THE

JOURNAL

OF

SYMBOLIC LOGIC

EDITED BY

Robert Goldblatt, Coordinating Editor Toshiyasu Arai Peter Cholak Françoise Delon Martin Grohe Greg Hjorth Michael C. Laskowski Simon Thomas Stewart Shapiro

> Volume 70 · Number 2 · June 2005 ISSN 0022-4812

PUBLISHED QUARTERLY BY THE ASSOCIATION FOR SYMBOLIC LOGIC, INC. WITH SUPPORT FROM INSTITUTIONAL MEMBERS

Copyright ©2005 by the Association for Symbolic Logic. All rights reserved. Reproduction by photostat, photo-print, microfilm, or like process by permission only.

TABLE OF CONTENTS

Quantum logic as motivated by quantum computing, by J. M. DUNN, T. J.	
HAGGE, L. S. Moss, and Z. WANG	353
Up to equimorphism, hyperarithmetic is recursive, by ANTONIO MONTALBÁN	360
On the type-definability of the binding group in simple theories, by BRADD HART and ZIV SHAMI	379
Lexicographic exponentiation of chains, by W. C. HOLLAND, S. KUHLMANN, and S. H. McCLEARY	389
Expansions of o-minimal structures by fast sequences, by HARVEY FRIEDMAN and CHRIS MILLER	410
Descriptive complexity of finite structures: Saving the quantifier rank, by	
OLEG PIKHURKO and OLEG VERBITSKY	419
The superintuitionistic predicate logic of finite Kripke frames is not	
recursively axiomatizable, by DMITRIJ SKVORTSOV	451
Finitely axiomatizable $\omega\text{-categorical theories}$ and the Mazoyer hypothesis, by	
DAVID LIPPEL	460
Elementary epimorphisms, by PHILIPP ROTHMALER	473
Interpreting descriptions in intensional type theory, by JESPER CARLSTRÖM	488
Randomness, relativization and Turing degrees, by ANDRÉ NIES, FRANK	
STEPHAN, and Sebastiaan A. Terwijn	515
The Church-Rosser property in symmetric combinatory logic, by KATALIN	
Вімво	536
Projective well-orderings and bounded forcing axioms, by ANDRÉS EDUARDO	
CAICEDO	557
Asymptotic theory of modules of separably closed fields, by FRANÇOISE POINT	573
Dimension theory and parameterized normalization for <i>D</i> -semianalytic sets over non-Archimedean fields, by Y. FIRAT ÇELİKLER	593
Structured pigeonhole principle, search problems and hard tautologies, by-	
JAN KRAJÍČEK	619
A Schanuel condition for Weierstrass equations, by JONATHAN KIRBY	631

(Continued on inside back cover)

The BULLETIN and the JOURNAL are the official organs of the Association for Symbolic Logic. an international organization for furthering research in symbolic logic and the exchange of ideas among mathematicians, philosophers, computer scientists, linguists, and others interested in this field.

The JOURNAL invites submission of (1) original technical papers in the field of symbolic logic, (2) expository papers in this field, (3) papers whose main point is philosophical and which either bear upon logic or make use of its methods, and (4) studies in the history of logic in which modern technical developments are taken into account.

10 9 8 7 6 5 4 3 2 1 10 09 08 07 06 05

Continued on inside back cover

THE JOURNAL OF SYMBOLIC LOGIC (ISSN 0022-4812) is published quarterly, in the months of March, June, September, and December, by the Association for Symbolic Logic, Inc., 124 Raymond Avenue, Poughkeepsie, NY 12604-0001, USA. Periodicals postage is paid at Poughkeepsie NY and at additional mailing offices. The JOURNAL is distributed with THE BULLETIN OF SYMBOLIC LOGIC; the 2005 annual subscription price for the two journals is \$495. Online subscription is available from Project Euclid; visit http://projecteuclid.org/jsl. Postmaster: Send address changes to The Journal of Symbolic Logic, Journals Division UIP, 1325 South Oak Street, Champaign, IL 61820-6903, USA. Business correspondence should be sent to the Secretary-Treasurer of the Association, Charles Steinhorn (address on inside back cover).