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THE AUSTRALIAN NATIONAL UNIVERSITY
CENTRE FOR MATHEMATICAL ANALYSIS
ANNUAL REPORT, 1983

The Centre for Mathematical Analysis completed its first full year of operation in 1983. By all accounts, the year was very successful with a formidable body of research produced. The level and quality of research activity compared favourably with the major new mathematical research institutes at Berkeley and Minneapolis in the United States, which enjoy much greater financial support. At the same time, the Centre achieved a significant international reputation and its activities, adjoined to those already in existence at the Australian National University, appear to have established Canberra as one of the world's foremost mathematical centres. A description of research carried out in 1983, including some major discoveries, is given 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 programme 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. Professor McIntosh also served as Acting Director during the Director's Outside Studies Programme in the second half of 1983.

Staffing matters

Professor R.P. Brent commenced a period of secondment from the Computer Science department in July and Professor L.M. Simon was seconded from the Research School of Physical Sciences on a half time basis from July until December. Dr. A.D. Miller from the University of Maryland, was appointed as a Research Fellow in July. One year Post-doctoral Fellowships were taken up by Dr. M. Krbec from the Czechoslovak Academy of Science, in January, Dr. G. Huisken from the University of Heidelberg in March, Dr. A. Bojańczyk from the University of Warsaw in May, Dr. P. Baird from the Massachusetts Institute of Technology in August and Dr. K. Ecker, already a Visiting

2.

Fellow in the Centre in August. Dr. R.S. Womersley, a Research Fellow funded through the Research School of Physical Sciences, was associated with the Centre from July. Extended Visiting Fellowship appointments were taken up by Dr. G. Bunting from the University of New England in July, Dr. M. Grüter from the University of Düsseldorf in September and by Dr. J. Jost from the University of Bonn in September.

Dr. B.R.F. Jefferies completed his appointment as Research Assistant in August. The Centre secretary, Ms. L.M. Mazanov resigned to join the C.S.I.R.O. in March and was replaced by Mrs. M.G. Gray. In addition Mrs. D.M. Nash was appointed as a part time typist.

The Centre benefited greatly through the participation of various short term Visiting Fellows. A list of staff and visiting fellows in 1983 is attached.

Research activities

The research of the Centre can be divided into two interwoven areas: (i) theoretical mathematics with emphasis on partial differential equations; (ii) computational and applied mathematics. The research of the Centre is also reflected in that of members of its advisory group which is also taken account of below.

(i) Theoretical mathematics

Professor Trudinger continued his research into fully nonlinear elliptic equations completing work on interior regularity [Research Report R19] and joint work with a graduate student, J. Urbas, on the equation of prescribed Gauss curvature [Reports R21, R28, R46]. Research was also successfully completed on nonlinear boundary value problems for such equations including joint work with P.L. Lions, of the University of Paris, on the Bellman equations of stochastic control theory (to appear in 1984), and with G.A. Lieberman, of Iowa State University, on general boundary value problems which included as a special case, boundary conditions of capillarity type (to appear 1984). In addition, in collaboration with E. Di Benedetto, of Indiana University, he resolved an outstanding problem concerning quasi-minima in the calculus of variations [Report R47].

Professor Simon concentrated his research activities on the study of certain partial differential equations aspects of geometric variational problems. Research begun in 1982, on asymptotic behaviour of solutions to elliptic evolution equations was completed and applied to settle some open questions concerning asymptotic behaviour of minimal surfaces and harmonic maps near isolated singularities [Reports R05, R23]. By further development

3.

he succeeded in obtaining the first estimates for asymptotic behaviour of solutions of the minimal surface equation, and produced many new examples of nonlinear entire solutions.

Professor McIntosh continued work on the boundedness of singular integral operators arising in partial differential equations and partially solved a longstanding problem (the "Kato problem") concerning the square roots of elliptic partial differential operators [Report R53].

Dr. Williams considered various aspects of the Dirichlet problem for the minimal surface equation, obtaining optimal conditions for solvability in different cases [Reports R18, R34, R41].

Dr. Baird worked on the relationship between harmonic maps and Hamiltonian mechanics. He also developed a theory of Gauss maps of submersions [Report R38] and succeeded in completely classifying a certain class of harmonic morphisms (to appear 1984).

Dr. Ecker continued to study the application of non-linear partial differential equations to Lorentzian geometry and produced results on the isolated singularities of maximal hypersurfaces in Lorentzian space [Report R40].

Dr. Huisken continued work on capillary surfaces, and established the existence of local minima of the energy functional for pendent drops, [Reports R07, R08 and R22]. He also began work on a fundamental problem concerning the deformation of convex surfaces along their mean curvature vector, which was partially solved (to appear 1984).**

Dr. Krbeč concentrated on the study of spaces of Sobolev and Sobolev-Orlicz type, used in partial differential equations and established results concerning traces, imbeddings and interpolation [Reports R17, R53].

Dr. Bunting worked on various problems for Einstein's equations in general relativity related to non-rotating stellar models and black holes, extending his previous work on uniqueness for black holes in the presence of non-gravitational fields.

Dr. Grüter continued previous work on free boundary problems for minimal surfaces improving previous results and, in joint work with J. Jost considered also free boundary behaviour for varifolds. Dr. Jost developed a global variational technique to prove the existence of conformal mappings and applied it to treat the classical Plateau problem for minimal surfaces of higher topological type [Report R44].

** This problem was completely solved by Huisken early in 1984

Dr. Jefferies continued work on operator measures and abstract evolution processes [Reports R13, R14, R20].

Substantial contribution to the Centre's research were also made by short term visitors, some of which is described in the research reports [Reports R04, R16, R27, R33, R48, R49].

(ii) Computational and Applied Mathematics

Professor Brent worked mainly on parallel algorithms for computational problems in numerical linear algebra including joint research with Visiting Fellows, F. Luk (Cornell) and D. Boley (Minnesota) on Toeplitz systems, unsymmetric eigenvalue problems and generalized singular value problems [Reports R01, R31, R45, R51]. He also developed VLSI design tools on the Univac 1100/82 computer and the Centre's Tektronix 4113A display, and used these to complete the design and simulation of a systolic integer GCD cell using nMOS technology. The cell has been fabricated in a multiproject chip and will be tested early in 1984.

Dr. Miller continued work on the finite element method including the transferring of a stress analysis program called FEARS, which he had helped to develop at the University of Maryland, to the Australian National University computer. In cooperation with Dr. R.S. Anderssen and Dr. F. de Hoog, he commenced an investigation of numerical models for solidification in foundry castings, using the Centre's Tektronix display for simulation.

Dr. Bojańczyk worked on systolic algorithms and their complexity, partly in collaboration with Professor Brent and was successful in improving previous algorithms [Reports R43, R45].

Dr. Gustafson completed his analysis of a large geo-magnetic database to determine electrical conductivity in the earth. He also continued work on mathematical programming, convergence acceleration and control theory, including application to groundwater pollution and economic models [Reports R06, R10, R37, R50].

Dr. Womersley continued work in numerical optimization, deriving a finite algorithm for the solution of a nonsmooth optimization problem occurring in Econometrics [Reports R42].

5.

Dr. Anderssen was involved in the analysis of geo-magnetic data and indirect measurements with Gustafson and finite difference methods for numerical differentiation with Dr. de Hoog. Dr. de Hoog also collaborated with Visiting Fellow, R. Weiss in work on numerical methods for differential equations with singularities [Report R11].

Additional computational research, carried out by short term visitors, is covered in the Research Reports [Reports R02, R09, R15, R24, R25, R29, R30].

Conference and Travel

Members of the Centre attended the Summer Research Institute of the Australian Mathematical Society in Canberra in January, the Annual Meeting of the Division of Applied Mathematics in Perth in February, the Annual General Meeting of the Society in Brisbane in May and the Conference on Computational Techniques and Applications in Sydney in August.

In addition, Professor N.S. Trudinger gave a series of lectures at the Summer Research Institute and a lecture at the University of Wollongong in April. In conjunction with an Outside Studies Programme he spent the months of July and August jointly at Stanford University and the new Mathematical Sciences Research Centre at Berkeley and the period from September to December as a Resident Fellow at the Institute of Advanced Studies of Indiana University. As well as some advanced lectures at Stanford and Indiana, he gave invited addresses at the American Mathematical Society Summer Research Institute on Nonlinear Functional Analysis in Berkeley in July [Report R46] and the Midwestern Conference on Partial Differential Equations at Purdue in October as well as invited lectures at the Universities of Chicago, Maryland, Pennsylvania, Kentucky, Montreal, Northwestern University and the Courant Institute.

Professor Brent gave a paper at the VLSI Conference in Norway in August, attended a workshop on PDE software in Sweden in August and was an invited speaker at the World Computer Conference in Paris in September.

Professor Simon gave invited addresses at the American Mathematical Society Summer Research Institute in Berkeley and the International Congress of Mathematicians in Warsaw in September [Report R36], as well as a seminar at the University of Heidelberg.

Professor McIntosh delivered an invited lecture at the Annual General Meeting of the Australian Mathematical Society and attended the International Congress of Mathematicians. In addition, he gave invited talks at the Technical University, Berlin, the Mathematical Institute, Prague, the Indian Statistical Institute, Delhi and the Tata Institute of Mathematical Sciences, Bombay.

Dr. Miller, Dr. Gustafson and Dr. Womersley all presented talks at the Conference on Computational Techniques. Dr. Gustafson also gave seminar talks at the James Cook University, Townsville, Capricornia Institute, Rockhampton, Griffith University and the Universities of Queensland, New South Wales, Wollongong, Melbourne and Adelaide. Dr. Krbec gave invited seminars at Flinders University, and the Universities of New England and Queensland.

Many of the Centre's short term Visiting Fellows also visited other Australian universities to deliver seminars or colloquia.

The Centre sponsored two conferences at Canberra during the year which were well attended by mathematicians from around Australia. Professor McIntosh and Dr. Jefferies organized a Miniconference on "Operator Theory and Partial Differential Equations" in July, and Dr. Gustafson (with Dr. Anderssen) a Numerical Analysis Workshop in December. The proceedings of these meetings will be published by the Centre in 1984.

Seminar Activity

The main Centre seminar activity was the Colloquium; the programme for 1983 is attached. In addition regular weekly seminars on Numerical Analysis, Functional Analysis and Analytic Methods in Geometry were organized.

Publications

The Centre produced 54 Research Reports and two volumes of its Proceedings in 1983. Details are attached as well as references to other staff publications which appeared in 1983. These include the expanded second edition of the book "Elliptic partial differential equations of second order" written by Professor N.S. Trudinger (in collaboration with Professor D. Gilbarg of Stanford University). (Publication 17) The publisher's announcement referred to the first edition as "already practically a classic". Books were also published by Dr. P. Baird and S. Gustafson. (Publications 1 and 7) All research reports should appear as publications in 1984 or 1985.

Honours

Professor Simon was elected a Fellow of the Academy of Science (FAA) and awarded the Third Australian Mathematical Society Medal. (The First Medal was awarded to Professor Trudinger in 1981).

Other activities

Professor Trudinger was appointed to the Editorial Board of a new French journal, Annales de L'Institut Henri Poincaré Analyse Nonlineaire. Professor Brent served as an Associate Editor of the journal, Numerische Mathematik and was Secretary to the Australian Society of Professors of Computer Science. Professor Simon was a Council member of the Australian Mathematical Society.

Facilities

A small extension to the Hanna-Neumann building, consisting of five offices and one seminar room was completed in June. This, in addition to the subdivision of a smaller seminar room within the building, yielded seven new offices which were desperately needed to cater for an influx of new Centre personnel in the second half of 1983. The Centre was honoured by the presence of the Minister for Education and Youth Affairs, Senator S.M. Ryan, at the launching of the new extension.

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.
Professors	R.P. Brent, M.S., Ph.D. (Stan.), D.Sc. (Monash), F.A.A. L.M. Simon, B.Sc. Ph.D. (Adel.), 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.(Mel) 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) K.Ecker, Dipl.Math., Dr.Rer.Nat.(Heidelberg) G. Huiskens, Dipl.Math., Dr.Rer.Nat.(Heidelberg) M. Krbec, R.N.Dr.(Charles), C.Sc. (Czech. Acad.Sc.)
Visiting Fellows *	G. Bunting, B.Sc.(Qld), B.Sc.Hons.(Monash), Ph.D.(N.E.) 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)
Research Assistant	B.R.F. Jefferies, B.Sc.(Qld), Ph.D.(Flinders)
Secretary	M.G. Gray
Typist	D. Nash

VISITING FELLOWS*(Short term)

Dr G. Chandler, University of Queensland
 Professor P.L. Lions, University of Paris
 Professor R. Weiss, Technical University of Vienna
 Professor C. Gerhardt, University of Heidelberg
 Professor G. Strang, Massachusetts Institute of Technology
 Professor E. Giusti, University of Florence
 Dr. S. Chow, Australian National University
 Dr. D. Boley, University of Minnesota
 Professor C. Davis, University of Toronto

VISITING FELLOWS (Short term)

Professor J. Gani, University of Kentucky

Professor G. Geymonat, University of Turin

Dr. F. Luk, Cornell University

Professor B. Simon, California Institute of Technology

Professor A. Torchinsky, Indiana University

Professor F. Stummel, University of Frankfurt

Professor A. Mitchell, University of Dundee

Professor C. Kenig, University of Minnesota

Dr. G. Verchota, California Institute of Technology

Professor R. Lapwood, Emmanuel College, Cambridge

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

COLLOQUIA 1983

- January 12 Dr. A. Miller (University of Maryland)
"Some aspects of adaptivity in the finite element method"
- January 26 Dr. G.A. Chandler (University of Queensland)
"Galerkin's method for boundary integral equations on polygonal domains"
- February 2 Professor Donald S. Cohen (Caltech)
"New problems in nonlinear parabolic equations - travelling waves and diffusive penetrant fronts in a system with an evolving diffusion coefficient"
- February 17 Dr. G. Alistair Watson (University of Dundee)
"The total approximation problem"
- February 23 Professor Frank W.J. Olver (University of Maryland)
"Floating-point error analysis"
- February 24 Professor Richard Weiss (Technical University, Vienna)
"Symmetric difference schemes for singularly perturbed boundary value problems"
- March 3 Professor T. Husain (McMaster University, Canada)
"On some sequential properties of topological algebras"
- March 17 Dr. M. Krbeć (Centre for Mathematical Analysis, ANU)
"Ranges of nonlinear operators"
- March 24 Dr. S-Å. Gustafson (Centre for Mathematical Analysis, ANU)
"Stability of functionals determined by moment conditions"
- April 7 Professor G. Strang (M.I.T.)
"Nonconvex variational problems and their applications"
- April 14 Professor L. Simon (Dept. of Mathematics, RSPHys., ANU)
"A 2-Dimensional Geometric Variational Problem"
- April 21 Professor A. McIntosh (Centre for Mathematical Analysis, ANU)
"Square Roots of Operators and Applications to Hyperbolic P.D.E.'s".
- April 28 Dr. K. Ecker (Centre for Mathematical Analysis, ANU)
"Isolated singularities of Maximal Space-like Hyper-surfaces in Lorentzian Manifolds"
- May 5 Professor V. Thomée (Chalmers University of Technology, Göteborg, Sweden)
"Galerkin Methods for Singular Boundary Value Problems in One Space Dimension"
- May 11 Professor Ulrich Hornung (University of Münster, Germany)
"Existence Theorems for Nonlinear Variational Inequalities of Evolution".

- May 12 Professor Andrew Odlyzko (Bells Labs., NJ, U.S.A.)
"New Algorithms for Computing $\pi(x)$ "
- May 24 Dr. Neil Watson (University of Canterbury, Christchurch, N.Z.)
"The Initial Distribution Problem for Parabolic Equations"
- May 25 Professor Enrico Giusti (University of Florence)
"Regularity of Minima of Variational Integrals"
- May 26 Professor David Zachman (Colorado State University)
"Population Dynamics with Cannibalism"
- June 2 Professor Heinz Bauer (Erlange, West Germany)
"Some Aspects of Modern Potential Theory"
- June 9 Professor Joe Taylor (University of Utah)
"Spectral Theory in Several Variables"
- June 16 Dr. S-A. Gustafson (Centre for Mathematical Analysis, ANU)
"Semi-infinite Programming"
- June 21 Professor R. Vyborny (University of Queensland)
"Minimisation Problems for Implicit Functionals Defined by Equations of Liver Kinetics"
- June 23 Dr. Gerhard Huisken (Centre for Mathematical Analysis, ANU)
"Pendent Drops in a Capillary Tube"
- June 30 Dr. R.S. Anderssen (CSIRO, Division of Maths and Statistics)
"Linear Functionals of the Foliage Angle Distribution"
- July 7 Professor Derek Robinson, (Maths Dept., I.A.S., A.N.U.)
"On Derivations and Dissipations"
- July 11 Professor F.T. Luk (Cornell University)
"A Systolic Array for the Linear-Time Solution of Toeplitz Systems of Equations"
- July 14 Dr. D. Boley (University of Minnesota)
"When is a System Almost Controllable"
- July 20 Dr. I. Sloan (University of New South Wales)
"The Approximate Solution of Wiener-Hopf Integral Equations"
- July 27 Professor G. Geymonat (University of Turin)
"An Application of Singularity Theory to Bifurcation"
- July 28 Professor A. Torchinsky (Indiana University)
"Hardy H^p spaces, $0 < p \leq 1$ "
- August 3 Professor C. Davis (University of Toronto)
"Perturbation of spectrum of a selfadjoint operator"
- August 11 Professor B. Simon (California Institute of Technology)
"Instantons, Double Wells and Large Deviations"
- August 18 Professor J. Gani (University of Kentucky)
"The Survival of Susceptibles in an Epidemic"

- August 25 Professor P. Rabinowitz (The Weizmann Institute of Science, Israel)
"Rates of Convergence of Gaussian Quadrature for Singular Integrands"
- September 1 Dr. George Rozvany (Monash University)
"Optimal Layout Theory in Structural Mechanics"
- September 8 Dr. Paul Baird (Centre for Mathematical Analysis, ANU)
"Constructing Harmonic Maps into Spheres"
- September 15 Professor F. Stummel (J.W.Goethe Universität, Frankfurt)
"Nonconforming Finite Element Methods and Related Approximation Methods"
- September 22 Dr. M. Grüter (Universität Düsseldorf)
"Regularity Results for Minimal Surfaces and Surfaces of Bounded Mean Curvature"
- September 29 Professor Alan McIntosh (Centre for Mathematical Analysis, ANU)
"Recent Results on Singular Integral Operators"
- October 6 Dr. Graham Williams (Centre for Mathematical Analysis, ANU)
"Minimal Surface Equation with Lipschitz Boundary Data"
- October 10 Dr. C.J. Smyth (James Cook University)
"An Application of Semi-Infinite Programming to a Problem in Number Theory"
- October 13 Dr. A. Bojańczyk (Centre for Mathematical Analysis, ANU)
"Complexity of Solving an $n \times n$ System of Linear Equations in Different Models of Computation"
- October 20 Dr. A.D. Miller (Centre for Mathematical Analysis, ANU)
"A Class of a Posteriori Error Estimates in the Finite Element Method"
- October 27 Professor Leon Simon (Centre for Mathematical Analysis, ANU)
"Qualitative Behaviour of Solutions of the Minimal Surface Equation"
- November 4 Dr. K. Ecker (Centre for Mathematical Analysis, ANU)
"Area-Maximising Hypersurfaces in Minkowski Space having an Isolated Singularity"
- November 10 Dr. P.C. Chatwin (University of Liverpool)
"Mathematical Models of Heavy Gas Dispersion"
- November 17 Dr. J. Hutchinson (Department of Mathematics, ANU)
" k -dimensional surfaces minimizing mass or curvature"
- November 24 Professor C. Kenig (University of Minnesota)
"Multilinear Singular Integrals and Partial Differential Equations"

- December 1 Dr. G. Verchota (California Institute of Technology)
"Integral Inequalities, Layer Potentials, and Harmonic
Functions in Lipschitz Domains"
- December 14 Dr. G. Huisken (Centre for Mathematical Analysis, ANU)
"On the deformation of convex surfaces in direction of
their mean curvature vector"
- December 15 Professor R.P. Brent (Centre for Mathematical Analysis, ANU)
"A Parallel Algorithm for Context-Free Parsing"

OFFICIAL PUBLICATIONS 1983

PROCEEDINGS

Vol. 3 Lectures on Geometric Measure Theory, Leon Simon

Vol. 4 Harmonic Mappings Between Riemannian Manifolds,
Jürgen Jost

RESEARCH REPORTS

- R01 Some linear-time algorithms for systolic arrays, R.P. Brent,
H.T. Kung and F.T. Luk
- R02 Instability of difference models for hyperbolic initial boundary
value problems, Lloyd Trefethen
- R03 Cylindrical probabilities and the differentiation of vector
measures, Brian Jefferies
- R04 Uniqueness, symmetry and embeddedness of minimal surfaces,
Richard Schoen
- R05 Asymptotics for a class of non-linear evolution equations with
applications to geometric problems, Leon Simon
- R06 H-sets, convex programming and constrained approximation,
M. Brannigan and S-Å. Gustafson
- R07 Capillary Surfaces in Negative Gravitational Fields, Gerhard Huisken
- R08 Capillary Surfaces over Obstacles, Gerhard Huisken
- R09 The Polyconvexification of $F(\nabla u)$, Gilbert Strang
- R10 Stability of functionals determined by moment conditions, S-Å. Gustafson
- R11 On the Asymptotic Expansions of Numerical Solutions to Second Order
Differential Equations with a Singularity of the First Kind,
F. de Hoog and Richard Weiss
- R12 Conditional Expectation for Operator-Valued Measures and functions,
Brian Jefferies
- R13 Evolution Processes and the Feynman-Kac Formula I, Brian Jefferies
- R14 Radon Polymeasures, Brian Jefferies

- R15 Superconvergent Approximations to the Solution of a Boundary Integral Equation on Polygonal Domains, G.A. Chandler
- R16 Boundary $C^{1,\infty}$ Regularity for Second-Order Quasilinear Elliptic Equations in Divergence Form, M. Giaquinta and E. Giusti
- R17 The Sobolev-Orlicz Trace Spaces, Miroslav Krbeč
- R18 Boundary Regularity of Solutions of the Non-parametric Least Area Problem, Graham Williams
- R19 Regularity of Solutions of Fully Nonlinear Elliptic Equations, Neil S. Trudinger
- R20 The Variation of Vector Measures and Cylindrical Concentration, Brian Jefferies
- R21 The Dirichlet Problem for the Equation of Prescribed Gauss Curvature, Neil S. Trudinger and John Urbas
- R22 On Pendent Drops in a Capillary Tube, Gerhard Huisken
- R23 Minimal Surfaces with Isolated Singularities, Luis Caffarelli, Robert Hardt and Leon Simon
- R24 Finite Element Error Estimation for Non-linear Elliptic Problems I, S.-S. Chow
- R25 Some Aspects of Finite Element Approximation Theory for Strongly Nonlinear Problems, S.-S. Chow
- R26 An Interior Gradient Bound for Solutions of Equations of Capillary Type, Klaus Ecker
- R27 On a Mixed Free-Boundary Value Problem which arises in the Study of Flows under Thin Bodies, A.J. Pryde and John van der Hoek
- R28 The Equation of Prescribed Gauss Curvature without Boundary Conditions, John Urbas
- R29 Finite Element Analysis of a Three Dimensional Magnetostatic Field Distribution Problem, S.-S. Chow
- R30 The Lanczos Algorithm and Controllability, Dan L. Boley and G.H. Golub
- R31 Computation of the Generalized Singular Value Decomposition Using Mesh-Connected Processors, Richard Brent, Franklin Luk and Charles Van Loan
- R32 Adaptive Techniques in Finite Element Analysis, A.D. Miller
- R33 Existence of maximal surfaces in asymptotically flat spacetimes, Robert Bartnik
- R34 The Dirichlet Problem for the Minimal Surface Equation with Small Lipschitz Boundary Data, Graham Williams

- R35 Optimal Asynchronous Newton Method for the Solution of Nonlinear Equations, A. Bojańczyk
- R36 Recent developments in the theory of minimal surfaces, Leon Simon
- R37 Linear Models for Managing Sources of Groundwater Pollution, Steven Gorelick and Sven-Åke Gustafson
- R38 The Gauss Map of a Submersion, Paul Baird
- R39 Finite Difference Methods for the Numerical Differentiation of Non-exact Data, R.A. Anderssen and F. de Hoog
- R40 Area Maximizing Hypersurfaces in Minkowski Space Having an Isolated Singularity, Klaus Ecker
- R41 The Dirichlet problem for the Minimal Surface equation with Lipschitz Continuous Boundary Data, Graham Williams
- R42 Censored ℓ_1 Approximation, Robert Womersley
- R43 Complexity of Solving Linear Systems in Different Models of Computation, A. Bojańczyk
- R44 Conformal Mappings and the Plateau-Douglas Problem, Jurgen Jost
- R45 Tridiagonalization of a Symmetric Matrix on a Square Array of Mesh Connected Processors, A. Bojańczyk and R.P. Brent
- R46 Graphs with Prescribed Curvature, Neil S. Trudinger
- R47 Harnack inequality for Quasi-Minima of Variational Integrals, E. Di Benedetto and Neil S. Trudinger
- R48 Holonomy, The Quantum Adiabatic Theorem and Berry's Phase, Barry Simon
- R49 Ultracontractive Semigroups and Some Problems in Analysis, E.D. Davies and Barry Simon
- R50 On the Stability of a Class of Convergence Acceleration Methods for Power Series, Sven-Åke Gustafson
- R51 A Parallel Algorithm for Context-Free Parsing, R.P. Brent and Leslie M. Goldschlager
- R52 Generalised Second Fundamental Form and the Existence of Surfaces Minimising Curvature, John E. Hutchinson
- R53 Square Roots of Elliptic Operators, Alan McIntosh
- R54 Some Imbedding Theorems for Anisotropic Sobolev Spaces, Miroslav Krbec

STAFF PUBLICATIONS, 1983

1. BAIRD, P., Harmonic maps with symmetry, harmonic morphisms and deformations of metrics. Pitman Press Ltd. Boston - London - Melbourne, 1983.
2. BRENT, R.P. (with F.T. Luk), Computing the Cholesky factorization using a systolic architecture, Proceedings of the Sixth Australian Computer Science Conference, special issue of Australian Computer Science Communications 5 (1983), 295-302.
3. BRENT, R.P. (with F.T. Luk), A systolic array for the linear-time solution of Toeplitz systems of equations, J. of VLSI and Computer Systems 1 (1983), 1-23.
4. BRENT, R.P. (with H.T. Kung and F.T. Luk), Some linear-time algorithms for systolic arrays, in Information Processing 83 (edited by R.E.A. Mason), North-Holland, Amsterdam, 1983, 865-876.
5. BRENT, R.P. (with H.T. Kung), Systolic VLSI arrays for linear-time GCD computation, in VLSI 83 (edited by F. Anceau & E.J. Aas), North-Holland, Amsterdam, 1983, 145-154.
6. BRENT, R.P. (with F.T. Luk and C. van Loan), Computation of the generalized singular value decomposition using mesh-connected processors, Proceedings SPIE Vol. 431, Real Time Signal Processing VI, Society of Photo-Optical Instrumentation Engineers, Bellingham, Washington, 1983, 431-09.
7. GUSTAFSON, S.-A. (with K. Glaushoff), Linear Optimization and Appreciation, Springer-Verlag, Berlin-Heidelberg-NewYork, 1983.
8. HUISKEN, G., On pendent drops in a capillary tube. Bull. Aust. Math.Soc., 28, (1983), 343-354.
9. KRBEC, M., Modular interpolation spaces II. Functionnes et Approximation. (Poznan) 1983.
10. McINTOSH, A.G.R. (with R. Coifman and Y. Meyer) Estimations L^2 pour les Noyaux Singulièrs, Conference on Harmonic Analysis in Honor of Antoni Zygmund, edited by Beckner, Calderón, Fefferman and Jones, Wadsworth Mathematical Series, 1983.
11. McINTOSH, A.G.R. (with R. Bhatia and C. Davis) Perturbation of spectral subspaces of normal operators, Linear Algebra and its Applications, 52/53 (1983) 45-67.

12. SIMON, L., Asymptotics for a class of evolution equations, with applications to geometric problems. Annals of Math. 118 (1983) 520-567.
13. SIMON, L., Survey lectures on Minimal Submanifolds. Annals of Math. Studies 103 (1983).
14. SIMON, L. (with R. Schoen), Regularity of simply connected surfaces with quasiconformal Gauss map. Annals of Math. Studies 103 (1983)
15. TRUDINGER, N.S., Fully nonlinear uniformly elliptic equations under natural structure conditions, Trans. Amer. Math. Soc. 278 (1983), 751-769.
16. TRUDINGER, N.S. (with J.I.E. Urbas), The Dirichlet problem for the equation of prescribed Gauss curvature. Bull. Aust.Math.Soc. 28 (1983) 217-231.
17. TRUDINGER, N.S. (with D. Gilbarg), Elliptic Partial Differential Equations of Second Order, Second Edition. Springer-Verlag, Berlin-Heidelberg-New York, 1983.