

## Near-Rings and Near-Fields

# Mathematics and Its Applications

---

Managing Editor:

M. HAZEWINDEL

*Centre for Mathematics and Computer Science, Amsterdam, The Netherlands*

---

Volume 336

---

# Near-Rings and Near-Fields

Proceedings of the Conference on Near-Rings and Near-Fields,  
Fredericton, New Brunswick, Canada, July 18–24, 1993

*edited by*

Yuen Fong

*Department of Mathematics,  
National Cheng Kung University,  
Tainan, Taiwan, Republic of China*

Howard E. Bell

*Department of Mathematics,  
Brock University,  
St. Catharines, Ontario, Canada*

Wen-Fong Ke

*Department of Mathematics,  
National Cheng Kung University,  
Tainan, Taiwan, Republic of China*

Gordon Mason

*Department of Mathematics and Statistics,  
University of New Brunswick,  
Fredericton, New Brunswick, Canada*

and

Günter Pilz

*Institute for Mathematics,  
Johannes Kepler Universität,  
Linz, Austria*



SPRINGER-SCIENCE+BUSINESS MEDIA, B.V.

A C.I.P. Catalogue record for this book is available from the Library of Congress.

ISBN 978-94-010-4160-7      ISBN 978-94-011-0359-6 (eBook)  
DOI 10.1007/978-94-011-0359-6

---

*Printed on acid-free paper*

All Rights Reserved  
© 1995 Springer Science+Business Media Dordrecht  
Originally published by Kluwer Academic Publishers in 1995  
Softcover reprint of the hardcover 1st edition 1995  
No part of the material protected by this copyright notice may be reproduced or  
utilized in any form or by any means, electronic or mechanical,  
including photocopying, recording or by any information storage and  
retrieval system, without written permission from the copyright owner.

## Table of Contents

Foreword . . . . .	vii
Acknowledgement . . . . .	ix
<b>Invited Addresses</b>	
G. Betsch On the beginnings and development of near-ring theory . . . . .	1
H.E. Heatherly Localized distributivity conditions . . . . .	13
J.J. Malone Endomorphism near-rings through the ages . . . . .	31
<b>Contributed Papers</b>	
J. Ahsan On regular near-ring modules . . . . .	45
Scott W. Bagley Does $R$ prime imply $M_R(R^2)$ is simple? . . . . .	53
Gary F. Birkenmeier Essential nilpotency in near-rings . . . . .	57
G. Birkenmeier, H. Heatherly and E. Lee Completely prime ideals and radicals in near-rings . . . . .	63
Donald W. Blackett Connecting seminearrings to probability generating functions . . . . .	75
S.G. Botha Nilpotency and solvability in categories . . . . .	83
G. Alan Cannon Centralizer near-rings determined by $\text{End } G$ . . . . .	89
Roland A. Eggetsberger On codes from residue class ring generated finite Ferrero pairs . . . . .	113
Y. Fong, K. Kaarli and W.-F. Ke On minimal varieties of near-rings . . . . .	123
Y. Fong, W.-F. Ke and C.-S. Wang Syntactic nearrings . . . . .	133

R.L. Fray	
On sufficient conditions for near-rings to be isomorphic . . . . .	141
Lucyna Kabza	
Simplicity of some nonzero-symmetric centralizer near-rings . . . . .	145
Wen-Fong Ke and Hubert Kiechle	
Characterization of some finite Ferrero pairs . . . . .	153
Emanuel Kolb	
On planar local nearrings and Bacon spreads . . . . .	161
Alexander Kreuzer	
Construction of finite loops of even order . . . . .	169
K.D. Magill, Jr.	
$N$ -homomorphisms of topological $N$ -groups . . . . .	181
K.D. Magill, Jr. and P.R. Misra	
The bicentralizer nearrings of $\mathbf{R}$ . . . . .	193
C.J. Maxson	
When is $M_n(G)$ a ring? . . . . .	199
Hans H. Ney	
Anshel-Clay near-rings and semiaffine parallelogramspaces . . . . .	203
Dorota Niewieczyza	
On semi-endorphal modules over Ore domains . . . . .	209
Gary L. Peterson	
Subideals and normality of near-ring modules . . . . .	213
Gerhard Saad, Momme Johs Thomsen and Sergei A. Syskin	
Endomorphism nearrings on finite groups, a report . . . . .	227
S.D. Scott	
On the structure of certain 2-tame near-rings . . . . .	239
Kirby C. Smith	
Rings which are a homomorphic image of a centralizer near-ring . . . . .	257
Andries B. van der Merwe	
Homogeneous maps of free ring modules . . . . .	271
Gerhard G. Wagner	
A decoding strategy for equal weight codes from Ferrero pairs . . . . .	275

## FOREWORD

This volume contains three invited lectures and 26 other papers presented at the 12th International Conference on Near-rings and Near-fields held at Fredericton, New Brunswick, Canada, July 18-24, 1993.

All the papers in this volume have been refereed. Thanks are due to all the referees, who were helpful and prompt in submitting their reports.

I am pleased to acknowledge financial assistance for the Conference provided by the Natural Sciences and Engineering Research Council of Canada, The New Brunswick Department of Advanced Education, Brock University (St. Catharines, Ontario) and the University of New Brunswick.

I wish to record my thanks to the Editorial Board: Howard Bell, who was also co-organizer of the Conference; Gunter Pilz, whose advice on conferences and their proceedings was most helpful; Yuen Fong, who so ably made the arrangements with the publisher; and the Managing Editor, Wen-Fong Ke, whose mastery of  $\text{T}_{\text{E}}\text{X}$  has been of great help. Finally, I extend my sincerest appreciation to Mrs. Linda Guthrie of the UNB Department of Mathematics and Statistics, whose secretarial work for both the Conference and its Proceedings has been invaluable.

The Fredericton Conference was held 25 years after the first conference devoted entirely to near-rings and near-fields which took place at the Mathematisches Forschungsinstitut, Oberwolfach, Germany in 1968. To mark the occasion, Betsch's invited lecture gives a historical overview of the development of the subject while the other invited talks by Heatherly and Malone combine a retrospective look at two of the main themes of near-ring research (distributivity conditions and endomorphism near-rings, respectively) with up-to-the minute results.

In fact the development of near-rings and near-fields has matured to the point where the theory is substantial, the applications are numerous and both are amply documented. There are now four text books ([3], [5], [6], [9]) and five volumes of conference proceedings ([1], [2], [4], [7], [8]). Moreover, thanks to the foresight of the early workers in the field, a comprehensive classified bibliography was established and is updated regularly in the near-ring newsletter.

The papers in this volume reflect some of the diversity of the subject:

- Connections to geometry are discussed by Kiechle and Ke, Kolb, Kreuzer, and Ney.
- Centralizer near-rings are investigated by Bagley, Cannon, Kabza, Maxson, Smith, and van der Merwe.
- Ideals and radicals are considered in the invited lecture by Heatherly, in the papers of Birkenmeier and Botha and the paper by Birkenmeier, Heatherly, and Lee.
- Various near-ring modules are examined by Ahsan, Niewieczeral, Peterson, and Scott.

- Topological considerations are found in Magill and in Magill and Misra.
- Applications to error-correcting codes are considered by Eggetsberger, and Wagner.
- Endomorphism near-rings are the subject of the paper by Saad, Syskin and Thomsen as well as the invited lecture by Malone.

The remaining papers touch on a variety of other topics: Connections to probability (Blackett), syntactic near-rings (Fong, Ke and Wang), minimal varieties (Fong, Kaarli and Ke) and isomorphism questions (Fray).

## References

- [1] G. Betsch (ed.), Near-rings and near-fields, Proceedings of the 1985 Tübingen Conference, North-Holland, Amsterdam, 1987.
- [2] G. Betsch (ed.), Near-rings and near-fields, Proceedings of the 1989 Oberwolfach Conference, to appear.
- [3] J. Clay, Near-rings: Geneses and Applications, Oxford Univ. Press, Oxford, 1992.
- [4] G. Ferrero and C. Ferrero-Cotti (eds.), Proceedings of the 1981 San Benedetto Conference, 1982.
- [5] J. Meldrum, Near-rings and their links with groups, Pitman, London, 1985.
- [6] G. Pilz, Near-rings (2nd Ed.), North-Holland, Amsterdam, 1983.
- [7] G. Pilz, (ed.), Proceedings of the 1991 Linz Conference, Contributions to General Algebra 8, Hölder-Pichler-Tempsky, Wien, 1992.
- [8] Proceedings of the 1978 Edinburgh Conference, Proc. Edin. Math. Soc. 23 (1980), 1-140.
- [9] H. Wähling, Theorie der Fastkörper, Thales Verlag, Essen, 1987.

Gordon Mason  
Fredericton, July 1994



## ACKNOWLEDGMENT

On behalf of all the nearringers, I would like to express my deepest thanks to Mr. Fong Ka-Wai and Prof. C. S. Wang for their generous financial support in publishing this new proceedings. Without their kindest understanding and enthusiasm, this new volume is surely still in the air. One very special remark should go to Prof. W. F. Ke, my dearest former student, who has spent over hundreds of hours for all the computer works which were compulsorily needed for the birth of this new creature. To him, I must say that “Thanks Ke!”

Last but not the least, thanks are also due to Prof. A. V. Mikhalev, the head of the Mathematics Institute of Moscow State University, who has built up the bridge between Dr. Paul Roos, the representative of Kluwer Academic Publishers and myself. Without his help, I am quite sure that we can't find such a good place for our new-born baby! Of course, one should finally say that “Thanks ☉!”

Yuen Fong  
Spring, 1995

Remark for fun:

○ = Yuen (in Chinese 源, circle)

□ = Fong (in Chinese 方, square)

○ + □ =  $\begin{cases} \text{☉} & \text{(ancient Chinese coin, or simply money)} \\ \text{Mathematics} & \text{(square-circle problem)} \end{cases}$