concerned dynamical systems in particular quadratic systems [Report R36] while Dr. Cullen was concerned with their control theory (see Publications 18,19,20).

During the year the Centre sponsored two separate activities on inverse problems.

In early February (February 3-7), it hosted jointly with the Summer Research Institute of the Australian Mathematical Society a Workshop on Inverse Problems. The organizers were Dr. R.S. Anderssen, Division of Mathematics and Statistics, CSIRO, and Dr. G.N. Newsam of the Centre. As well as invited talks by Professor R. Barakat, Harvard University (Research Reports R06-86, R15-86), Professor K. Nickel, University of Freiburg (Research Reports R11-86, R12-86), R13-86), and Professor David F. Katz, University of California at Davis (Research Report R13-86), the workshop examined in great detail three important inverse problems which arise in applications, discussed at some length the utility of regularization techniques, and solicited independent talks from attendees. The details of the major activities of that workshop are:

Dr. N.G. Barton Division of Mathematics and Statistics CSIRO,	Ultrasonic Testing
Dr. A.J. Jakeman, Centre for Resource and Environmental Studies	Transmissivity Estimation
Dr. C. Tarlowski, Geophysics Division, Bureau of Mineral Resources	The Magnetic Relief Problem
Dr. M.A. Lukas, School of Mathematics and Physics Murdoch University,	Assessing Regularization Approximations for a Particular Practical Problem

The proceedings of that Workshop, which report on a substantial part of the deliberations that took place, have been published as Volume 11 of the Proceedings of the Centre for Mathematical Analysis.

In the second half of 1986, the Centre organized (with the assistance of Dr. R.S. Anderssen on secondment to the Centre from the CSIRO) an activity on inverse problems by inviting as visitors a number of leading international experts on various aspects of inverse problems. They included:

Dr. R. Barakat, Harvard University (Phase Retrieval)
Professor R. Davies,University College of Wales (Numerical Differentiation and Convolution)
Professor H.W. Engl, University of Linz (Theory and Application of Regularization Methods
Professor O. Hald, University of California (Inverse Eigenvalue Problems)
Professor K-H Hoffman, University of Augsberg (Optimal Control, Asymptotic Regularization, and parameter identification for elliptic pde)
Professor J. McLaughlin, Rensselaer Polytechnic Institute (Inverse Eigenvalue Problems)
Professor M. Overton, New York University (Inverse Eigenvalue Problems)
Professor T. Seidman, University of Maryland (Theory and Application Regularization Methods)
Professor C. Vogel, University of Montana (Theory and Application of Regularization Methods)
Professor M. Vogelius, University of Maryland (Determination of an Unknown Conductivity from Boundary Measurements)

As a result of the interaction and collaboration which these visits fostered, considerable progress was made with the development of new methodologies for various classes of inverse problems such as methods

based on the weak formulation for the aquifer transmissivity identification problem (Research Report R01-87); as phase retrieval in two dimensions (Research Report R15-86); as asymptotic regularization techniques for parameter identification (Research Report - in preparation); and as hyperbolic approximations for a Cauchy problem for the heat equation (Research Report R44-86). In addition, a number of new and exciting results were discovered. They included a variational method for impedance computed tomography (Research Report R50-86); a proof that the distance between nodal points uniquely determine the density of a vibrating string (Research Report - in preparation); optimal parameter choice for general regularization methods (Research Report R35-86).

Contributions were also made in applied mathematics by Visiting Fellows, not specifically involved with the above programme. In particular Professor Limaye spent five months in the Centre during which time he wrote a monograph on "Spectral Perturbation and Approximation with Numerical Experiments" which will be published as Volume 13 of the Centre's proceedings. He also carried out research on the numerical performance of variational methods, partly in collaboration with Dr. Anderssen, [Reports R20, R42].

Professor Ascher pursued his research on numerical solution of differential equations [Report R16] and Professor Williams her research on reflected diffusion processes applied to queuing theory [Report R02, 1987].

Members of the Centre participated in the Summer Research Institute of the Australian Mathematical Society in Canberra in January, the Annual Meeting of the Division of Applied Mathematics at Wirrina February, the Annual Meeting of the Australian Mathematical Society in Perth in May and the Workshop on Mathematics in Industry in Melbourne in November. As well as the workshop on Inverse problems reported above, the Centre organized a week at the SRI on nonlinear wave equations with lecture series given by Professors Klainerman and Shatah. The Centre also organized two miniconferences in 1986, on "Geometry and partial differential equations" at the ANU in June and "Operator Theory" at Macquarie University in September. The proceedings of these conferences are being published as Volumes 12 and 14 of the Centre's proceedings.

Professor Trudinger visited China again in March 1986, giving lectures at Zhogshan University, Guangzhou, Yunnan University, Kunming, S.W. Jiaotong University, Emei, Sichuan University, Chengdu, Beijing University and Academica Sinica, Beijing. In July he gave a series of advanced lectures on Elliptic Partial Differential Equations at Cortona, Italy and in August attended the International Cogress of Mathematicians in Berkeley, California. Dr. Anderssen was an invited speaker at conferences on Inverse Problems, Oberwolfach, Germany in May and Inverse and Ill-posed Problems at St. Wolfgang See, Austria in June. Dr. Bartnik visited the University of San Diego in April for research collaboration with Professor S.T. Yau

Centre members and visiting fellows also lectured at various Australian universities during the year. As well as the typical mathematical itinerary, Professor Nickel visited a hang gliding factory in Helensburg and Professor Katz visited Westmead Hospital in Sydney, for research consultation in sail design and sperm motion respectively (see Reports R14, R13).

SEMINAR ACTIVITY

The main seminar activity was the Colloquium (program attached). In addition regular weekly seminars on Partial Differential Equations, Numerical Analysis, Functional Analysis, Geometric Measure Theory and Analytic Methods in Geometry were held.

PUBLICATIONS

The Centre produced fifty two research reports and three volumes of its Proceedings in 1986. Details are attached as well as references to publications of CMA personnel which appeared in 1986.

GRANTS

The salary of Dr. Newsam was paid for three months in conjunction with his consultancy for National Energy Research,Development and Demonstration Council on data analysis for commercial building energy use.

Professor Trudinger succeeded Dr. Anderssen as President of the Austalian Mathematical Society in May with Dr. Anderssen remaining as Vice President. Professor Trudinger served on the Editorial board of the journals, Annales de L'Institut Henri Poincaré and Proceedings of the Royal Society of Edinburgh. Dr. Anderssen continued as Chairman of the National Committee for Mathematics and Treasurer of the Federation of Australian Scientific and Technological Societies.

FUTURE PLANNING

Planning proceeded for the special year on Harmonic Analysis in 1987, with Professor Cowling of the University of New South Wales and Professor Moran of the University of Adelaide as co-directors and Dr. Meaney of the Department of Mathematics, R.S.Phys.S. as local organizer. About fifty mathematicians from the Australian state universities and overseas are expected to participate in this programme.

CENTRE FOR MATHEMATICAL ANALYSIS

STAFF

Director and Professor	N.S. Trudinger, B.Sc. (N.E.), M.Sc., Ph.D. (Stan.), F.A.A.
Research Fellows	R. Bartnik, B.Sc., M.Sc. (Melb.), Ph.D. (Princeton)
	A.D. Miller, B.Sc., Ph.D. (Qld)
	G. Newsam, B.Sc., M.Sc. (Cant.), A.M., Ph.D. (Harvard)
Queen Elizabeth Fellow	J.I.E. Urbas, B.Sc., Ph.D. (ANU)
Postdoctoral Fellows	C.A. Holmes, B.A. (Cambridge), M.Sc. (Cornell), Ph.D. (London)
	S.G. Roberts, B.Sc., M.Sc. (Flinders) Ph.D. (Berkeley)
Visiting Fellows	K. Amano, B.Sc. (Chiba) M.Sc., Ph.D.(Tokyo)
	R.S. Anderssen, B.Sc., M.Sc. (Qld) Ph.D. (Adel.)
	R. Bonner, Filosofiekandidat (Stockholm) Filosofiekodoktor (Stockholm)
	M.L. Overton, B.Sc.(Brit.Columbia) M.Sc.,Ph.D. (Stanford)
	Z. Yan, Diploma (Jilin University,China)
Secretary	M.G. Gray
Wordprocessor Operator	D.M. Nash
Typist	J. Heinz
Research Assistant	D. Cullen, B.Sc., Ph.D. (ANU)

ASSOCIATE MEMBERS

R.P. Brent	Engineering Physics, R.S.Phys.S.
F. de Hoog	Div. Maths & Stats., CSIRO
G. Huisken	Mathematics, Faculty of Science
J. Hutchinson	Mathematics, Faculty of Science
A.G.R. McIntosh	Mathematics, Macquarie University
C. Meaney	Mathematics, R.S.Phys.S.
L.M. Simon	Mathematics, R.S.Phys.S.

VISITING FELLOWS* (Short term)

Profesor S. Klainerman, NYU Courant
Professor J. Shatah, NYU Courant
Professor R. Adams, British Columbia
Professor R. Barakat, Harvard University
Dr. D. Katz, Universaity of California,Davis
Professor K. Nickel, Albert Ludwigs University, Germany
Professor E. Fraenkel, University of Sussex
Dr. U.Ascher, University of British Columbia
Professor E. di Benedetto, Northwestern University
Professor B. Limaye, Indian Institute of Technology, Bombay
Dr. F.-H. Lin, NYU Courant
Professor R. Hardt, University of Minnesota
Professor W.-M. Ni, University of Minnesota
Dr. C.-S. Lin, University of San Diego
Professor C. Groetsch, University of Cincinnati
Professor M. Vogelius, University of Maryland
Prof. H. Engl, Johannes Kepler University
Professor R. Williams, University of California, San Diego
Professor G.-C. Dong, Zhejiang University, China
Dr. R. Davies, University College of Wales
Professor O. Hald, University of California, Berkeley
Dr. R. Barakat, Harvard University
Professor L. Elden, Linkoping University
Professor K. Hoffmann, University of Augsburg
Dr. C. Vogel, Montana State University
Dr. B. Thompson, University of Queensland

* Visiting Fellows appointed for more than six months are shown as staff

COLLOQUIA 1986

January 30	Professor Sergiu Klainerman (NYU Courant) "Remarks on Non-Linear Evolution Equations"
February 6	Professor Jalal Shatah (NYU Courant) "Stability of Ground States for Some Non-Linear Evolution Equations"
February 18	Professor David Katz (University of California,Davis) "Applications of Mathematics to the Study of Reproduction and Fertility"
February 20	Professor R. Adams (University of British Columbia) "Variations of Sobolev's Inequality"
February 27	Professor K. Nickel(Albert Ludwigs-Universität,Germany) "A Mathematical Model for Ball Lightning"
March 4	Professor N. Kuiper (IHES, France) "Total absolute curvature for knotted surfaces"
March 13	Professor U. Ascher (University of British Columbia) "Numerical solution of stiff two-point boundary-value problems"
March 20	Professor L.E. Fraenkel (University of Sussex) "On a Linear, Partly Hyperbolic Model of Viscoelastic Flow Past a Plate"
March 27	Dr. Michael Grüter (Universität Dusseldorf) "Partitioning a Convex Body"
April 3	Dr. Stephen Roberts (Centre for Mathematical Analysis) "Numerical solution to Stochastic Differential Equations"
April 10	Professor A. MacIntosh (Macquarie University) "A functional calculus for commuting m-tuples of operators"
April 17	Dr. D.J. Cullen (Centre for Mathematical Analysis) "The Equivalence of Linear Systems"
April 24	Professor N.S. Trudinger (Centre for Mathematical Analysis) "Mathematics in China: Some impressions"
May 1	Dr. G. Verchota (Macquarie University) "Recent Results on Elliptic Boundary Value Problems"
May 29	Professor Bob Hardt (University of Minnesota) "Regularity at ∞ for Area Minimizing Hypersurfaces in Hyperbolic Space"
June 5	Professor E. Di Benedetto (Northwestern University) "Free Boundary Problems"
June 12	Professor P. Aviles (University of Illinois) "Some Recent Results on Conformal Deformations of Complete Riemannian Manifold"

June 19	Dr. F-H. Lin (NYU Courant) "Unique Continuation"
June 25	Professor A. Neeman (Princeton University) "Plurisubharmonic Functions on Algebraic Surfaces"
July 3	Dr. C-S. Lin (University of California,San Diego) "On Nodal Domains of Second Eigenfunctions of the Laplacian"
July 10	Dr. I. Aitchison (University of Melbourne) "Remarks on knot invariants"
July 17	Professor M. Vogelius (University of Maryland) "Determining conductivity by boundary measurements"
July 24	Professor B. Limaye (Indian Institute of Technology) "Korovkin's Theorem for $C(X)$ and $\beta(H)$
July 31	Professor P. Rabinowitz (Witzman Institute, Israel) "Numerical Evaluation of Cauchy Principal-Value Integrals"
August 7	Professor C. Groetsch (University of Cincinnati) "Integral equations of the first kind and ill-posed problems"
August 14	Professor H. Engl (Johannes Kepler University, Austria) "Some Numerical and Practical Aspects of Ill-Posed Problems"
August 21	Professor R. Williams (University of California, San Diego) "Laplaces equation with oblique derivative boundary conditions and consequences for reflected Brownian motion"
August 28	Dr. John Urbas (Centre for Mathematical Analysis) "A Survey of Some Recent Results on Monge-Ampère Equations"
September 11	Dr. Robert Bartnik (Centre for Mathematical Analysis) "Survey of Maximal Surface Regularity"
September 18	Professor P. de Bartolomeis (University of Florence) "Riemannian structures on Twistor spaces"
September 25	Dr. J. Paine (University of Adelaide) "Inverse Sturm-Liouville problems"
October 2	Dr. R. Davies (University College of Wales) "Recent developments in the numerical treatment of PDE's arising in non-Newtonian flows"
October 9	Dr. R. Bonner (Mittag-Leffler, Sweden) "Recent results on inverting convolution operators I."
October 16	Professor K. Amano (Josai University, Japan) "The Dirichlet problem for degenerate elliptic Monge-Ampère equations"
October 23	Professor G-C Dong (Zhejiang University, China) "The Initial and Boundary Value Problems for Nonlinear Parabolic Equations"

October 29	Professor O. Hald (University of California, Berkeley) "Inverse Problem for the Earth"
November 6	Professor E. Bombieri(University of Princeton) "1-Dimensional Quasi-Crystals"
November 13	Professor T. Seidman (University of Maryland) "A nonlinear parabolic system arising in semiconductor theory"
November 20	Professor L. Elden (Linkoping University, Sweden) "Approximations for a Cauchy problem for the heat equation"
November 27	Professor K.-H. Hoffman (University of Augsburg) "Identification of Hysteresis Nonlinearities from Measurements"
December 4	Dr. B. Thompson (University of Queensland) "Existence Results for Two-Point Boundary Value Problems"
December 11	Dr. C. Vogel (Montana State University) "Iterative Methods for Large Linear Ill-Posed Problems"

OFFICIAL PUBLICATIONS 1986

PROCEEDINGS

Volume 11	Workshop on Inverse Problems, Edited by R.S. Anderssen and G.N. Newsam
Volume 12	Miniconference on Geometry/Partial Differential Equations Edited by John Hutchinson and Leon Simon
Volume 13	Spectral Perturbation and Approximation with Numerical Experiments Balmohan Vishnu Limaye
Volume 14	Miniconference on Operator Theory and Partial Differential Equations Edited by Brian Jefferies, Alan McIntosh and Werner Ricker

RESEARCH REPORTS

CMA-R01-86	Leon Simon	A Strict Maximum Principle for Area Minimizing Hypersurfaces
CMA-R02-86	G.A. Chandler and I.G.Graham	The Convergence of Nystrom Methods for Wiener-Hopf Equations
CMA-R03-86	A.K.M. Masood-Ul-Alam	On Spherical Symmetry of Static Perfect Fluid Space-Times and the Positive Mass Theorem
CMA-R04-86	G.L. Bunting and A.K.M. Masood-Ul-Alam	Non-existence of Multiple Black Holes in Asymptotically Euclidean Vacuum Space-time
CMA-R05-86	R.A. Adams	Anisotropic Sobolev Inequalities
CMA-R06-86	G.N. Newsam and R. Barakat	Why Crude Phase Estimation Fails
CMA-R07-86	S. Luckhaus	$C^{1,\varepsilon}$-regularity for Energy Minimizing Hölder Continuous p-Harmonic Maps between Riemannian Manifolds
CMA-R08-86	R.A. Adams	Reduced Sobolev Inequalities
CMA-R09-86	Neil S.Trudinger	On Degenerate Fully Nonlinear Elliptic Equations. in Balls
CMA-R10-86	Michael Grüter	Free boundaries in Geometric Measure Theory and Applications
CMA-R11-86	Karl L.E.Nickel	A Model for Ball Lightning and Bead Lightning
CMA-R12-86	Karl L.E.Nickel	The Lifetime of Hill's Vortex

CMA-R13-86	David Katz and Neville de Mestre	Hydrodynamic Thrust of an undulating Slender Body Against a No-slip Boundary at Low Reynolds Number: A model of sperm thrust during fertilisati
CMA-R14-86	Karl L.E.Nickel	A three-dimensional Theory for Sails
CMA-R15-86	G.N. Newsam and R. Barakat	Phase Retrieval in Two Dimensions
CMA-R16-86	Uri Ascher and G. Bader	A Node on Conditioning Stability and Collocation Matrices
CMA-R17-86	Yan Ziqian	A Free Boundary Problem for ODE arising from Degenerate Parabolic Equations
CMA-R18-86	Mario Micallef	On the Topology of Positively Curved Manifolds
CMA-R19-86	Brian White	Curvature Estimates and Compactness Theorems in 3 manifolds for Surfaces that are Stationary. for Parametric Elliptic Functionals
CMA-R20-86	B.V. Limaye and M.T. Nair	Rayleigh-Schrodinger Procedure for Iterative Refinement of Computed Eigenelements Under Strong Approximation
CMA-R21-86	E. di Benedetto	Intrinsic Harnack type inequalities for solutions of certain degenerate parabolic equations
CMA-R22-86	Robert Bartnik	Regularity of Variational Maximal Surfaces
CMA-R23-86	Brian White	New Applications of Mapping Degrees to Minimal Surface Theory
CMA-R24-86	Robert Hardt and F-H.Lin	Mappings Minimizing the L^p Norm of the Gradient
CMA-R25-86	Robert Hardt and F-H.Lin	Regularity at Infinity for Area-minimizing Hypersurfaces in Hyperbolic Space
CMA-R26-86	C-S.Lin and W-M. Ni	A counterexample to the nodal domain conjecture and a related semilinear equation
CMA-R27-86	C-S. Lin	On the Second Eigenfunction of the Laplacian in R^2
CMA-R28-86	F-H. Lin	Estimates for Surfaces which are Stationary for an Elliptic Parametric Integral
CMA-29-86	C.W. Groetsch and C.R. Vogel	Asymptotic Theory of Filtering for Linear Operator Equations with Discrete Noisy Data
CMA-R30-86	C-S. Lin and W-M. Lin	On the Diffusion Coefficient in a Semilinear Neumann Problem

CMA-R32-86	Robert Hardt	Singularities in some Geometric Variational Problems
CMA-R33-86	Robert Hardt and F-H.Lin	Non-Minimality of Minimal Graphs
CMA-R34-86	David Adams and Leon Simon	Rates of Asymptotic Convergence Near Isolated Singularities of Geometric Extreme
CMA-R35-86	Heinz Engl and Helmut Gfrerer	A-Posteriori Parameter Choice for General Regularization Methods for Solving Linear Ill-Posed Problems
CMA-R36-86	C.A. Holmes	Some Quadratic Systems with a Separatrix cycle surrounding a limit cycle
CMA-R37-86	Stephen Roberts	Convergence of a Random Walk-Method for the Burgers Equation
CMA-R38-86	Robert Bartnik	Remarks on constant mean curvature surfaces
CMA-R39-86	Robert Bartnik	Isolated singularities of the Lorentz Mean Curvature Equation
CMA-R40-86	Guang-Chang Dong	Initial and nonlinear oblique boundary value problems for fully nonlinear parabolic equations
CMA-R41-86	Heinz Engl and Andreas Neubauer	Convergence rates for Tikhonov Regularization in finite-dimensional subspaces of Hilbert space
CMA-R42-86	L.N. Despande and B.V. Limaye	Power Method for a Semi-Simple Eigenvalue
CMA-R43-86	T.I. Seidman	An Inverse Eigenvalue Problem with Rotational Symmetry
CMA-R44-86	Lars Elden	Hyperbolic approximations for a Cauchy problem for the heat equation
CMA-R45-86	Gerhard Huisken	The volume preserving mean curvature flow
CMA-R46-86	Gene Golub and Michael Overton	The Convergence of Inexact Chebyshev and Richards on Iterative Methods for Solving Linear Systems
CMA-R47-86	Richard Bonner	A smoothness property of pseudo-convolution operators
CMA-R48-86	C. Vogel and T. Seidman	Well-Posedness and Convergence of some regularization methods for nonlinear ill-posed problems

CMA-R49-86	Bevan Thompson	Minimal Solutions for Two Point Boundary Value Problems
CMA-R50-86	R. Kohn and M. Vogelius	Relaxation of a Variational Method for Impedance Computed Tomography
CMA-R51-86	Richard Bonner	On the existence of tempered fundamental solutions to systems of PDE's with constant coefficients with regularity and support conditions: a survey
CMA-R52-86	Richard Bonner	An Estimate of Fourier Transforms of Measures

1. Adams, D. (with L. Simon) "Asymptotic behaviour near isolated singular points for geometric variational problems." *Proc. Centre Math. Analysis* 10 (1986) 1-7.

2. Anderssen, R.S., "The Lanczos methods and the Rayleigh quotient." In *Computational Techniques and Applications*: CTAC 85 (Eds J. Noye and R. May) North-Holland, Amsterdam (1986) 695-706.

3. Anderssen, R.S., "What is Applied Mathematics." *School Math. J.* 32 (1986) 6-14.

4. Anderssen, R.S. (with Chengsung Wang and K.J. Muirhead) "Observations of Core Phases from Australian short-period array and network seismograms." *Bull. Inst. Earth Sciences, Academia Sinica* 5 (1985) 151-159.

5. Anderssen, R.S. (with A.R. Davies) "Improved estimates of statistical regularization parameters in Fourier differentiation and smoothing." *Numer. Math.* 48 (1986) 671-679.

6. Anderssen, R.S. (with A.R. Davies) "Optimization in the regularization of ill-posed problems." *J. Austral. Math. Soc. Ser.* B 28 (1986) 114-133.

7. Anderssen, R.S. (with I. Koch) "Direct Surface Smoothing for image reconstruction". In *Computational Techniques and Applications*: CTAC 85 (Eds J. Noye and R. May) North-Holland, Amsterdam (1986).

8. Anderssen, R.S. (with D.R. Jackett) "Use of the linear functional strategy for assessing the status of plant canopies." In *Industrial Numerical Analysis* (Eds C.M. Elliott and S. McKee) Oxford University Press, Oxford, 1985.

9. Anderssen, R.S., (with D.R. Jackett, D.L.B. Jupp and J.M. Norman) "Interpretation of and simple formulas for some key linear functions of the foliage angle distribution. *Agric. For. Meteor.* 36 (1985) 165-188.

10. Anderssen, R.S. (with J.W. Paine) "Efficent Computation of geophysical eigenvalues. In *Computational Techniques and Applications*: CTAC 85 (Eds J. Noye and R. May) North-Holland, Amsterdam (1986) 323-332.

11. Baird, P. "The Gauss Map of a Submersion." *Proc. Centre Math. Analysis* 10 (1986) 8-24.

12. Bartnik, R. "The Mass of an Asymptotically Flat Manifold." *Commun Pure and Appl. Math.*, 39 (1986) 661-693

13. Brent, R.P. "Some integer factorization algorithms using elliptic curves." *Proceedings of the Ninth Australian Computer Science Conference, special issue of Australian Computer Science Communications* 8 (1986) 149-163.

14. Brent, R.P. (with A.W. Bojanczyk) "A systolic algorithm for extended GCD computation." *Proceedings of the Ninth Australian Computer Science Conference, special issue of Australian Computer Science Communications* 8 (1986) 128-137.

15. Brent, R.P. (with A.W. Bojanczyk) "Parallel solution of certain Toeplitz least squares problems." *J. Linear Algebra and its Applications* 77 (1986) 43-60.

16. Brent, R.P. (with A.W. Bojanczyk) "Tridiagonalization of a symmetric matrix on a square array of mesh-connected processors." *J. Parrallel and Distributed Computing* 2 (1985) 261-276.

17. Brent, R.P. (with A.W. Bojanczyk and F.R. de Hoog) "Parallel QR factorization of Toeplitz matrices." *Proceedings SPIE 696, Advanced Algorithms and Architectures for Signal Processing*, Society of Photo-Optical Instrumentation Engineers, Bellingham, Washington (1986).

18. Brent, R.P. (with A.W. Bojanczyk and F.R. de Hoog) "QR factorization of Toeplitz matrices." *Numerische Mathematik* 49 (1986) 81-94.

19. Cullen, D.J. "An ALgebraic condition for controllability at infinity." *Systems & Control Letters* 6 (1986) 321-324.

20. Cullen, D.J. "Local System Equivalence." *Math. Systems Theory* 19 (1986) 67-78.

21. Cullen, D.J. "State-space realizations at infinity." *Int. J. Control* 43 (1986) 1075-1088.

22. Dancer, E.N. "Remarks on multiple solutions of nonlinear equations." *Proc. Centre Math. Analysis* 10 (1986) 25-31.

23. Di Benedetto, E. "About some ill-posed problems." *Proc. Centre Math. Analysis* 10 (1986) 32-56.

24. Fusco, N. (with J.E. Hutchinson) "Partial regularity for solutions of variational problems." *Proc. Centre Math. Analysis* 10 (1986) 57-67.

25. Getzler, E. "Degree theory and Gaussian measures in infinite dimensions." *Proc. Centre Math. Analysis* 10 (1986) 68-77.

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