

COMBINATORICS

Volume 3 (1981), Number 3 (October),

pp. 19-32

---

*Combinatorics* is the newsletter of the Combinatorial Mathematics Society of Australasia, and is published by the Society. Annual subscription rate for individual non-members and institutions is \$A4. All enquiries should be directed to the C.M.S.A., c/- Dr. Sheila Williams, Department of Mathematics, University of Queensland, St. Lucia, Queensland, 4067, Australia.

GENERAL ANNOUNCEMENTSNews

Jennie Seberry is now a member of the editorial board of the Journal of Statistical Planning and Inference and papers for that journal may be submitted directly to Jennie.

Mailing List

Dr. R. Eggleton, Department of Mathematics, University of Newcastle,  
N.S.W. 2308.

Mr. D. Skilton, Department of Mathematics, University of Newcastle,  
N.S.W. 2308.

Temporary Addresses

David and Elizabeth J. Billington,

Jan. 4, 1982 - April 9, 1982 : Department of Computer Science,  
University of Manitoba,  
Winnipeg,  
Canada R3T 2N2.

April 19, 1982 - June 30, 1982 : Department of Mathematics,  
Royal Holloway College,  
Egham Hill,  
Egham, Surrey TW20 0EX,  
U.K.

Derek Holton,

Dec. 28, 1981 - mid-May, 1982 : Tennessee State University,  
Nashville,  
Tennessee 37203,  
U.S.A.

RESEARCH ANNOUNCEMENTS

Please send contributions to Ms. D.J. Street, Department of Mathematics, University of Queensland, St. Lucia, Qld.4067. An asterisk indicates that preprints of that article are available. This list was prepared by Mr. R. Taylor.

- \*S. Kageyama, Properties for resolvability of a balanced block design.
- \*S. Kageyama, New bounds on the number of treatments common to any set of blocks for designs.
- \*S. Kageyama, Remark on "Some series of efficiency balanced designs".
- \*S. Kageyama, Best possible bound on the number of mutually disjoint blocks in incomplete block designs.
- \*S. Kageyama and R.N. Mohan, Some new  $\mu$ -resolvable BIB designs.
- \*S. Kageyama and T. Tsuji, A condition for the validity of Fisher's inequality.

NEW PUBLICATIONS

Authors are invited to contribute lists of publications and send further details of publications on appearance to Ms. D.J. Street, Department of Mathematics, University of Queensland, St. Lucia, Qld.4067. This list was prepared by Mr. R. Taylor.

- B. Alspach and M. Rosenfeld, Realization of certain generalized paths in tournaments, *Discrete Maths.*, 34, 1981, 199-202.
- E.J. Billington, More balanced ternary designs with block size three, *Discrete Maths.*, 39, 1982, 1-13.
- P. Eades, Integral quadratic forms and orthogonal designs, *J. Aust. Math. Soc.*, 30A, 1981, 297-306.
- J.M. Fitz-Gerald and E.J. Billington, Manufacturing sequences for the Economic Lot Scheduling problem, *Bull. Aust. Math. Soc.*, 22, 1980, 321-338.
- A. Hedayat and S. Kageyama, The family of t-designs - Part I, *J. Statist. Planning Inf.*, 4, 1980, 173-212.
- S. Kageyama, Characterization of certain balanced n-ary block designs, *Ann. Inst. Statist. Math.*, 32, A, 1980, 107-110.
- S. Kageyama, On properties of efficiency-balanced designs, *Commun. Statist. - Theor. Meth.*, A9, 1980, 597-616.
- S. Kageyama, Robustness of connected balanced block designs, *Ann. Inst. Statist. Math.*, 32, A, 1980, 255-261.
- S. Kageyama, Variations of power for t-test based on differences in two sample sizes, *Bull. Fac. Sch. Educ., Hiroshima Univ.*, 3(2), 1980, 65-77.

- S. Kageyama, Bounds on the number of blocks and some block structure for resolvable designs, *J. Japan Statist. Soc.*, 10, 1980, 127-134.
- S. Kageyama, On balanced incomplete block designs with  $v = 2k$ , *J. Japan Statist. Soc.*, 10, 1980, 135-137.
- S. Kageyama, Some bounds for partially balanced block designs, *Ann. Inst. Statist. Math.* 33, A, 1981, 141-153.
- S. Kageyama and R. Nishii, Non-existence of equireplicated variance-balanced designs, *Recent Developments in Statistical Inference and Data Analysis*, North-Holland Publishing Company.
- S. Kageyama and T. Tsuji, Characterization of equireplicated variance-balanced block designs, *Ann. Inst. Statist. Math.*, 32, A, 1980, 263-273.
- S. Kageyama and T. Tsuji, Some bounds on balanced block designs, *J. Statist. Planning Inf.*, 4, 1980, 155-167.
- K.M. Koh, D.G. Rogers and T. Tan, Products of graceful graphs, *Discrete Maths.*, 31, 1980, 279-292.
- K.M. Koh, D.G. Rogers, H.K. Teo and K.Y. Yap, Graceful graphs: some further results and problems, *Congressus Numerantium*, 29, 1980, 559-571.
- M.J. Pelling and D.G. Rogers, Some  $(2, n)$  combinatorial Stein groupoids, *Aequationes Math.*, 21, 1980, 225-235.
- R.C. Read and N.C. Wormald, Counting the 10-point graphs by partition, *J. Graph. Th.*, 5(2), 1981, 183-196.
- D.G. Rogers, The enumeration of a family of ladder graphs by edges II: Schröder and superconnective relations, *Quart. J. Math. (Oxford)* (2), 31, 1980, 491-506.
- D.G. Rogers, Triangular arrays associated with some partitions, in *18th Anniversary Volume, Fibonacci Association, Santa Clara*, 1980, 169-172.

# Lecture Notes in Mathematics

Edited by A. Dold and B. Eckmann

884

---

Combinatorial Mathematics VIII

Proceedings of the Eighth Australian Conference  
on Combinatorial Mathematics Held at Deakin  
University, Geelong, Australia, August 25 - 29, 1980

Edited by Kevin L. McAvaney

---



Springer-Verlag  
Berlin Heidelberg New York 1981

## TABLE OF CONTENTS

\* denotes speaker

## EXPOSITORY PAPERS

R.G. Stanton* and R.C. Mullin: Some properties of H-designs .....	1
R.G. Stanton* and H.C. Williams: Computation of some number-theoretic coverings .....	8

## INVITED PAPERS

Brian Alspach: The search for long paths and cycles in vertex-transitive graphs and digraphs .....	14
C.C. Chen* and N.F. Quiampo: On strongly hamiltonian abelian group graphs .....	23
R.L. Graham*, Wen-Ching Winnie Li, and J.L. Paul: Monochromatic lines in partitions of $Z^n$ .....	35
J.S. Hwang: Complete stable marriages and systems of I-M preferences .....	49
Peter Lorimer: The construction of finite projective planes .....	64
Ronald C. Read: A survey of graph generation techniques .....	77
J.J. Seidel: Graphs and two-distance sets .....	90
John Sheehan: Finite Ramsey theory is hard .....	99

R.C. Stanton:

Further results on covering integers of the form  $1+k2^n$  by primes .

107

## CONTRIBUTED PAPERS

R.A. Bailey:

Distributive block structures and their automorphisms .....

115

David Billington:

Connected subgraphs of the graph of multigraphic realisations of  
a degree sequence .....

125

J.E. Dawson:

A construction for a family of sets and its application to  
matroids .....

136

Peter Eades:

Regularity and optimality for trees .....

148

R.B. Eggleton\* and D.A. Holton:

Simple and multigraphic realizations of degree sequences .....

155

L.R. Foulds:

Critical link identification in a network .....

173

L.R. Foulds\* and R.W. Robinson:

Enumeration of binary phylogenetic trees .....

187

W. Haebich\* and J-L. Lassez:

Minimisation of multiple entry finite automata .....

203

A. Hartman:

A singular direct product for quadruple systems .....

21

Katherine Heinrich\* and W.D. Wallis:

The maximum number of intercalates in a latin square .....

221

D.A. Holton and C.H.C. Little\*:

Elegant odd rings and non-planar graphs .....

234

Mordechai Lewin:

On critical sets of edges in graphs .....

269

K.L. McAvaney: Further evidence for a conjecture on two-point deleted subgraphs of cartesian products .....	272
D.G. Rogers* and L.W. Shapiro: Deques, trees and lattice paths .....	293
Deborah J. Street: Graeco-latin and nested row and column designs .....	304
R. Taylor: Constrained switchings in graphs .....	314
W.D. Wallis: One-factorisations of wreath products .....	337
Peter Wild: Divisible semisymmetric designs .....	346
Sheila Oates-Williams: Graphs and universal algebras .....	351
Sheila Oates-Williams* and Anne Penfold Street: Universal fabrics .....	355

#### REMAINING ADDRESSES

- Aian Brace:  
A report on combinatorial mathematics in China
- Erich Durnberger:  
Some results on discontinuous homeomorphism groups of surfaces
- R.L. Graham:  
Distance matrices of trees
- A.M. Herzberg, C.W.L. Garner, and G.H.J. van Rees\*:  
Latin queen squares
- D.A. Holton\*, B.D. McKay, and M.D. Plummer:  
A nine point theorem for 3-connected cubic graphs, a twenty-three  
point conjecture for 3-connected cubic planar graphs and many  
ill-conceived ideas on related topics



Alan Rahilly:

A characterisation of  $PG(2,4)$

R.W. Robinson:

Isomorphic factorisations VII : bisection of trees

D.G. Rogers\* and J.M. Turgeon:

Perfect systems of difference sets

C.A. Rowley:

The Hungarian magic cube

D.E. Taylor:

Permutation groups and experimental designs

Helge Tverberg:

Some remarks on the 4-colour theorem

Combinatorial Mathematics Society of Australasia

Minutes of the Third Annual Meeting held on Wednesday 26th August, 1981 at the University of Queensland, St. Lucia, Queensland.

Meeting opened: 1330 hours.

Present: Sheila Williams (Director and Chairperson), Elizabeth Billington (Secretary), Anne Street (Assistant Treasurer) and 33 members.

Apologies: Peter O'Halloran.

Minutes of Second A.G.M.: Confirmed as circulated in *Combinatorics*, Vol. 2, number 3. (S. Williams/E.J. Billington.)

Matters arising: deferred to General Business.

Director's Report:Membership

We started the year with 90 members and have lost 27 through non-payment of subscription. We have gained 38 members (15 by the normal process and 23 as a result of the automatic membership for conference members) so that our numbers now stand at 101.

9 ACCM

We have 55 participants, including 9 invited speakers and 17 from overseas.

Support has been provided by the University of Queensland, Australian Mathematical Society, B.H.P. Ltd., Digital Equipment Australia Pty.Ltd., Trafalgar Travel, TAA, Xerox and CSIRO.

Committee

The original committee consisted of Elizabeth Billington as Secretary, Peter Eades as Treasurer and myself as Director. We co-opted Anne Street (with the official title of Assistant Treasurer, though in fact her main role is as Editor-in-Chief of the Proceedings) and Debbie Street (as Editor of the newsletter). As Peter Eades departed on Study Leave early in the year we then co-opted Bill Wilson as Acting Treasurer. I should like to thank all the members of the committee for their hard work and support.

Matters arising from 8 ACCM

1. Affiliation with Australian Mathematical Society

I approached the Council of the A.M.S. on this matter and was informed that they were reluctant to create more divisions, particularly for such a small number of people. As affiliation would have the disadvantage of forcing our members to be members of the A.M.S. I propose that no further action be taken in this matter. [After ensuing discussion, carried (S. Williams/K. McAvaney).]

2. Life Membership

The committee proposed that a category of Life membership of C.M.S.A. be established, the fee being \$100.  
Carried (S. Williams/B.H. Neumann).

Financial Report 1980

A statement of receipts and payments for the period 1 January 1980 to 31 December 1980 was presented by K. McAvaney.  
Report received (K. McAvaney/J. Seberry).

Venues for 10 ACCM and 11 ACCM

Agreed that the venue for 10 ACCM be the University of Adelaide, with Rey Casse as Director, with power to co-opt further committee members. (B.H. Neumann/K. McAvaney.)

Agreed that the venue for 11 ACCM be the University of Canterbury, Christchurch, New Zealand. (S. Williams/L. Foulds.)

General Business

1. The Director, S. Williams, suggested that 'computing' be included in the title of the conference, as many participants are in computer science, and money seems to be more available from areas of computing rather than combinatorics. The incoming Director for 1982, Rey Casse, is to investigate this.
2. Professor B.H. Neumann made three points :
  - (i) The Australian Academy of Science publish a six-monthly list of Scientific meetings in Australia, free-of-charge. In future, conferences should be advertised there.
  - (ii) The I.M.U. Canberra circular lists visitors to Australia and New Zealand from overseas, and wants information on such visitors: name, home institution, if accompanied, by whom, etc., mathematical field, affiliation here, main contact here. Listing is free; circular appears about 4 times a year; please send information to Dr. T.M. Gagan at the University of Sydney.
  - (iii) Thanks to the 1981 committee.

Meeting closed: 0154 hours.

COMBINATORIAL MATHEMATICS SOCIETY OF AUSTRALASIA

Financial Statement for the period 1 Jan 1980 to 31 Dec 1980

Opening Balance 1 Jan 1980 :

Commonwealth Bank (Newcastle)	743.45	
Petty Cash (Newcastle)	13.17	
ANZ Bank (Deakin - early membership subscriptions)	25.50	
		782.12

Receipts :

Membership Subscriptions	316.96	
Donations	1413.00	
Interest	154.36	
Conference : Registration	778.00	
Excursion	280.00	
Evita Tickets	250.00	
Accommodation & Meals	3047.00	
Sale of excess wine	99.00	
		6338.32

Expenditure :

Stamp Duty	8.04	
Bank Fees (Cheque account)	27.33	
Conference : Excursion	315.00	
Evita	250.00	
Accommodation & Meals	3681.20	
Drinks	187.00	
Air Fares (Invited speakers)	1488.00	
Accommodation deposit refund	10.00	
Printing	12.00	
		\$ 5978.57

Surplus :

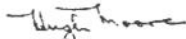
\$ 1141.87

Closing Balance 31 December 1980 : V.S. & L. Soc. 1126.87  
 Petty Cash 15.00

\$ 1141.87

Auditor's Statement :

I have examined the accounts and verified that they represent a true and fair view of the financial affairs of the Society.

  
 - Hugh Moore  
 M.Ec., Dip.Ed., A.A.S.A. (Snr.)

PARTICIPANTS 9 ACCMAUSTRALIAA.C.T.

Department of Mathematics,  
I.A.S., A.N.U. P.O.Box 4,  
Canberra, A.C.T.2600.

Bernard H. Neumann

School of Information Sciences,  
Canberra C.A.E., P.O.Box 1,  
Belconnen, A.C.T.2600.

Peter J. O'Halloran

N.S.W.

C.S.I.R.O., Div. Mathematics & Statistics,  
P.O.Box 218, Lindfield, N.S.W.2070.

Jeremy E. Dawson

University of Sydney, N.S.W.2006.  
Department of Applied Mathematics

Jennifer Seberry  
Philip Loh

Department of Pure Mathematics

Joseph Hammer

Queensland

Capricornia I.A.E., Rockhampton, Q.4700.

John Arkinstall

Department of Mathematics & Computer  
Science, Q.I.T.,  
P.O.Box 2434, Brisbane, Q.4001.

Edward Dawson  
Ruth F. Hubbard

University of Queensland, Q.4067.  
Department of Computer Science

Peter D. Eades Michael Hickson  
William H. Wilson Ian Parberry

Department of Mathematics

Elizabeth J. Billington  
Robert N. Buttsworth  
Henry M. Finucan  
James M. Fitz-Gerald  
Peter J. Robinson  
Anne Penfold Street  
Deborah J. Street  
Sheila Williams

South Australia

Department of Pure Mathematics,  
University of Adelaide,  
Box 498 G.P.O., Adelaide, S.A.5001.

Rey Casse  
David G. Glynn  
Marta Sved  
Peter Wild

Victoria

School of Applied Science,  
Gippsland I.A.E.,  
Switchback Road, Churchill, Vic.3842.

Alan Rahilly

Division of Computing & Mathematics,  
Deakin University, Vic.3217.

Kevin L. McAvaney

Department of Applied Mathematics,  
La Trobe University, Bundoora, Vic.3083.

Department of Mathematics,  
Monash University, Clayton, Vic.3168.

Department of Mathematics,  
R.M.I.T., Melbourne, Vic.3000.

Department of Mathematics,  
University of Melbourne,  
Parkville, Vic.3052.

Robert Johnston  
Dieter Ross

St. John Kettle

Charles H.C. Little

Uday Shankar Bar  
David Billington  
Mark Ellingham  
Derek A. Holton  
Richard Taylor

#### Western Australia

School of Mathematics & Computing,  
W.A.I.T., Bentley, W.A.6102.

Department of Mathematics,  
University of Western Australia,  
Nedlands, W.A.6009.

Louis Caccetta

Cheryl E. Praeger

#### CANADA

Department of Computer Science,  
Concordia University, Montreal,  
Quebec H8G1M8.

Department of Computing Science,  
Dalhousie University, Halifax, B3H4H6.

University of Manitoba,  
Winnipeg, Manitoba, R3T2N2.

Department of Clothing and Textiles

Department of Computer Science

Clement W.H. Lam

David Skillicorn

Janet A. Hoskins

William D. Hoskins  
William Kocay  
Ralph Stanton

Rudolf Mathon

Department of Computer Science,  
University of Toronto,  
Toronto, Ontario, M5S1A7.

Department of Combinatorics &  
Optimisation, University of Waterloo,  
Waterloo, Ontario, N2L3G1.

U.S.R. Murthy

#### KUWAIT

Department of Mathematics,  
Kuwait University, P.O.Box 5969, Kuwait.

Z. Skupien

#### NEW ZEALAND

University of Canterbury,  
Christchurch.

Department of Mathematics

Department of Operations Research

Derrick Breach

Leslie R. Foulds  
John W. Giffin

UNITED KINGDOM

Department of Pure Mathematics,  
University of Birmingham,  
Birmingham, B15 2TJ.

Merton College, Oxford, OX1 4JD.

68 Liverpool Road, Watford,  
Hertfordshire, WD1 8DN.

Anthony Gardiner

Peter J. Cameron

Douglas G. Rogers

UNITED STATES

Department of Mathematics,  
University of Illinois at Chicago Circle,  
Chicago, Illinois 60680.

Department of Computer Science,  
Vanderbilt University,  
Nashville, Tennessee, 37235.

Vera S. Pless

Brendan D. McKay