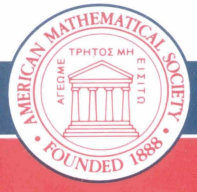


CONTEMPORARY MATHEMATICS

AMERICAN MATHEMATICAL SOCIETY

111

Finite Geometries and Combinatorial Designs

Proceedings of the AMS Special Session in
Finite Geometries and Combinatorial Designs
held October 29–November 1, 1987

http://dx.doi.org/10.1090/conm/111

Titles in This Series

Volume

1 **Markov random fields and their applications,** Ross Kindermann and J. Laurie Snell

2 **Proceedings of the conference on integration, topology, and geometry in linear spaces,** William H. Graves, Editor

3 **The closed graph and P-closed graph properties in general topology,** T. R. Hamlett and L. L. Herrington

4 **Problems of elastic stability and vibrations,** Vadim Komkov, Editor

5 **Rational constructions of modules for simple Lie algebras,** George B. Seligman

6 **Umbral calculus and Hopf algebras,** Robert Morris, Editor

7 **Complex contour integral representation of cardinal spline functions,** Walter Schempp

8 **Ordered fields and real algebraic geometry,** D. W. Dubois and T. Recio, Editors

9 **Papers in algebra, analysis and statistics,** R. Lidl, Editor

10 **Operator algebras and K-theory,** Ronald G. Douglas and Claude Schochet, Editors

11 **Plane ellipticity and related problems,** Robert P. Gilbert, Editor

12 **Symposium on algebraic topology in honor of José Adem,** Samuel Gitler, Editor

13 **Algebraists' homage: Papers in ring theory and related topics,** S. A. Amitsur, D. J. Saltman, and G. B. Seligman, Editors

14 **Lectures on Nielsen fixed point theory,** Boju Jiang

15 **Advanced analytic number theory. Part I: Ramification theoretic methods,** Carlos J. Moreno

16 **Complex representations of GL(2, K) for finite fields K,** Ilya Piatetski-Shapiro

17 **Nonlinear partial differential equations,** Joel A. Smoller, Editor

18 **Fixed points and nonexpansive mappings,** Robert C. Sine, Editor

19 **Proceedings of the Northwestern homotopy theory conference,** Haynes R. Miller and Stewart B. Priddy, Editors

20 **Low dimensional topology,** Samuel J. Lomonaco, Jr., Editor

21 **Topological methods in nonlinear functional analysis,** S. P. Singh, S. Thomeier, and B. Watson, Editors

22 **Factorizations of $b^n \pm 1$, $b = 2$, 3, 5, 6, 7, 10, 11, 12 up to high powers,** John Brillhart, D. H. Lehmer, J. L. Selfridge, Bryant Tuckerman, and S. S. Wagstaff, Jr.

23 **Chapter 9 of Ramanujan's second notebook—Infinite series identities, transformations, and evaluations,** Bruce C. Berndt and Padmini T. Joshi

24 **Central extensions, Galois groups, and ideal class groups of number fields,** A. Fröhlich

25 **Value distribution theory and its applications,** Chung-Chun Yang, Editor

26 **Conference in modern analysis and probability,** Richard Beals, Anatole Beck, Alexandra Bellow, and Arshag Hajian, Editors

27 **Microlocal analysis,** M. Salah Baouendi, Richard Beals, and Linda Preiss Rothschild, Editors

28 **Fluids and plasmas: geometry and dynamics,** Jerrold E. Marsden, Editor

29 **Automated theorem proving,** W. W. Bledsoe and Donald Loveland, Editors

30 **Mathematical applications of category theory,** J. W. Gray, Editor

31 **Axiomatic set theory,** James E. Baumgartner, Donald A. Martin, and Saharon Shelah, Editors

32 **Proceedings of the conference on Banach algebras and several complex variables,** F. Greenleaf and D. Gulick, Editors

33 **Contributions to group theory,** Kenneth I. Appel, John G. Ratcliffe, and Paul E. Schupp, Editors

34 **Combinatorics and algebra,** Curtis Greene, Editor

Titles in This Series

Volume

35 **Four-manifold theory,** Cameron Gordon and Robion Kirby, Editors

36 **Group actions on manifolds,** Reinhard Schultz, Editor

37 **Conference on algebraic topology in honor of Peter Hilton,** Renzo Piccinini and Denis Sjerve, Editors

38 **Topics in complex analysis,** Dorothy Browne Shaffer, Editor

39 **Errett Bishop: Reflections on him and his research,** Murray Rosenblatt, Editor

40 **Integral bases for affine Lie algebras and their universal enveloping algebras,** David Mitzman

41 **Particle systems, random media and large deviations,** Richard Durrett, Editor

42 **Classical real analysis,** Daniel Waterman, Editor

43 **Group actions on rings,** Susan Montgomery, Editor

44 **Combinatorial methods in topology and algebraic geometry,** John R. Harper and Richard Mandelbaum, Editors

45 **Finite groups–coming of age,** John McKay, Editor

46 **Structure of the standard modules for the affine Lie algebra $A_1^{(1)}$,** James Lepowsky and Mirko Primc

47 **Linear algebra and its role in systems theory,** Richard A. Brualdi, David H. Carlson, Biswa Nath Datta, Charles R. Johnson, and Robert J. Plemmons, Editors

48 **Analytic functions of one complex variable,** Chung-chun Yang and Chi-tai Chuang, Editors

49 **Complex differential geometry and nonlinear differential equations,** Yum-Tong Siu, Editor

50 **Random matrices and their applications,** Joel E. Cohen, Harry Kesten, and Charles M. Newman, Editors

51 **Nonlinear problems in geometry,** Dennis M. DeTurck, Editor

52 **Geometry of normed linear spaces,** R. G. Bartle, N. T. Peck, A. L. Peressini, and J. J. Uhl, Editors

53 **The Selberg trace formula and related topics,** Dennis A. Hejhal, Peter Sarnak, and Audrey Anne Terras, Editors

54 **Differential analysis and infinite dimensional spaces,** Kondagunta Sundaresan and Srinivasa Swaminathan, Editors

55 **Applications of algebraic K-theory to algebraic geometry and number theory,** Spencer J. Bloch, R. Keith Dennis, Eric M. Friedlander, and Michael R. Stein, Editors

56 **Multiparameter bifurcation theory,** Martin Golubitsky and John Guckenheimer, Editors

57 **Combinatorics and ordered sets,** Ivan Rival, Editor

58.I **The Lefschetz centennial conference. Proceedings on algebraic geometry,** D. Sundararaman, Editor

58.II **The Lefschetz centennial conference. Proceedings on algebraic topology,** S. Gitler, Editor

58.III **The Lefschetz centennial conference. Proceedings on differential equations,** A. Verjovsky, Editor

59 **Function estimates,** J. S. Marron, Editor

60 **Nonstrictly hyperbolic conservation laws,** Barbara Lee Keyfitz and Herbert C. Kranzer, Editors

61 **Residues and traces of differential forms via Hochschild homology,** Joseph Lipman

62 **Operator algebras and mathematical physics,** Palle E. T. Jorgensen and Paul S. Muhly, Editors

63 **Integral geometry,** Robert L. Bryant, Victor Guillemin, Sigurdur Helgason, and R. O. Wells, Jr., Editors

64 **The legacy of Sonya Kovalevskaya,** Linda Keen, Editor

65 **Logic and combinatorics,** Stephen G. Simpson, Editor

66 **Free group rings,** Narian Gupta

67 **Current trends in arithmetical algebraic geometry,** Kenneth A. Ribet, Editor

Titles in This Series

Volume

68 **Differential geometry: The interface between pure and applied mathematics,** Mladen Luksic, Clyde Martin, and William Shadwick, Editors

69 **Methods and applications of mathematical logic,** Walter A. Carnielli and Luiz Paulo de Alcantara, Editors

70 **Index theory of elliptic operators, foliations, and operator algebras,** Jerome Kaminker, Kenneth C. Millett, and Claude Schochet, Editors

71 **Mathematics and general relativity,** James A. Isenberg, Editor

72 **Fixed point theory and its applications,** R. F. Brown, Editor

73 **Geometry of random motion,** Rick Durrett and Mark A. Pinsky, Editors

74 **Geometry of group representations,** William M. Goldman and Andy R. Magid, Editors

75 **The finite calculus associated with Bessel functions,** Frank M. Cholewinski

76 **The structure of finite algebras,** David C. Hobby and Ralph Mckenzie

77 **Number theory and its applications in China,** Wang Yuan, Yang Chung-chun, and Pan Chengbiao, Editors

78 **Braids,** Joan S. Birman and Anatoly Libgober, Editors

79 **Regular differential forms,** Ernst Kunz and Rolf Waldi

80 **Statistical inference from stochastic processes,** N. U. Prabhu, Editor

81 **Hamiltonian dynamical systems,** Kenneth R. Meyer and Donald G. Saari, Editors

82 **Classical groups and related topics,** Alexander J. Hahn, Donald G. James, and Zhe-xian Wan, Editors

83 **Algebraic K-theory and algebraic number theory,** Michael R. Stein and R. Keith Dennis, Editors

84 **Partition problems in topology,** Stevo Todorcevic

85 **Banach space theory,** Bor-Luh Lin, Editor

86 **Representation theory and number theory in connection with the local Langlands conjecture,** J. Ritter, Editor

87 **Abelian group theory,** Laszlo Fuchs, Rüdiger Göbel, and Phillip Schultz, Editors

88 **Invariant theory,** R. Fossum, W. Haboush, M. Hochster, and V. Lakshmibai, Editors

89 **Graphs and algorithms,** R. Bruce Richter, Editor

90 **Singularities,** Richard Randell, Editor

91 **Commutative harmonic analysis,** David Colella, Editor

92 **Categories in computer science and logic,** John W. Gray and Andre Scedrov, Editors

93 **Representation theory, group rings, and coding theory,** M. Isaacs, A. Lichtman, D. Passman, S. Sehgal, N. J. A. Sloane, and H. Zassenhaus, Editors

94 **Measure and measurable dynamics,** R. Daniel Mauldin, R. M. Shortt, and Cesar E. Silva, Editors

95 **Infinite algebraic extensions of finite fields,** Joel V. Brawley and George E. Schnibben

96 **Algebraic topology,** Mark Mahowald and Stewart Priddy, Editors

97 **Dynamics and control of multibody systems,** J. E. Marsden, P. S. Krishnaprasad, and J. C. Simo, Editors

98 **Every planar map is four colorable,** Kenneth Appel and Wolfgang Haken

99 **The connection between infinite dimensional and finite dimensional dynamical systems,** Basil Nicolaenko, Ciprian Foias, and Roger Temam, Editors

100 **Current progress in hyperbolic systems: Riemann problems and computations,** W. Brent Lindquist, Editor

101 **Recent developments in geometry,** S.-Y. Cheng, H. Choi, and Robert E. Greene, Editors

102 **Primes associated to an ideal,** Stephen McAdam

103 **Coloring theories,** Steve Fisk

Titles in This Series

Volume

104 Accessible categories: The foundations of categorical model theory, Michael Makkai and Robert Paré

105 Geometric and topological invariants of elliptic operators, Jerome Kaminker, Editor

106 Logic and computation, Wilfried Sieg, Editor

107 Harmonic analysis and partial differential equations, Mario Milman and Tomas Schonbek, Editors

108 Mathematics of nonlinear science, Melvyn S. Berger, Editor

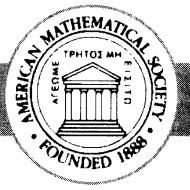
109 Combinatorial group theory, Benjamin Fine, Anthony Gaglione, and Francis C. Y. Tang, Editors

110 Lie algebras and related topics, Georgia Benkart and J. Marshall Osborn, Editors

111 Finite geometries and combinatorial designs, Earl S. Kramer and Spyros S. Magliveras, Editors

Finite Geometries and Combinatorial Designs

Dale M. Mesner



CONTEMPORARY MATHEMATICS

111

Finite Geometries and Combinatorial Designs

Proceedings of the AMS Special Session in
Finite Geometries and Combinatorial Designs
held October 29–November 1, 1987

Earl S. Kramer and
Spyros S. Magliveras, Editors

AMERICAN MATHEMATICAL SOCIETY • PROVIDENCE, RHODE ISLAND

EDITORIAL BOARD

Richard W. Beals, managing editor

Sylvain E. Cappell	Jan Mycielski
Jonathan Goodman	Linda Preiss Rothschild
Craig Huneke	Michael E. Taylor

The AMS Special Session in Finite Geometries and Combinatorial Designs was held at the University of Nebraska, Lincoln, Nebraska, October 29–November 1, 1987.

1980 *Mathematics Subject Classification* (1985 *Revision*). Primary 05BXX, 51EXX.

Library of Congress Cataloging-in-Publication Data

Finite geometries and combinatorial designs: proceedings of the AMS Special Session in Finite Geometries and Combinatorial Designs held October 29–November 1, 1987 [Lincoln, Nebraska]/Earl S. Kramer and Spyros S. Magliveras, editors.

p. cm.—(Contemporary mathematics, ISSN 0271-4132; v. 111)

Includes bibliographical references.

ISBN 0-8218-5118-7

1. Finite geometries—Congresses. 2. Combinatorial designs and configurations—Congresses. I. Kramer, Earl S. (Earl Sidney), 1940–. II. Magliveras, Spyros S. (Spyros Simos), 1938–. III. Title. IV. Series: Contemporary mathematics (American Mathematical Society); v. 111.

QA167.2.A47 1987 90-45302

515′.13—dc20 CIP

Copying and reprinting. Individual readers of this publication, and nonprofit libraries acting for them, are permitted to make fair use of the material, such as to copy a chapter for use in teaching or research. Permission is granted to quote brief passages from this publication in reviews, provided the customary acknowledgment of the source is given.

Republication, systematic copying, or multiple reproduction of any material in this publication (including abstracts) is permitted only under license from the American Mathematical Society. Requests for such permission should be addressed to the Executive Director, American Mathematical Society, P.O. Box 6248, Providence, Rhode Island 02940-6248.

The owner consents to copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law, provided that a fee of $1.00 plus $.25 per page for each copy be paid directly to the Copyright Clearance Center, Inc., 27 Congress Street, Salem, Massachusetts 01970. When paying this fee please use the code 0271-4132/90 to refer to this publication. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale.

Copyright ©1990 by the American Mathematical Society. All rights reserved.
The American Mathematical Society retains all rights except those granted to the United States Government.
Printed in the United States of America.
The paper used in this book is acid-free and falls within the guidelines established to ensure permanence and durability. ♾

This volume was prepared by the authors using $\mathcal{A}\mathcal{M}\mathcal{S}$-TEX, the American Mathematical Society's TEX macro system.

10 9 8 7 6 5 4 3 2 1 95 94 93 92 91 90

DEDICATED TO

DALE M. MESNER

Contents

Preface xiii

List of Contributors xv

List of Participants xvii

A Note on Hamilton Cycles in Block-Intersection Graphs
B. ALSPACH, K. HEINRICH, AND B. MOHAR 1

All Dicyclic Groups of Order at Least Twelve Have Symmetric Sequencings
B. A. ANDERSON 5

Concerning Pairwise Balanced Designs With Prime Power Block Sizes
F. E. BENNETT 23

On the p-Rank of Incidence Matrices and a Question of E.S. Lander
A. A. BRUEN AND U. OTT 39

On the Dempwolff Plane
M. J. DE RESMINI 47

Difference Sets in 2-Groups
J. F. DILLON 65

On the Existence of Room Squares with Subsquares
J. H. DINITZ AND D. R. STINSON 73

A Bound for Blocking Sets in Finite Projective Planes
D. A. DRAKE 93

Sets With More Than One Representation as an Algebraic Curve of Degree Three
J. W. P. HIRSCHFELD AND J. A. THAS 99

Flocks and Partial Flocks of Quadric Sets
N. L. JOHNSON 111

The Finite Flag-Transitive Linear Spaces with an Exceptional Automorphism Group
P. B. KLEIDMAN 117

Constructing 6-(14,7,4) Designs
D. L. KREHER AND S. P. RADZISZOWSKI 137

On the Classification of Finite C_n-Geometries with Thick Lines
A. PASINI 153

Cyclic Codes and Cyclic Configurations
V. PLESS 171

Designs and Approximation
J. J. SEIDEL 179

Flocks, Maximal Exterior Sets, and Inversive Planes
J. A. THAS 187

Self-Orthogonal Designs
V. D. TONCHEV 219

Nonembeddable Quasi-Residual Designs
T. VAN TRUNG 237

Finite Planes And Clique Partitions
W. D. WALLIS 279

Oval Designs in Quadrics
M. A. WERTHEIMER 287

On the Order of a Finite Projective Plane and its Collineation Group
C. Y. HO 299

Some Geometric Aspects of Root Finding in $GF(q^m)$
P. C. VAN OORSCHOT AND S. A. VANSTONE 303

Automorphism Groups as Linear Groups
J. SIEMONS 309

Preface

A special session on *Finite Geometries and Combinatorial Designs* was held at a regional conference of the American Mathematical Society in Lincoln, Nebraska during October 29–November 1, 1987. The organizers of the session were Dale Mesner and the editors of these proceedings. We were pleasantly surprised at the large number of participants from several countries who came to Lincoln for the three-day conference. We were even more pleased at the very high quality of results presented at the conference and submitted to the proceedings. We wish to thank conference participants, contributors to this volume, and referees. The editors take the liberty of dedicating this volume to Dale M. Mesner in appreciation of his contributions to combinatorics.

The editors express their thanks to the University of Nebraska, especially the Department of Computer Science and the Department of Mathematics, for funding and other support. Very special gratitude is due to Leanne Magliveras for her expert typesetting of the manuscripts.

Spyros S. Magliveras
Earl S. Kramer
Lincoln, Nebraska
November, 1989

List of Contributors

ALSPACH, Brian	Simon Fraser University, Burnaby BC
ANDERSON, Bruce A.	Arizona State University, Tempe, AZ
BENNETT, Frank E.	Mount St. Vincent University, Halifax, Nova Scotia
BRUEN, Aiden A.	University of Western Ontario, London, Canada
de RESMINI, Marialuisa J.	Università di Roma "La Sapienza", Italy
DILLON, John F.	New Carrolton, MD
DINITZ, Jeff H.	University of Vermont, Burlington, VT
DRAKE, David A.	University of Florida, Gainesville, FL
HEINRICH, Katherine	Simon Fraser University, Burnaby BC
HIRSCHFELD, James W.P.	University of Sussex, Brighton UK
HO, Chat Y.	University of Florida, Gainesville, FL
JOHNSON, Norman L.	University of Iowa, Iowa City, IA
KLEIDMAN, Peter B.	Trinity College, Cambridge, UK
KREHER, Don L.	Rochester Institute of Technology, Rochester, NY
MOHAR, Bojan	University of Ljubljana, Yugoslavia
OTT, U.	University of Braunschweig, West Germany
PASINI, Antonio	Università di Siena, Italy
PLESS, Vera S.	University of Illinois, Chicago, IL
RADZISZOWSKI, Stanislaw P.	Rochester Institute of Technology, Rochester, N.Y.
SEIDEL, J. J.	Technische Hogeschool Eindhoven, The Netherlands
SIEMONS, Johannes	University of East Anglia, Norwich, UK
STINSON, Doug R.	University of Manitoba Winnepeg, Manitoba
THAS, Jef A.	State University of Ghent, Belgium
TONCHEV, Vladimir, D.	Bulgarian Academy of Sciences, Sofia, Bulgaria
van OORSCHOT, P. C.	University of Waterloo, Ontario, Canada
van TRUNG, Tran	University of Heidelberg, West Germany
VANSTONE, Scott A.	University of Waterloo, Ontario, Canada
WERTHEIMER, Michael A.	Department of Defense, Fort George G. Meade, MD
WALLIS, Walter D.	Southern Illinois University, Carbondale, IL

Conference Participants

List of Participants

ADAMS, Michael	
ANDERSON, Bruce A.	Arizona State University, Tempe, AZ
ARCHDEACON, Dan	University of Vermont, Burlington, VT
ATKINSON, Michael D.	Carleton University, Ottawa, Canada
BAKER, Ronald D.	University of Delaware, Newark, DE
BANNAI, Eiichi	Ohio State University, Columbus, OH
BATTEN, Lynn M.	University of Winnipeg, Manitoba, Canada
BENNETT, Frank	Mount St. Vincent University, Halifax, Nova Scotia, Canada
BHATTACHARYA, Prabir	University of Nebraska Lincoln, NE
BEUTELSPACHER, A.	Siemens - München, West Germany
BRIDGES, W	University of Wyoming, Laramie, WY
BROWN, Julia M.	York University, North York, Ontario, Canada
BRUALDI, Richard A.	University of Wisconsin, Madison, WI
BRUEN, Aiden A.	University of Western Ontario, London, Ontario, Canada
CALDERBANK, R.	Bell Laboratories, Murray Hill, NJ
CARRAMINARA, Rodrigo	University of Iowa, Iowa City, IA
CHEROWITZO, Bill E.	University of Colorado at Denver, CO
CHOUINARD, Leo G.	University of Nebraska, Lincoln, NE
COLBOURN, Charles J.	University of Waterloo, Ontario, Canada
CORDERO-BRANA, Minerva	University of Iowa, Iowa City, IA
CRITTENDEN, Andre	Colorado State University, Fort Collins, CO
de RESMINI, Marialuisa J.	Università di Roma "La Sapienza", Italy
DILLON, John F.	New Carrolton, MD
DINITZ, Jeff H.	University of Vermont, Burlington, VT
DOOB, Michael	University of Manitoba, Winnipeg, Canada
DOYEN, Jean	Université Libre de Bruxelles, Belgium
DRAKE, David A.	University of Florida, Gainesville, FL
EALY, Clifton E., Jr.	Northern Michigan University, Marquette,MI
ELLARD, Cecil Andrew	Miami University, Oxford, OH
FIGUEROA, Raul	University of Iowa, Iowa City, IA
FURINO, Steven	University of Waterloo, Ontario, Canada
GRAMS, Gerhard	
GAWGIRDWIBOON, Suwimon	University of Nebraska, Lincoln, NE
HARTMAN, Alan	IBM - Israel
HEINRICH, Katherine	Simon Fraser University, Burnaby, BC, Canada
HIRSCHFELD, James W.P.	University of Sussex, Brighton, UK
HO, Chat Y.	University of Florida, Gainesville, FL
HOBART, Sylvia	University of Wyoming, Laramie, WY
HUGHES, Dan R.	Queen Mary College, London, UK
JOHNSON, Norman L.	University of Iowa, Iowa City, IA
KLARNER, David A.	University of Nebraska, Lincoln, NE

KLEIDMAN, Peter B.	Trinity College, Cambridge, UK
KRAMER, Earl E.	University of Nebraska, Lincoln, NE
KREHER, Don L.	Rochester Institute of Technology, Rochester, NY
LAMKEN, Esther	Institute for Defense Analyses, Princeton, NJ
LA ROSA, Myrna	University of Iowa, Iowa City, IA
LIEBLER, Bob	Colorado State University, Fort Collins, CO
MAGLIVERAS, Spyros	University of Nebraska, Lincoln, NE
MATHON, Rudi	University of Toronto, Ontario, Canada
MCLEAN, Jeffrey Thomas	College of St. Thomas, St. Paul, MN
MEMON, Nasir	University of Nebraska, Lincoln, NE
MENDELSOHN, Eric	University of Toronto, Ontario, Canada
MENDELSOHN, Nathan S.	University of Manitoba, Winnipeg, Canada
MESNER, Dale	University of Nebraska, Lincoln, NE
OSTROM, T. G.	Washington State University, Pullman, WA
PADMANABHAN, R.	University of Manitoba, Winnipeg, Canada
PASINI, Antonio	Università di Siena, Italy
PAYNE, Stan E.	University of Colorado at Denver, CO
PLESS, Vera S.	University of Illinois, Chicago, IL
POMAREDA, Rolando	Universidad de Chile, Santiago, Chile
RAY-CHAUDHURI, Dijen K.	Ohio State University, Columbus, OH
RODGERS, Chris	Auburn University, Alabama
ROSA, Alex	McMaster University, Hamilton, Ontario, Canada
SCHELLENBERG, Paul J.	University of Waterloo, Ontario, Canada
SEIDEL, Jaap J.	Technische Hogeschool Eindhoven, The Netherlands
SHULT, Ernie	Kansas State University, Manhattan, KS
SIEMONS, Johannes	University of East Anglia, Norwich, UK
SPENCE, Ted	University of Glasgow, Scotland, UK
STINSON, Doug R.	University of Manitoba, Winnipeg, Canada
TAM, Kok C.	University of Western Ontario, London, Ontario, Canada
TEIRLINCK, Luc	Auburn University, Alabama
THAS, Jef A.	State University of Ghent, Belgium
VALDES, Silvia	University of Iowa, Iowa City, IA
VANSTONE, Scott A.	University of Waterloo, Ontario, Canada
van TRUNG, Tran	University of Heidelberg, West Germany
WALLIS, Walter D.	Southern Illinois University, Carbondale, IL
WARD, John J.	
WERTHEIMER, Michael A.	Department of Defense, Fort George G. Meade, MD
WISEMAN, James A.	Massachusetts Institute of Technology, Cambridge, MA
WILSON, Stephen	Northern Arizona University, Flagstaff, Arizona
WU, Qiu-Rong	University of Nebraska, Lincoln, NE

ISBN 978-0-8218-5118-0

ISBN 0-8218-5118-7

CONM/111