

THE AUSTRALIAN NATIONAL UNIVERSITY

CENTRE FOR MATHEMATICAL ANALYSIS

ANNUAL REPORT, 1984

Research continued to flourish in the Centre for Mathematical Analysis in 1984, with the level of overall activity matching that in 1983. A large number of mathematicians drawn from around Australia and overseas participated in the Centre's program which resulted in the production of fifty two original research reports. Further details of particular discoveries and events are provided below.

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 Computer Science, Faculty of Science, 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

Professors Brent and McIntosh continued their secondments throughout 1984. Professor E.N. Dancer from the University of New England spent six months from May in the Centre, three months on secondment and the balance on study leave. Dr. G. Keady from the University of Western Australia and Dr. J. Van der Hoek from the University of Adelaide were seconded from May until August. Dr. P. Price was appointed as a Postdoctoral Fellow from January. Extended Visiting Fellow appointments were taken up by: Dr. G.M. Lieberman for six months from January supported by a Faculty Improvement Grant from Iowa State University; Dr. N. Fusco, from the University of Naples, for one year from April; Dr. G. Newsam from Harvard University for one year from April; Dr. A.R. Davies from University College of Wales for six months from July and Professor Z. Yan from Jilin University for one year from November, supported by a grant from the Government of the Peoples Republic of China. In addition, the Postdoctoral Fellow appointments of Dr. A. Bojańczyk, Dr. G. Bunting, and Dr. G. Huisken were continued throughout 1984. Drs. Krbec and Gustafson departed in February,

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Drs. Gruter and Jost departed in March, and Dr. P. Baird completed his appointment in August. Dr. A. Richardson from James Cook University and Dr. J. Hutchinson from Department of Mathematics, Faculty of Science took study leave in the Centre during the second half of 1984.

Short term Visiting Fellows are indicated under the attached Staff List.

Research activities

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

(i) Theoretical mathematics

Professor Trudinger continued his work on oblique boundary value problems for nonlinear elliptic equations in collaboration with G. Lieberman and P-L. Lions [Reports R23,24] and on Monge-Ampère equations with a graduate student, J. Urbas, [Report R11]. In particular Lions and Trudinger considered Signorini-obstacle problems for the Bellman equation with application to the optimal stopping of reflected diffusion processes and also established the solvability of the Neumann problem for the Monge-Ampère equation (to appear in 1985 reports).

Dr. Baird continued work on harmonic submersions [Report R38 (1983)] and solved an outstanding classification problem for harmonic morphisms from three dimensional domains into Riemann surfaces [Report R27]. Dr. Bunting continued to exploit the connection between harmonic mappings and relativity [Report R34] the main achievement of his work in 1984 being the description of Bäcklund transformations for Einstein's equations in terms of harmonic mappings.

Professor Dancer addressed questions concerning numbers of solutions of semilinear equations corresponding to various applied models providing in particular negative answers to previous conjectures, [Report R40].

Dr. Fusco worked on homogenization problems for integral functionals and elliptic equations [Report R26] and the existence and regularity of minima of integral functions depending on vector-valued functions, connected with elasticity.

Drs. Gruter and Jost continued their investigations on the regularity of the free boundary of varifolds [Report R14] and the embedding of minimal discs in convex bodies [Report R21]. Dr. Jost also studied harmonic maps between surfaces and Riemannian manifolds [Reports R05, R06, R17]. A set of lectures he gave in 1983 was published as a Centre Proceedings (Vol.4, 1984).

Dr. Huisken, by extending his 1983 investigations, solved the problem of contraction of convex hypersurfaces in Euclidean space moving by their mean curvature. In particular, he proved that a uniformly convex body contracts to a single point [Report R10]. This work which is related to the annealing of metal was later extended to Riemannian manifolds [Reports R18, R43].

Dr. Hutchinson's research was concerned with the existence and regularity of varifolds minimizing curvature [Report R49].

Professor Lieberman, as well as the joint research with Professor Trudinger, prepared reports on his research on linear and quasilinear parabolic equations [Reports R03, R04, R16].

Professor McIntosh continued his research in operator theory, giving direct proofs using Clifford algebras of some boundedness results for singular integrals on Lipschitz surfaces which extend to higher dimensions his celebrated work with Meyer and Coifman, (see Publication 10, 1983). In collaboration with Dr. Pryde, he also applied Clifford algebra techniques to the functional calculus of operators in Banach spaces

Dr. Williams continued research on the Dirichlet problem for the minimal surface equation, examining in particular the boundary behaviour of generalized solutions [Reports R01, R45].

Professor Simon continued work on the asymptotic behaviour of minimal surfaces and harmonic maps, partly in collaboration with a short term Visiting Fellow, Professor R. Hardt [Reports R41, R42, R51, R52]. In particular striking new results related to the Bernstein conjecture for minimal graphs were produced [Report R52].

Substantial contributions to the Centre's research were also made by short term visitors, some of which is covered by research reports [Reports R08, R09, R22, R30] and by research students supervised by Centre personnel [Reports R32, R35, R36, R44].

(ii) Computational and applied mathematics

Professor Brent and Dr. Bojanczyk worked on parallel algorithms for problems arising in numerical linear algebra and developed a fast algorithm for the tridiagonalization of a symmetric matrix on a square array of mesh connected processors [Report R29]. Together with Dr. F.R. de Hoog, they also worked on stable and parallel algorithms for Toeplitz systems

discovering new algorithms for certain least squares problems and QR factorization [Report, R02, R19]. In addition Professor Brent continued previous work on VLSI design and devised new strategies for dynamic storage allocation on computers with virtual memory [Reports R33, R37].

Dr. Anderssen and Dr. Davies undertook a detailed analysis of regularization filters for the numerical differentiation of non-exact data, obtaining improved asymptotic maximum likelihood and cross validation estimated [Reports to appear in 1985].

Dr. Miller further developed his numerical study of solidification of steel castings using a reformulation in terms of enthalpy. A computer package SIROCAST was developed jointly with the CSIRO (Division of Mathematics and Statistics and Manufacturing Technology). In addition he continued previous work on adaptive finite element techniques with a short term Visiting Fellow, Professor I. Babuska [Report R47] and considered applications of finite element methods to plasma stability calculations with Dr. R.L. Dewar, (Theoretical Physics, ANU).

Dr. Newsam's research advanced on several fronts including the estimation of sparse Jacobians and Hessians, the modelling of charge transport in photosynthesis and heat diffusion in iron castings, the analysis of samples from very long tailed distributions and the essential dimension of ill-posed problems [Reports R28, R39].

Dr. Keady produced qualitative results pertaining to semilinear equations arising in inviscid fluid flow and flow in a porous medium [Report R30]. Dr. van der Hoek continued research on parabolic equations, flows in porous media (with Dr.C. Barnes and J. Knight, CSIRO) and inverse problems (with Dr. Anderssen).

Dr. Womersley worked on the structure, differential properties, optimality conditions and algorithms for various classes of nonsmooth functions arising in optimization problems, [Reports R12, R13].

Further applied research was carried out by various short term visitors. In particular significant contributions in fluid mechanics were made by Dr. M. and Dr. Y. Renardy [Reports R20, R48], Professor Carey [Report R07] and Professor Toland (to appear 1985). Dr. Richardson, in collaboration with Dr. de Hoog, commenced investigations on the numerical solutions of certain systems of differential equations occurring in various important applied models such as photo-electric effects in semi-conductors. Dr. Anderssen was responsible for overseeing the joint project with the CSIRO in solidification and both he and Dr. Miller had useful contacts with the foundry industry.

Conferences and Travel

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 Merimbula in February, the Annual Meeting of the Australian Mathematical Society in Melbourne in May, Conferences on Inverse Problems in Sydney in July and Free and Moving Boundary Value Problems in Wollongong in August and the CSIRO-SIROMATH Workshop on Mathematics in Industry in Melbourne in November. The Centre itself organized the last week of the Summer Research Institute on numerical partial differential equations and, immediately following the meeting of the Division of Applied Mathematics, convened a seminar on the Contributions of Mathematical Analysis to the Numerical Solution of Partial Differential Equations. The seminar proceedings edited by A. Miller were published as Volume 7 of the Centre's proceedings. During the year the Centre also held miniconferences on Nonlinear Analysis in July and Linear Analysis and Function Spaces in October. The proceedings of these meetings are also published as Centre proceedings, Volume 8, edited by N. Trudinger and G. Williams, and Volume 9 edited by A. McIntosh and A. Pryde (to appear 1985).

Professor Trudinger visited the Universities of Paris and Florence in January and in addition gave seminars at the Universities of Rome, Naples, Trent and Zurich. In November he spent two weeks at the Banach Centre in Warsaw, delivering some lectures on recent research. This was followed by brief visits to the Universities of Heidelberg, Bonn and Paris and then a one month sojourn at the Institute for Mathematics and Its Applications at the University of Minnesota in conjunction with their special year on Continuum Mechanics and Partial Differential Equations. Brief seminar visits were also made to other U.S. universities.

Professor Brent delivered papers at the 7th Australian Computer Science Conference in Adelaide in February, the ANZAAS Congress in Canberra in May as well as an invited address at the Annual Meeting of the Australian Mathematical Society.

Dr. Huisken, Dr. Hutchinson and Professor Simon were invited participants in the American Mathematical Society, Summer Research Institute on Geometric Measure Theory in Arcata, California in July, and Dr. Dancer at Conferences on Topological Methods for Nonlinear Boundary Problems at Trieste, Italy in May and Bifurcation Theory and Applications at Durham, U.K. in July. In addition Dr. Huisken visited the University of California at San Diego in November and December. Professor McIntosh gave a paper at a meeting of the American Mathematical Society in San Diego in November and afterwards proceeded to visit Yale University, Princeton University and the University of Minnesota.

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Many Centre members and visitors also gave seminars at other Australian universities.

Seminar activity

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

Publications

The Centre produced fifty two Research Reports and four Proceedings volumes in 1984. Details are attached as well as references to other staff publications which appeared in 1984. The Centre took over responsibility for the distribution of its proceedings from ANU Press in 1984 with a resultant sharp increase in sales.

Honours

Professor Brent was awarded the Fourth Australian Mathematical Society Medal. As a consequence Centre members have now accounted for three of the four medals awarded (Professor Trudinger, 1981, Professor Simon 1983).

Grants

Professor Brent received an ARGS grant for a project entitled "High Level VLSI design" and a CSIRO Computing Grant for a project entitled "Vector algorithms for problems in numerical linear algebra". Professor Brent and Dr. de Hoog also received an ANU/CSIRO Collaborative Research Fund Grant for a project entitled "Stable and parallel algorithms for Toeplitz matrices".

Other activities

Professors Brent and Trudinger served on the editorial boards of the two international journals, Numerische Mathematik and Annales de L'Institut Henri Poincaré Analyse Nonlineaire respectively. Professor Brent also acted as Secretary of the Australian Association of Professors of Computer Science and a member of the National Committee for Mathematics and the Council of the Australian Mathematical Society. Dr. Anderssen was elected President of the Australian Mathematical Society.

CENTRE FOR MATHEMATICAL ANALYSIS

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STAFF

Director and Professor	N.S. Trudinger, B.Sc.(N.E.), M.S., Ph.D. (Stan.), F.A.A.
Professor	R.P. Brent, M.S., Ph.D.(Stan.), D.Sc. (Monash), F.A.A.
Associate Professor	A.G.R. McIntosh, B.Sc.(N.E.), Ph.D.(Calif.)
Research Fellows	A.D. Miller, B.Sc., Ph.D. (Qld.) G.H. Williams, B.Sc., Ph.D.(Adel.) Dip.Comp.Stud. (Melb.) R.S. Womersley, B.Sc.(Adel.), M.Sc., Ph.D.(Dundee)
Postdoctoral Fellows	P. Baird, B.Sc., Ph.D. (Warwick), M.Sc.(Oxford) A. Bojańczyk. mgr.dr. (Warsaw) G. Bunting, B.Sc.(Qld), B.Sc.Hons.(Monash), Ph.D. (N.E.) G. Huisken, Dipl.Math., Dr.Rer.Nat.(Heidelberg) M. Krbeč, R.N.Dr.(Charles), C.Sc.(Czech.Acad.Sc.) P. Price, B.Sc., Ph.D. (W.A.)
Visiting Fellows*	E.N. Dancer, B.Sc.(Qld.), Ph.D.(Cambridge) A.R. Davies, B.Sc.(Kings), M.Sc., D.Phil.(Oxford) N. Fusco, Laurea (Napoli) M. Grüter, Dipl.Math., Dr.Rer.Nat.(Bonn) S.-Å. Gustafson, fil.mag.(Lund), fil.dr., docent (Stockholm) J. Jost, Dipl.Math., Dr.Rer.Nat.(Bonn) G. Lieberman, B.A., M.S.(Northwestern), Ph.D.(Stan) G. Newsam, B.Sc.Hons., M.Sc.(Cant.), A.M., Ph.D. (Harvard) Z. Yan, Diploma (Jilin University, China)
Secretary	M.G. Gray
Typist	D.M. Nash
Research Assistant (Part time)	J.P. Duggan, B.Sc.Hons.(Melb.), Ph.D. (A.N.U.)

ASSOCIATE MEMBERS

L. Simon	(Mathematics, R.S.Phys.S.)	S. Reye	(Mathematics, Fac. of Sc.)
J. Hutchinson	(Mathematics, Fac. of Sc.)	J. Urbas	(Mathematics, Fac. of Sc.)
A. Pryde	(Mathematics, R.S.Phys.S.)	W. McLean	(Mathematics, Fac. of Sc.)
R.S. Anderssen	(Div. of Maths & Stats., CSIRO)	C. Lau	(Mathematics, R.S.Phys.S.)
F.R. de Hoog	(Div. of Maths & Stats., CSIRO)		

VISITING FELLOWS* (Short term)

Dr. G. Chandler, University of Queensland
Dr. I. Graham, University of Melbourne
Professor I. Babuska, University of Maryland
Professor G. Carey, University of Texas
Dr. I. Duff, Harwell Atomic Energy Authority
Professor H.-O. Kreiss, California Institute of Technology
Professor F. Stenger, University of Utah
Dr. R. Lapwood, Emanuel College, Cambridge
Professor C. Gerhardt, University of Heidelberg
Professor G. Wahba, University of Wisconsin, Madison
Dr. G. Keady, University of Western Australia
Dr. J. Van der Hoek, University of Adelaide
Dr. M. Renardy, University of Wisconsin, Madison
Dr. Y. Renardy, University of Wisconsin, Madison
Professor W.P. Ziemer, Indiana University
Dr. G. David, Yale University
Dr. A.A. Richardson, James Cook University
Professor J. Toland, University of Bath
Dr. J. Michael, University of Adelaide
Professor R. Hardt, University of Minnesota
Professor P. Davis, Brown University
Professor E. Stein, Princeton University
Professor H. Triebel, F. Schiller University of Jena
Professor N. Ikeda, University of Osaka
Professor G. Fabes, University of Minnesota
Dr. J.E. Hutchinson, Australian National University

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

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COLLOQUIA 1984

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|-------------|---|
| January 10 | Professor Juris Hartmanis (Cornell University)
"Computational Complexity and Kolmogorov Complexity" |
| February 23 | Dr. I. Duff (A.E.R.E. Harwell, Oxon)
"The Solution of Nearly Symmetric Sparse Linear Equations" |
| March 1 | Dr. Jost (Universität Bonn)
"Conformal Mappings and the Plateau-Douglas Problem" |
| March 8 | Dr. G. Bunting (Centre for Mathematical Analysis, ANU)
"Bäcklund Transformations, Harmonic Maps and Black Holes" |
| March 15 | Professor F. Stenger (University of Utah)
"Solution of Inverse Problems in Ultrasonic Tomography and Geophysics" |
| March 22 | Dr. G. Lieberman (Iowa State University)
"Linear and Nonlinear Oblique Derivative Problems for Elliptic Equations" |
| March 29 | Professor Neil S. Trudinger (Centre for Mathematical Analysis, ANU)
"Quasi-Minima for Variational Integrals" |
| April 5 | Dr. Alan Kennington (University of Melbourne)
"The Naturalness of Power Concavity" |
| April 11 | Professor Joel Hass (University of Michigan)
"An Existence Theorem for Minimal Surfaces" |
| April 12 | Dr. Huy-Bui (University of Sydney)
"Some Results on Besov and Triebel-Lizorkin Spaces" |
| April 26 | Professor Grace Wahba (University of Wisconsin, Madison)
"Generalized Inverses in Reproducing Kernel Spaces" |
| May 3 | Dr. A. Miller (Centre for Mathematical Analysis, ANU)
"Numerical Methods for the Multiphase Stefan Problem" |
| May 10 | Dr. John Giles (University of Newcastle)
"The Relation between continuity of the Metric Projection and differentiability of the distance function" |
| May 24 | Dr. G. Newsam (Centre for Mathematical Analysis, ANU)
"A Measure of the Information Recoverable in an Ill-posed Problem" |
| May 31 | Dr. G. David (Yale University)
"A Geometric Proof of Coifman-McIntosh-Meyer's Theorem" |

- June 7 Dr. M. Renardy (University of Wisconsin, Madison)
"On Wave Propagation in Linear Viscoelasticity"
- June 14 Professor Norm Dancer (University of New England)
"Existence, Uniqueness and Stability of Positive
Solutions of Certain Systems of Differential Equations"
- June 21 Professor William Ziemer (Indiana University)
"General Balance Laws and Sets of Finite Perimeter"
- June 28 Dr. Alan Pryde (Department of Mathematics, I.A.S.)
"The Fredholm Index of Linear Elliptic Mixed
Boundary Value Problems on Planar Domains"
- July 12 Dr. A.R. Davies (Aberystwyth College, Wales)
"Viscoelastic Flows and their Numerical Treatment"
- July 19 Dr. J.H. Michael (University of Adelaide)
"A Fixed Point Theorem and Invariant Integration on
a Compact Semigroup"
- July 26 Professor Richard Brent (Centre for Mathematical
Analysis, ANU)
"Dynamic Storage Allocation on a Computer with
Virtual Memory"
- August 2 Professor John Toland (University of Bath)
"The Regularity of the Wave of Greatest Height"
- August 9 Professor Robert Hardt (University of Minnesota)
"Green's Functions on Compact Riemann Surfaces"
- August 16 Dr. Paul Baird (Centre for Mathematical Analysis, ANU)
"Harmonic Morphisms on to Riemann Surfaces"
- August 23 Professor Olli Lehto (University of Helsinki)
"Value Distribution Theory of Meromorphic Functions:
A Historical Survey"
- August 30 Professor Michele Emmer (Università di Roma)
Presentation of Films "Soap Bubbles, "Symmetry and
Space in M.C. Escher", Non-Euclidean Geometry and
Impossible Worlds"
- September 13 Dr. J.R. and Dr. H. Ockendon (Oxford University)
"Differential Equation Models in Industry"
- September 27 Professor Andrejs Granas (University of Montreal)
"Homotopy and Non-Linear Equations in Banach Spaces"

- October 4 Professor Hans Triebel (F. Schiller University
of Jena)
"Function Spaces: A survey from the standpoint of
Fourier Analysis"
- October 11 Professor J.L. Verdier (École Normale Supérieure)
"The Korteweg-de Vries Equation - A Historical Survey"
- October 25 Professor Gene Fabes (University of Minnesota)
"LP Integrability of Fundamental Solutions of
Parabolic Equations with Nonsmooth Coefficients"
- October 30 Professor Eli M. Stein (Princeton University)
"Some Recent Results in the Theory of Maximal
Functions"
- November 8 Professor Nobuyuki Ikeda (University of Osaka)
"Short Time Asymptotics for Fundamental Solutions
of Diffusion Equations"
- November 15 Dr. Brendan D. McKay (Computer Science, ANU)
"The Status of the Graph Isomorphism Problem"
- November 26 Dr. James Lyness (Argonne National Laboratories)
"Extrapolation Methods for Multidimensional
Quadrature of Singular and Regular Integrand Functions"
- November 29 Dr. Mark A. Lucas (University of New South Wales)
"Convergence Rates for Regularized Solutions"

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OFFICIAL PUBLICATIONS 1984

PROCEEDINGS

- Vol. 5 Miniconference on Operator Theory and Partial Differential Equations, Edited by Brian Jefferies and Alan McIntosh
- Vol. 6 Mathematical Programming and Numerical Analysis Workshop, Edited by S.Å. Gustafson and R.S. Womersley
- Vol. 7 Contributions of Mathematical Analysis to the Numerical Solution of Partial Differential Equations, Edited by Anthony Miller
- Vol. 8 Miniconference on Nonlinear Analysis, Edited by Neil S. Trudinger and Graham H. Williams

RESEARCH REPORTS

- R01 Global regularity for solution of the minimal surface equation with continuous boundary values, Graham Williams
- R02 Systolic arrays for solving Toeplitz linear least squares problems, A. Bojańczyk
- R03 Intermediate Schauder Theory for Second Order Parabolic Equations I. Estimates, G. Lieberman
- R04 Intermediate Schauder Theory for Second Order Parabolic Equations II. Existence Uniqueness and Regularity, G. Lieberman
- R05 A note on harmonic maps between surfaces, J. Jost
- R06 A conformally invariant Variational Problem for Mappings between Riemannian Manifolds, J. Jost
- R07 A continuation method for a Penalty Approximation of the Navier-Stokes Equations, G.F. Carey and R. Krishnan
- R08 An example illustrating integral-geometric measures, Pertti Mattila
- R09 On the Elliptic Equation $Lu - k + Ke^{2u} = 0$, Carlos E. Kenig and Wei-Ming Ni
- R10 Flow by Mean Curvature of Convex Surfaces into Spheres, Gerhard Huisken
- R11 On Second Derivative Estimates for Equations of Monge-Ampère Type, Neil S. Trudinger and John Urbas
- R12 Minimizing Non-Smooth Composite Functions, R.S. Womersley
- R13 Local Properties of Algorithms for minimizing Non-Smooth Composite Functions, R.S. Womersley

- R14 Allard Type Regularity Results for Varifold with Free Boundaries, Michael Grüter and Jürgen Jost
- R15 Ultracontractivity and the Heat Kernel for Schrodinger Operators and Dirichlet Laplacians, E.B. Davies and B. Simon
- R16 The First Initial-Boundary Value Problem for Quasilinear Second Order Parabolic Equations, Gary M. Lieberman
- R17 On the Existence of Nonorientable Harmonic Maps from a Surface into the Real Projective Plane, Jürgen Jost
- R18 Ricci Deformation of the metric on Riemannian manifolds of restricted positive curvature, Gerhard Huisken
- R19 On the Solution of Toeplitz Systems of Equations, Frank de Hoog
- R20 Existence of Slow Steady Flows of Viscoelastic Fluids with Differential Constitutive Equations, Michael Renardy
- R21 On Embedded Minimal Disks in Convex Bodies, Michael Gruter and Jürgen Jost
- R22 An Alternative Proof of Coifman-McIntosh-Meyer's Theorem on the Cauchy Integral, Guy David
- R23 Linear Oblique Derivative Problems for the Uniformly Elliptic Bellman Equation, Neil S. Trudinger and P. Lions
- R24 Nonlinear Oblique Boundary Value Problems for Nonlinear Elliptic Equations, Neil S. Trudinger and G.M. Lieberman
- R25 On an Interpolation Inequality and its Applications to Nonlinear Elliptic Equations, Neil S. Trudinger
- R26 On the Homogenization of Quasilinear Divergence Structure Operators, N. Fusco and G. MoscarIELlo
- R27 On the Classification of Harmonic Morphisms with totally Geodesic Fibres from an Open Subset of Euclidean Space onto a Riemann Surface, Paul Baird
- R28 Measures of Information in Linear Ill-Posed Problems, Gary Newsam
- R29 Parallel Solution of Certain Toeplitz Least Squares Problems, A.W. Bojańczyk and R.P. Brent
- R30 The Concavity of solutions of $-\Delta u = u^r$, Grant Keady
- R31 The Solution of Singular Value Problems Using Systolic Arrays, Richard Brent and Frank Luk

- R32 Federer's Theorem, Martin Ross
- R33 Efficient Implementation of the First-Fit Strategy for
Dynamic Storage Allocation, Richard Brent
- R34 Harmonic Maps and Uniqueness of the Kerr-Newman Black Hole,
Gary Bunting
- R35 $W^{2,p}$ Regularity for Varifolds with Mean Curvature, John P.
Duggan
- R36 Regularity Theorems for Varifolds with Mean Curvature,
John P. Duggan
- R37 Dynamic Storage Allocation on a Computer with Virtual
Memory, Richard Brent
- R38 Regularity of Solutions of Fully Nonlinear Elliptic
Equations II, Neil S. Trudinger
- R39 Trends Towards Monopoly in the New Zealand Commercial Stock,
G.N. Newsam
- R40 Counterexamples to Some Conjectures on the Numbers of
Solutions of Nonlinear Equations, Norm Dancer
- R41 Isolated Singularities of Extrema of Geometric Variational
Problems, Leon Simon
- R42 Area Minimizing Hypersurfaces with Isolated Singularities,
Robert Hardt and Leon Simon
- R43 Contracting Convex Hypersurfaces in Riemannian Manifolds
by their Mean Curvature, Gerhard Huisken
- R44 Harnack Inequalities for Parabolic Equations in General
Form with Bounded Measurable Coefficients, S.J. Reye
- R45 Solution of the Minimal Surface Equation continuous and
discontinuous at the Boundary, Graham Williams
- R46 The Generalized Dirichlet Problem for Equations of Monge-
Ampère Type, John I.E. Urbas
- R47 A Feedback Finite Element Method with a Posteriori Error
Estimation Part I: The Finite Element Method and some
Basic Properties of the A Posteriori Error Estimator,
I. Babuška and A. Miller
- R48 Perturbation of a multiple eigenvalue in the Bénard Problem
for two Fluid Layers, Yuriko Renardy and Michael Renardy

- R49 $C^{1,\alpha}$ Multiple Function Regularity and Tangent Cone Behaviour
for Varifolds with Second Fundamental Form in L^p ,
J.E. Hutchinson
- R50 On the Number of Positive Solutions of Weakly Nonlinear
Elliptic Equations when a Parameter is large, E.N. Dancer
- R51 Asymptotic Behaviour of Minimal Submanifolds and Harmonic
Maps, Leon Simon
- R52 Asymptotic Behaviour of Minimal Graphs over Exterior Domains,
Leon Simon

PUBLICATIONS, 1984

1. BABUSKA, I. (with V. Majer) The Factorization Method for Two point Boundary Value Problems for ODE's and its relation to the finite difference method, 7(1984) 71-92, Proc. Centre for Math. An., Aust. Nat. Univ.
2. BAIRD, P., Harmonic morphisms onto Riemann surfaces - some classification results, 8(1984) 91-100, Proc. Centre for Math. An., Aust. Nat. Univ.
3. BOJAŃCZYK, A.W., Complexity of solving linear systems in different models of computation, 21(1984) 591-603, Siam. J. Numer. Anal.
4. BOJAŃCZYK, A.W., Solution of dense systems of linear equations using a fixed size systolic array, 6(1984) 22-37, Proc. Centre for Math. An., Aust. Nat. Univ.
5. BOJAŃCZYK, A.W. (with R.P. Brent and H.T. Kung) Numerically stable solution of dense systems of linear equations using mesh-connected processors, 5(1984) 95-104, SIAM J. Sci. Stat. Comp.
6. BOLEY, D.L. (with G.H. Golub) The Lanczos-Arnoldi algorithm and controllability, 4(1984) 317-324, Systems and Control Letters.
7. BRENT, R.P. (with F.T. Luk) The solution of singular-value and eigenvalue problems on systolic arrays 6(1984) 38-64, Proc. Centre for Math. An., Aust. Nat. Univ.
8. BRENT, R.P. (with F.T. Luk) The solution of singular-value problems using systolic arrays, 495(1984) 6pp. Proc. SPIE, Real time Signal Processing VII, Society of Photo-Optical Instrumentation Engineers, Bellingham, Washington.
9. BRENT, R.P. (with L.M. Goldschlager) A parallel algorithm for context-free parsing 6(1984), Proc. Seventh Aust. Comp. Sci. Conf., Aust. Comp. Sci. Comm.
10. BRENT, R.P. (with H.T. Kung) Systolic VLSI arrays for polynomial GCD computation, C-33(1984) 731-736, IEEE Transactions on Computers.
11. CAREY, G.F., Nonconforming Elements, Patch Tests and Inter-Element Constraints 7(1984) 138-149, Proc. Centre for Math. An., Aust. Nat. Univ.
12. CHANDLER, G.A., Numerical analysis of the boundary integral method, 6(1984) 211-230, Proc. Centre for Math. An., Aust. Nat. Univ.
13. CHANDLER, G.A., The Boundary Integral Method for PDE's, 7(1984) 178-196, Proc. Centre for Math. An., Aust. Nat. Univ.
14. DANCER, E.N., Morse inequalities and estimates for the number of solutions of nonlinear equations, 8(1984) 1-13, Proc. Centre for Math. An., Aust. Nat. Univ.

15. DAVIS, C., Dilations preserving a bound on the norm of an operator, 5(1984) 3-14, Proc. Centre for Math. An., Aust. Nat. Univ.
16. DUGGAN, J., $W^{2,p}$ regularity for varifolds with mean curvature, 8(1984) 101-106, Proc. Centre for Math. An., Aust. Nat. Univ.
17. FUSCO, N., Minimum problems for nonconvex integrals, 8(1984) 14-28, Proc. Centre for Math. An., Aust. Nat. Univ.
18. FUSCO, N. (with G. Mosciarello) An application of quality to homogenization of integral functionals (1984) Mem. Acc. dei Lincei.
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