

CENTRE FOR MATHEMATICS
AND ITS APPLICATIONS
AUSTRALIAN NATIONAL UNIVERSITY

ANNUAL REPORT 1992

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AUSTRALIAN NATIONAL UNIVERSITY

Centre For Mathematics and its Applications

School of Mathematical Sciences

Annual Report, 1992

CENTRE FOR MATHEMATICS AND ITS APPLICATIONS

1. STAFF

FACULTIES COMPONENT:

Professor & Director

N.S. Trudinger, BSc(NE), MS, PhD(Stanford), FAA

Professor

P.G. Hall, BSc(Syd), DPhil Oxf, MSc, FAA

Research Fellows

G. Latham, BEng, BSc(Qld), PhD(California), MSc

B. LeMesurier, MS, PhD(New York), BSc,

W. Simon, PhD(Vienna)

Postdoctoral Fellow

T. Cranny, BSc, PhD(Qld)

ARC Senior Research Fellow

M. Aitkin, BSc(Syd), PhD(Syd)

ARC Research Fellows

S. Scott, PhD(Adelaide), BSc(Monash)

K.-A. Do, BSc(Qld), MS, PhD(Stanford)

ARC Senior Research Associate

P. Chrusciel, MSc(Warsaw), PhD(Polish Acad Sciences)

ARC Research Associates

S. Altschuler, BA(Pennsyl), MS, PhD(California)

G. Gregori, MS, PhD(Stanford)

B.-Y. Jing, BSc(Lanzhou), MSc(UTS), PhD(Sydney)

A. Isaev, BSc, MSc, PhD(Moscow)

P. Patil, BS, MSc, M.Phil(Poona), MS(Ohio), PhD(North Carolina)

Visiting Fellows

A. Rejali, PhD(Stanford), BSc, MSc(Shiraz)

M. Tingley, BA(Adelaide), MA, PhD(Dalhousie), MAT,
MS(Michigan State)

D. Tingley, BS, MA(Dalhousie), MS, PhD(Michigan)

INSTITUTE COMPONENT:

Professors

R.W. Richardson, BSc(Louisiana State), PhD(Michigan), FAA
D.W. Robinson, MA, DPhil (Oxford), FAA

Senior Fellow

S. Wilson, BSc(Syd), PhD

Reader

G. Huiskens*, DiplMath, Dr Rer Nat, Habil (Heidelberg)

Fellow

J.I.E. Urbas, BSc, PhD

Research Fellow

A. Wood, BA, DiplMathStat(Camb), PhD(Open)

Postdoctoral Fellows

J. Booth, BSc, MS(Leeds), MS, PhD(Kentucky)
A.F.M. ter Elst, BSc, MSc(Nijmegen), PhD(Eindhoven)
L.-F. Wu, BA(Taiwan Nat), MS, PhD(California)

ADMINISTRATIVE STAFF:

Programmer

D.R.L. Davies*, BSc, MSc

Administrator

M. Gray

Assistant Administrators

J. Smith
S. Eldridge

* Joint with Department of Mathematics.

GRADUATE STUDENTS:

B. Andrews, BSc
G. Chan, BSc(Adel)
S-X Chen, BSc, MSc(Beijing Normal), MS(Victoria)
A. M. Cowling, BSc(Melb), MStat(NSW), MA(Sydney)
B.J.K. Evans, BSc
C.R. Dun, BSc(WA)
G. Fodor, BSc(Budapest)

G.C-I Lim, BSc(Melb)
D-S.I. Mahmood, BSc, MSc(Pakistan), MS(Durham UK)
W. Muller, BSc(Syd), BA, MSc
R.D. Murison, BApSc(DDIAE), MStats(NSW)
M.J. Spillane, BSc(Sydney)

ASSOCIATE MEMBERS

R. S. Anderssen, Division Mathematics & Statistics, CSIRO
R. Bartnik, Mathematics Department, Univ. of NSW
M.N. Barber, Mathematics Department, Faculty of Science
R.P. Brent, Computer Sciences Laboratory, RSPHysSE
F.R. de Hoog, Division Mathematics & Statistics, CSIRO
J. Hutchinson, Mathematics Department, Faculty of Science
A.G.R. McIntosh, School of Maths, Physics, Computing & Electronics,
Macquarie University
S. Roberts, Mathematics Department, Faculty of Science

VISITING FELLOWS * (Short Term)

Akritis, M.	Penn. State Univ.	Feb - Apr
Batty, C.J.K.	Oxford Univ.	Oct - Dec
Bratteli, O.	Univ. of Oslo,	Nov
Brown, P.	Univ. of Liverpool	Jan - Feb
Dutta, J.	Cambridge Univ.	July - Aug
Dzuik, G.	Univ. of Freiburg	Nov
Feuerverger, A.	Univ. of Toronto	August
Haerdle, W	Cath. Louvain Univ.	June - July
Jensen, R.	Loyola Univ.	July - Aug
Jørgensen, P.	Univ. of Iowa	Nov
Krylov, N.	Univ. of Minnesota	Aug - Sept
Lindsay, B.	Pennsylvania State Univ.	July
Mammen, E.	Univ. of Heidelberg	Mar - Apr
Norton, J.P.	Univ. of Birmingham	July-Dec
Pani, A.	Indian Inst. of Tech.	June - July
Parshall, B.	Univ. of Virginia	May - June
Roy, R.	Indian Stat. Inst.	June - July
Seidel, E.	Univ. of Illinois	July - Aug
Sellier, F	Univ. of Nth Carolina	Oct - Dec (stats)
Wolff, R.	Univ. of Glasgow	July - Oct

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

2. GENERAL

2.1 INTRODUCTION

The Centre operated in 1992 on a similar basis to 1991 embracing both Institute and Faculties Components. The Centre published three volumes of its Proceedings, all from conferences held in preceding years, issued sixty eight research reports and ran three conferences and workshops. As in the past lively seminar and colloquia programs flourished and there was considerable interaction with visiting mathematicians and statisticians from Australia and overseas.

Notable achievements included Professor Hall giving the 1992 Mahalanobis Memorial Lectures in India and publication by Springer-Verlag of his monograph entitled "The Bootstrap and Edgeworth Expansion".

2.2 ADMINISTRATION

The Centre is funded jointly by the Faculties (Faculties Component) and the Institute of Advanced Studies (Institute Component) of the Australian National University. The Faculties component is also supported by a grant from the Department of Education, Employment and Training to provide transitional funding for the former Commonwealth Special Research Centre for Mathematical Analysis.

Professor Trudinger continued as Director with Professor Hall serving as Acting Director during his absences.

2.3 STAFFING MATTERS

Dr Huisken took up a Chair at the University of Tübingen from February. Dr Wilson was seconded full time to the National Centre for Epidemiology and Population Health. Professor Aitkin was an ARC Senior Research Fellow from January until August, when he moved to the University of Western Australia. Drs Gregori and Isaev were appointed as Research Associates in the ARC Program Grant, "Nonlinear Analysis and Geometric Applications" held by Professor Trudinger, Drs Huisken, Bartnik, Urbas and Hutchinson. Drs Jing and Patel were appointed as Research Associates in the ARC Special Investigator Program of Professor Hall. Dr Simon (from the University of Vienna) and Dr Cranny (from the University of Queensland) took up their appointments in December. Dr Scott commenced her ARC Fellowship in October. Dr Do took up a lectureship at the University of Canberra in July. Dr Chrusciel took a Humboldt Fellowship at the Max Planck Institute for Astrophysics in Garching in June, while Dr Gregori commenced an Assistant Professorship at the University of Utah in September. Drs Altschuler and Wu left for the Institute of Advanced Studies, Princeton in September. Mr Chen submitted his Ph.D. in October and took up the position of Statistician in the Division of Fisheries, CSIRO, Hobart. Dr Booth returned to his position at the University of Florida in December.

3. RESEARCH ACTIVITIES

The basic research of the Centre spans theoretical mathematics, computational and applied mathematics and statistics. The following represents a **selection** of research undertaken in 1992 in each of these divisions.

3.1 THEORETICAL MATHEMATICS:

- (i) **Algebraic groups and representations.** - Richardson continued his work on orbits of algebraic groups and related geometric problems. In particular he completed the classification of K -orbits on the flag manifold in the Hermitian symmetric case with some extensions to the general case. He also showed that some previously developed methods of his could be applied to the orbits of the corresponding real group on the flag manifold; all of these results are important in the representation theory of real semi simple Lie groups. In joint research with P. D. Ryan, he obtained an elementary description of the partial order on those orbits in the Hermitian symmetric case. A number of these results are described in the expository paper with T. A. Springer (CMA Research Report MR22-92) and in CMA Research Report MR27-92.
- (ii) **Operator theory.** - ter Elst and Robinson continued their earlier work on subelliptic operators on Lie groups. In a major paper (Research Report MR4A-92) they introduced a family of subcoercive operators which generalized the notion of subellipticity to operators of order higher than two. The notion of subcoerciveness is based on the version of the Garding inequality introduced earlier for Lie groups by Bratteli, Goodman, Jorgensen and Robinson. The main accomplishment of this investigation was the proof that the subcoercive operators generate heat semigroups with smooth kernels satisfying Gaussian bounds. The construction of these kernels from an extension of the parametrix method followed the recognition of Bratteli and Robinson (Research Report MR3-92) that the parametrix series had extremely strong convergence properties. The parametrix method for the resolvent was used by Bratteli and Robinson to construct a theory of second-order subelliptic operators with variable coefficients on a general Lie group. Subsequently, ter Elst and Robinson (Research Report MR16-92) applied the method to the semigroup kernel and extended the earlier results for constant coefficient subcoercive operators to operators with variable coefficients. In another paper (Research Report MR29-92) ter Elst and Robinson, together with a former graduate student R. J. Burns, derived L_p -regularity properties of subcoercive operators and established new results which even extended those known for the classical case of the Euclidean group. A later collaboration between ter Elst and Robinson (Research Report MR31-92) investigated problems of functional analysis in the subcoercive theory and used the results to obtain new structure theorems on interpolation spaces.

Finally, Robinson together with Visiting Fellows, Batty from Oxford, Bratteli from Oslo and Jørgensen from Iowa, investigated heat flow in periodic systems and established that it is governed by two scales of length. The small time diffusion is described by the geodesic distance but the large time behaviour is dictated by the distance associated with an homogenized system obtained by a suitable nonlinear averaging process.

- (iii) **Nonlinear partial differential equations.** - Trudinger continued research on fully nonlinear elliptic equations and curvature problems. Urbas continued related work on nonlinear oblique boundary conditions. Gregori investigated weak solution of non-uniformly elliptic equations in divergence form (Research Report MR24, 25) and wrote up previous results on gradient bounds for mean curvature systems (Research Report MR26). Useful interaction occurred with two of the leading worker in the field, N. Krylov and R. Jensen who were Visiting Fellows.
- (iv) **Geometric evolution problems.** - Altschuler and Wu studied the flow of graphs by mean curvature and more generally with fixed contact angles, obtaining translating solutions as their limits (Research Report MR7-92). In addition Wu continued previous work on Ricci flow, in conjunction with finding Einstein metrics on Kenmura spheres. Andrews studied the contraction of convex hypersurfaces under general curvature flow, as well as related Harnack and entropy inequalities (Research Reports MR20, 21-92). As an application he found a completely new proof of the Aleksandrov-Fenchel inequalities for convex sets (to appear).
- (v) **Mathematical Relativity.** - Scott continued previous investigations on the abstract boundary of pseudo-Riemannian manifolds, cosmological singularities and computational techniques for analysing solutions of the Einstein field equations. Chrusciel analyzed obstructions to asymptotic smoothness in space-times, partly in collaboration (Research Report MR35) with L. Andersson (Stockholm), which shed new light on the structure of the radiation field in general relativity. As well he continued previous collaborations (Research Reports MR2, MR14, see Annual Report 1991). In addition Spillane along with Bartnik (University of New England) and Seidel (Visiting Fellow) considered the evolution of the Einstein equations for black hole spacetimes.
- (vi) **Complex analysis.** - Isaev studied the boundary behaviour of Kähler-Einstein metrics on Reinhardt domains as well as completing previous work on tube manifolds (Research Reports MR 18, 19, 23).
- (viii) **Miniconference on Elliptic Equations.** - The CMA hosted a miniconference on Elliptic Equations in Canberra from August 20-22, to coincide with the visits of Jensen and Krylov. The conference drew a good participation from Australian mathematicians and covered as well as the basic theory of elliptic equations, aspects related to functional analysis, stochastic analysis, differential geometry and applications.

3.2 COMPUTATIONAL AND APPLIED MATHEMATICS

- (i) **Numerical partial differential equations.** - Trudinger and Kuo (Nat. Chung-Hsing Univ, Taiwan) completed their paper on maximum principles for parabolic difference schemes (Research Report MR15). LeMesurier developed numerical methods for focussing and singularity formation in nonlinear Schrodinger equations (Research Report MR10) and for flows of convex surfaces by general curvatures.
- (ii) **Modelling.** - Latham in collaboration with Anderssen, Grunbaum (Visiting Fellow) and Zubelli (IMPA, Brazil) worked on algorithms for medical imaging and soliton equations. Norton (Visiting Fellow, jointly with the Centre for Resource and Environmental Studies) worked in the area of environmental modelling.

3.3 STATISTICS

- (i) **Bootstrap and Empirical Likelihood Methods.** - Hall and Mammen (Heidelberg) studied general resampling algorithms (Research Report SR17) while Booth, Hall and Wood obtained new results on the validity of Edgeworth and Saddlepoint approximations in problems related to the bootstrap (Research Report SR7). Aspects of the implementation of bootstrap methods were discussed by Booth and Murison (Research Report SR25), Booth and Do (Research Report SR27) and Booth and Hall (Research Report SR30). Chen studied empirical likelihood methods for the linear model (Research Report SR14) and compared empirical likelihood and bootstrap approaches to hypothesis testing (Research Report SR22).
- (ii) **Bootstrap Workshop.** - A workshop entitled "Practical Applications of the Bootstrap" was hosted by the CMA in December, and coordinated by Dr. Do. The workshop was funded jointly by the Department of Industry, Technology and Commerce (DITAC) and the CMA. Invited speakers included Professors Beran (Berkeley), Olshen (Stanford), Louis (Minnesota), Hall (CMA), and Dr. Fisher (CSIRO, Sydney). In addition, there were fourteen contributed talks. A wide variety of topics and applications were covered, including: bootstrap inference in random coefficient regression models (Beran); problems in Mining and Geology (Fisher); prediction of high risk cholesterol levels (Olshen); gait analysis (Olshen).

There were more than fifty participants at the workshop, not only from Australia but also from North America, Europe and Korea. Judging by comments received from participants, the workshop was an unqualified success.

- (iii) **Statistical estimation of Fractal Dimension.** - Professor Hall continued his collaboration with scientists at CSIRO on problems relating to statistical aspects of rough surfaces. This collaboration has provided some stimulating research problems for CMA staff and visitors. Hall and Roy (Indian Statistical Institute) clarified the relationship between the fractal dimension and fractal index of stationary, non-Gaussian random fields (Research Report SR19), while Hall studied the implicit smoothing which occurs in the measurement of a self-similar process (Research Report SR20). Estimators of fractal dimension obtained by counting level crossings were investigated by Feuerverger (Toronto), Hall and Wood (Research Report SR28). Chan, Hall and Poskitt (Department of Statistics, ANU) considered the use of the periodogram for estimating fractal dimension (Research Report SR29).
- (iv) **Curve Estimation and Smoothing.** - Fan (North Carolina) and Hall discussed an approach to curve estimation based on minimising the mean absolute deviation (Research Report SR12). Hall and Wood investigated the effect of smoothing on distribution function estimation (Research Report SR11), and Hall (Research Report SR13) studied locally-smoothed density estimators. Anderson (Glasgow), Hall and Titterton (Glasgow) discussed measures of discrepancy for multivariate populations using kernel-based density estimates (Research Report SR18). Hall and Patil (Research Report SR33) studied nonparametric estimators of the covariance function of a stationary random field.
- (v) **Approximate Conditional Inference Workshop.** - A workshop entitled "Approximate Conditional Inference" was hosted by the CMA during the period 30th June to 3rd July, and coordinated by Dr. Wood. The workshop was funded by DITAC. Invited speakers included Professors Barndorff-Nielsen (Denmark), McCullagh (Chicago), Härdle (Germany) and Drs. Robinson and Miller (both of CSIRO, Melbourne), and there were approximately thirty five participants at the workshop. Discussion both during and after the talks was very lively and many worthwhile contacts were formed over the duration of the workshop.

CONFERENCES AND TRAVEL

4.1 Australian activities.

The Centre organised the following meetings: -

Workshop on Conditional Inference, Canberra, June 30 - July 3.

Miniconference on Elliptic Equations, Canberra, August.

Workshop on Practical Applications of the Bootstrap, Canberra, December.

These meetings are described in the section on research activities.

In addition, members of the Centre participated in the following Australian conferences: -

Workshop on Differential Geometry and Nonlinear Differential Equations, Melbourne, September - October.

Conference on Lie Groups, Adelaide, November.

Statistical Society of Australia Conference, Perth, 6 -10 July.

Australasian Epidemiological Association Scientific Meeting, Canberra, 27th September.

4.2 Overseas activities.

The following overseas activities were undertaken by Centre members:

Mathematics

Professor Trudinger was based at Northwestern University from January until early March. He participated in conferences on Curvature Flow at Trento, Italy and Calculus of Variations at Oberwolfach, Germany in August and visited Taiwan in November, under the sponsorship of the Taiwan National Science Foundation, giving lectures at Academia Sinica, Chung-hsing University, Chiaotung University and Chung-seng University.

Drs Altschuler, Gregori and Wu all participated in a Summer Research Institute in Geometry in Park City, Utah, in July.

Dr Scott participated in a workshop on "Cosmic Censorship" in Aspen, Colorado from May to June, gave invited lectures at the 13th International Conference on General Relativity and Gravitation in Argentina in June and the 4th Hungarian Relativity Workshop in Gardony, Hungary in July, as well as visiting Oxford University and the Université Libre de Bruxelles in July.

Professor Robinson participated in a conference on Non-commutative Analysis in Kyoto, Japan in June followed by a visit to Hokkaido University, Sapporo in July.

Statistics

Professor Hall visited the United States from the beginning of January to the end of February, and was based at the Mathematical Sciences Research Institute, Berkeley. During this period, he gave an invited lecture at Princeton University and colloquia at the following institutions: The University of California campuses at Berkeley, Davis and Los Angeles (5 talks in all); National Bureau of Standards and Technology, Washington (2 talks); Bell Communications Laboratories, Morristown, Stanford University and University of Minnesota (1 talk each).

Professor Hall visited Britain in September and was an invited speaker at the Royal Statistical Society Conference in Sheffield. In December, he visited the Indian Statistical Institute and delivered the 1992 Mahalanobis Memorial Lectures (3 lectures, repeated in Calcutta and Delhi).

Dr. Wilson attended the International Symposium on Multivariate Analysis and its Applications in Hong Kong in March. In October, she gave a talk at McGill University, Montreal.

Dr. Wood visited the Mathematical Sciences Research Institute, Berkeley, and the University of Colorado at Fort Collins, in April, and gave talks at both places.

Dr. Booth visited the Mathematical Sciences Research Institute, Berkeley, in February, and gave a talk there. During this period, he also gave talks at the University of Georgia, Pennsylvania State University and the University of Kentucky.

5. OTHER ACTIVITIES

Professor Trudinger was Dean of the School of Mathematical Sciences. He continued to serve on the Editorial Boards of the Proceedings of the Royal Society of Edinburgh and the Journal of Potential Analysis. He was also a member of the selection committee for a chair at the University of New England.

Professor Robinson was the Chairman of the Review Panel for the ARC Large Grants Funding Scheme in the Mathematical Sciences.

Professor Hall was a member of the Physics and Mathematics Panel of the ARC Committee. He served as an Associate Editor for the Annals of Statistics, Journal of the American Statistical Association, and on the Advisory Board of the Journal of Multivariate Analysis.

Dr. Wilson served as an Associate Editor (Shorter Communications) for Biometrics; as Australasian Correspondent for Biometric Bulletin; as Corresponding Editor for the Institute of Mathematical Statistics Bulletin, and as a Member of the Editorial Board of Statistical methods in Medical Research. She was appointed Editor of the Institute of Mathematical Statistics Bulletin in December. Dr. Wilson also served as a Member of the National Working Group on HIV/AIDS Projections, and as Chairperson, Standing Committee for the Promotion of Statistics in the Life Sciences (International Statistical Institute).

6. COLLABORATIVE RESEARCH AND STATISTICAL CONSULTING

Professor Hall continued to engage in extensive collaborative research with the CSIRO Division of Mathematics and Statistics, mainly in Sydney and Adelaide.

7. GRANTS AND AWARDS

7.1 ARC Grants

N.S. Trudinger, J. Urbas (with J. Hutchinson, Mathematics) ARC Project Grant "Nonlinear Analysis and Applications", 1992-93.

7.2 ARC Fellowships

S. Scott ARC Research Fellowship, "New Approaches in Mathematical Relativity", 1992-97.

7.3 ARC Special Investigator Award

Professor P. G. Hall, "Theory and Applications of Computer-Intensive Statistical Methods", 1992-94.

7.4 DITAC Grants

Workshops on Approximate Conditional Inference and Practical Applications of the Bootstrap (see Research Activities - Statistics).

7.5 ANU Large Equipment Grant

Dr Scott was the proposer of a successful bid from the SMS to the Boardman Committee of ANU to purchase a Silicon Graphics R4000 Indigo Elan workstation.

8. COLLOQUIA 1992

8.1 Mathematics

- | | |
|-------------|---|
| January, 23 | Dr Gerhard Huisken
(Centre for Mathematics & Its Applications, ANU)
"Floating Bubbles and Constant Mean Curvature Surfaces in Riemannian Manifolds" |
| March, 26 | Dr John Sullivan
(Geometry Project, University of Minnesota)
"Generalized Uncertainty Principles on Spaces of Homogeneous Type" |
| April, 16 | Professor Richard Melrose
(Massachusetts Institute of Technology)
"Wave Propagation for Nonlinear Hyperbolic Equations" |
| May, 28 | Professor Brian Parshall
(University of Virginia, USA)
"Duality in Representation Theory" |
| June, 4 | Professor Simon Gindikin
(Rutgers University, USA)
"Integral Geometry and the Theory of Representations" |
| June, 11 | Dr. John Salmon
(Caltech Con-Current Parallel Facility Caltech Pasadena, USA)
"Astrophysical N-Body Problems on Parallel Computers" |
| June, 18 | Professor Alan McIntosh
(Macquarie University)
"Clifford Algebras and Fourier Theory" |
| June, 25 | Professor A. Kirillov
(Moscow, visiting University of NSW)
"The Growth and Complexity of Lie Algebras of Vector Fields on Manifolds" |
| July, 16 | Dr Alex Dimca
(University of Sydney)
"Algebraic Differential Forms and Topological Invariants" |

- July, 23 Dr Gaven Martin
(University of Auckland, NZ)
"The Geometry of Discrete Groups"
- August, 6 Professor Edward Seidel
(NCSA, University of Illinois, USA)
"Distorted Black Holes and Black Hole Collisions"
- August, 20 Professor R. Jensen
(Loyola, Chicago, USA)
"Maximum Principles for Fully Nonlinear Elliptic Equations"
- August, 21 Professor N. Krylov
(Minneapolis, USA)
"Some Recent Results about Interior and Weak Interior Estimates for Nonlinear Elliptic Degenerate Equations"
- August, 27 Professor Leon Simon
(Stanford, USA)
"On the Structure of the Singular Set of Minimal Surfaces and Harmonic Maps"
- September, 10 Professor G.I. Lehrer
(University of Sydney)
"The Cohomology of the Pure Braid Groups and Alperin's Weight Conjecture"
- September, 17 Professor Gerd Dzuik
(University of Freiburg)
"A Finite Element Method for the Two Dimensional Dendrite Growth Problem"
- October, 15 Professor Bert Schrieber
(Wayne State University, USA)
"Multilinear Forms over Locally Compact Groups"
- October, 22 Professor Dirk Siersma
(University of Utrecht, Netherlands)
"The Beautiful World of Singularities"
- October, 29 Dr Yi Fang
(Mathematics Department, ANU)
"Global Properties of Complete Minimal Surfaces of Finite Topology"

- November, 5 Dr King Fai Lai
(University of Sydney)
"On Volumes, Scattering Matrices and Motives"
- November, 19 Professor J.D. Stegeman
(Utrecht University)
"Difference Spectra of Ideals and Spectral Synthesis"
- November, 26 Professor Daniel Altschuler
(CERN University, Switzerland)
"Quasi-Hopf Algebras, Knots, and Three-Manifolds"
- December, 1 Professor A Ya Helemskii
(Moscow State University)
"Homological Methods in the Multi-Operator Holomorphic Calculus"
- December, 9 Professor Peter Slodowy
(University of Hamburg, Visiting University of Sydney)
"The Icosahedron and Quintic Equations"
- December, 10 Professor Alberto Grunbaum
(University of California at Berkeley)
"Band-and-Time Limiting and Other Miracle Factories"

8.2 Statistical Science

- March, 12 Professor Michael Akritas
(Pennsylvania State University)
"Pearson-Type Goodness-of-Fit Tests for Regression"
- March, 19 Professor Michael Akritas
(Pennsylvania State University)
"Nonparametric Hypotheses and Rank Tests for Interaction in Multivariate Repeated Measures Designs"
- March, 26 Dr. Enno Mammen
(Heidelberg, Germany)
"Empirical Processes of Residuals in High-Dimensional Linear Models"
- April, 2 Dr. Enno Mammen
(Heidelberg, Germany)
"Bootstrap, Wild Bootstrap and Asymptotic Normality"

- April, 9 Dr. James G. Booth
(Statistics, CMA/ANU)
"Tail Probability Approximations for Statistics with
non-Normal Distributions"
- May, 7 Karen George
(University of Canberra)
"Methods for Estimating Variance in Rank
Regression"
- May, 14 Professor Nitis Mukhopadhyay
(University of Connecticut)
"On Estimating the Best Treatment Effect: One Way
Fixed-Effects Model"
- June, 18 Dr. Rahul Roy
(Indian Statistical Institute, New Delhi)
"Single-Linkage Clusters and Continuum
Percolation"
- June, 29 Professor R. R. Hocking
(Dept. of Statistics, Texas A & M University)
"A Diagnostic Approach to Variance Component
Estimation in Mixed Linear Models"
- July, 3 Professor Wolfgang Hardle
(CORE and Institut de Statistique, Catholic
University of Louvain)
"An Introduction to XploRe"
- July, 23 Professor Bruce Lindsay
(Pennsylvania, USA)
"Inference and Information in Semiparametric
Models, with Special Reference to the Mixture
Model"
- July, 30 Professor Richard L. Smith
(University of North Carolina, USA)
"Spatial Extremes"
- August, 6 Professor Andrey Feuerverger
(University of Toronto)
"A Consistent Test for Bivariate Dependence"
- August, 14 Professor W. J. Hall
(University of Rochester, USA)
"Large-Sample Optimality for Parametric and
Semiparametric Tests"

- August, 20 Dr. Alan Welsh
(Statistics Department, The Faculties)
"In Pursuit of a Missing Link"
- August, 27 Professor Frank Hampel
(ETH Zurich, Switzerland)
"Constants and Contrasts Under Long-Range
Correlations, or: Why Statistics Sometimes Works"
- September, 3 Dr. Rodney C. L. Wolff
(Dept. of Statistics, University of Glasgow, UK)
"Some Statistical Aspects of Chaos"
- October, 8 Dr. Matt Wand
(Australian Graduate School of Management
University of New South Wales, Kensington)
"The Unification of Kernel Smoothing Techniques"
- October 29, Dr. Xiaogu Zheng
(Beijing Normal University and CRI for Water and
Atmospheric Research, NZ)
"Some Aspects of Interacting Particle Systems"
- November, 5 Adjunct Professor Amode R Sen
(Queensland University of Technology)
"Migratory Game Bird Surveys in North America"
- November, 12 Francoise Seillier-Moiseiwitsch
(University of North Carolina at Chapel Hill)
"Evaluating Statistical Forecasting Systems"
- November, 19 Professor Joe Gani and Dr. Daryl Daley
(Statistics Research Section, Australian National
University)
"Epidemic Models in Stratified Populations"
- November, 26 Professor Elvezio Ronchetti
(University of Geneva, Switzerland)
"Empirical Saddlepoint Approximations and Empirical
Likelihood"
- November, 30 Professor A.W.F. Edwards
(University of Cambridge, UK)
"Are Mendel's Results Too Close?"
- December, 10 Professor Ali Rejali
(Isfahan University of Technology, Iran)
"Asymptotic Independence in Number Theory"

9. OFFICAL PUBLICATIONS 1992

The Centre produced 68 Research Reports in 1992 (Mathematics 35, Statistics 33) and 3 volumes of its Proceedings. Further details are given under Official Publications

9.1 PROCEEDINGS

- | | |
|-----------|---|
| Volume 29 | Miniconference on Probability and Analysis
(24-26 July, 1991: University of New South Wales)
Edited by Ian Doust and Brian Jeffries |
| Volume 30 | Miniconference on Free and Moving Boundary and
Diffusion Problems
(Canberra, June 14-16, 1990)
Edited by Robert S. Anderssen, James M. Hill and
Amiya K. Pani |
| Volume 31 | Inverse Problems in Partial Differential Equations
(Canberra, August 23-25, 1990)
Edited by Amiya K. Pani and Robert S. Anderssen |

9.2 RESEARCH REPORTS (MATHEMATICS)

- | | |
|-------------|---|
| CMA-MR1-92 | R.W. Richardson
Intersections of Double Cosets in Algebraic Groups |
| CMA-MR2-92 | P.T. Chrusciel and R.M. Wald
Maximal Hypersurfaces in Asymptotically Stationary
Spacetimes |
| CMA-MR3-92 | O. Bratteli and D. Robinson
Subelliptic Operators on Lie Groups: Variable Co-
efficients |
| CMA-MR4-92 | A.F.M. ter Elst and D.W. Robinson
Complex Subelliptic Operators on Lie Groups |
| CMA-MR4A-92 | A.F.M. ter Elst and D.W. Robinson
Subcoercivity and Subelliptic Operators on Lie Groups |
| CMA-MR5-92 | G.H. Meyer
A Finite Element Version of the Method of Lines for
Elliptic Boundary Value Problems |
| CMA-MR6-92 | R. Richardson, G. Rohrle and R. Steinberg
Parabolic Subgroups with Abelian Unipotent Radical |

- CMA-MR7-92 S. Altschuler and L.F. Wu
Convergence to Translating Solutions for a Class of
Quasilinear Parabolic Boundary Problems
- CMA-MR8-92 R.P. Brent
On the Periods of Generalized Fibonacci Recurrences
- CMA-MR9-92 G.A. Latham and R.S. Anderssen
A Hyperplane Approach to the EMS Algorithm
- CMA-MR10-92 B. LeMesurier
A New Dynamic Adaptive Grid Numerical Approach for
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(Note: Became CMA-SR-7)
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