Fields Institute Monographs

The Fields Institute for Research in Mathematical Sciences

Lectures on Algebraic Model Theory

Bradd Hart
Matthew Valeriote
Editors

American Mathematical Society

Selected Titles in This Series

15 **Bradd Hart and Matthew Valeriote, Editors,** Lectures on algebraic model theory, 2002

14 **Frank den Hollander,** Large deviations, 2000

13 **B. V. Rajarama Bhat, George A. Elliott, and Peter A. Fillmore, Editors,** Lectures in operator theory, 2000

12 **Salma Kuhlmann,** Ordered exponential fields, 2000

11 **Tibor Krisztin, Hans-Otto Walther, and Jianhong Wu,** Shape, smoothness and invariant stratification of an attracting set for delayed monotone positive feedback, 1999

10 **Jiří Patera, Editor,** Quasicrystals and discrete geometry, 1998

9 **Paul Selick,** Introduction to homotopy theory, 1997

8 **Terry A. Loring,** Lifting solutions to perturbing problems in C^*-algebras, 1997

7 **S. O. Kochman,** Bordism, stable homotopy and Adams spectral sequences, 1996

6 **Kenneth R. Davidson,** C*-Algebras by example, 1996

5 **A. Weiss,** Multiplicative Galois module structure, 1996

4 **Gérard Besson, Joachim Lohkamp, Pierre Pansu, and Peter Petersen Miroslav Lovric, Maung Min-Oo, and McKenzie Y.-K. Wang, Editors,** Riemannian geometry, 1996

3 **Albrecht Böttcher, Aad Dijksma and Heinz Langer, Michael A. Dritschel and James Rovnyak, and M. A. Kaashoek**
Peter Lancaster, Editor, Lectures on operator theory and its applications, 1996

2 **Victor P. Snaith,** Galois module structure, 1994

1 **Stephen Wiggins,** Global dynamics, phase space transport, orbits homoclinic to resonances, and applications, 1993

This page intentionally left blank

http://dx.doi.org/10.1090/fim/015

FIELDS INSTITUTE MONOGRAPHS

THE FIELDS INSTITUTE FOR RESEARCH IN MATHEMATICAL SCIENCES

Lectures on Algebraic Model Theory

Bradd Hart
Matthew Valeriote
Editors

American Mathematical Society
Providence, Rhode Island

The Fields Institute for Research in Mathematical Sciences

The Fields Institute is named in honour of the Canadian mathematician John Charles Fields (1863–1932). Fields was a visionary who received many honours for his scientific work, including election to the Royal Society of Canada in 1909 and to the Royal Society of London in 1913. Among other accomplishments in the service of the international mathematics community, Fields was responsible for establishing the world's most prestigious prize for mathematics research—the Fields Medal.

The Fields Institute for Research in Mathematical Sciences is supported by grants from the Ontario Ministry of Education and Training and the Natural Sciences and Engineering Research Council of Canada. The Institute is sponsored by McMaster University, the University of Toronto, the University of Waterloo, and York University, and has affiliated universities in Ontario and across Canada.

2000 *Mathematics Subject Classification.* Primary 03C64; Secondary 12L12, 03C05.

Library of Congress Cataloging-in-Publication Data

Hart, Bradd T.
Lectures on algebraic model theory / Bradd Hart, Matthew Valeriote, editors.
p. cm. — (Fields Institute monographs, ISSN 1069-5273 ; 15)
Includes bibliographic references.
ISBN 0-8218-2705-7 (alk. paper)
1. Model theory. 2. Algebraic fields. I. Valeriote, Matthew. II. Title. III. Series.
QA9.7.H37 2001
511.3–dc21 2001053718
CIP

This publication was prepared by The Fields Institute.
Visit the AMS home page at URL: `http://www.ams.org/`

10 9 8 7 6 5 4 3 2 1 07 06 05 04 03 02

Contents

Preface

During the academic year 1996/97 the Fields Institute for Research in Mathematical Sciences held a year-long programme in Algebraic Model Theory. During the first semester of the programme three lecture series were presented which covered recent developments in Differential Fields, o-Minimality, and Finite Algebra. This volume contains the lecture notes from those series.

The editors which to thank those students who kindly assisted in the preparation of these notes.

Bradd Hart
Matthew Valeriote
Editors

This page intentionally left blank

Bibliography

[1] S. Burris and H. P. Sankappanavar. *A course in Universal Algebra.* Graduate Texts in Mathematics. Springer, 1981.

[2] R. Freese and R. McKenzie. *Commutator Theory for Congruence Modular Varieties*, volume 125 of *London Mathematical Society Lecture Note Series.* Cambridge University Press, 1987.

[3] D. Hobby and R. McKenzie. *The Structure of Finite Algebras*, volume 76 of *Contemporary Mathematics.* American Mathematical Society, 1988.

[4] Wilfried Hodges. *Model Theory.* Oxford University Press, 1993.

[5] K. Kearnes, E. Kiss, and M. Valeriote. A geometric consequence of residual smallness. *Annals of Pure and Applied Logic*, 99:137–169, 1999.

[6] R. McKenzie, G. McNulty, and W. Taylor. *Algebras, Lattices, Varieties Volume I.* Wadsworth, 1987.

Lectures on Algebraic Model Theory

Bradd Hart and Matthew Valeriote, Editors

In recent years, model theory has had remarkable success in solving important problems as well as in shedding new light on our understanding of them. The three lectures collected here present recent developments in three such areas: Anand Pillay on differential fields, Patrick Speissegger on o-minimality and Matthias Clasen and Matthew Valeriote on tame congruence theory.

ISBN 0-8218-2705-7

9 780821 827055

FIM/15