

THE
JOURNAL
OF
SYMBOLIC LOGIC

EDITED BY

ROD DOWNEY, Coordinating Editor
FRANÇOISE DELON JOHN ETCEMENDY
ROBERT GOLDBLATT MARTIN GROHE GREG HJORTH
MICHAEL RATHJEN SIMON THOMAS

VOLUME 68 · NUMBER 3 · SEPTEMBER 2003
ISSN 0022-4812

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

*Copyright ©2003 by the Association for Symbolic Logic. All rights reserved.
Reproduction by photostat, photo-print, microfilm, or like process by permission only.*

TABLE OF CONTENTS

Canonical functions, non-regular ultrafilters and Ulam's problem on ω_1 , by OLIVER DEISER and DIETER DONDER	713
Generality of proofs and its Brauerian representation, by KOSTA DOŠEN and ZORAN PETRIĆ	740
The completeness of Heyting first-order logic, by W. W. TAIT	751
Ultrafilters on the natural numbers, by CHRISTOPHER BARNEY	764
Transfer methods for \mathfrak{o} -minimal topology, by ALESSANDRO BERARDUCCI and MARGARITA OTERO	785
A proof-technique in uniform space theory, by DOUGLAS BRIDGES and LUMINIȚA VÎȚĂ	795
Expansions of geometries, by JOHN T. BALDWIN	803
Positive abstraction and extensionality, by ROLAND HINNION and THIERRY LIBERT	828
Fat sets and saturated ideals, by JOHN KRUEGER	837
Discouraging results for ultraimaginary independence theory, by ITAY BEN-YAACOV	846
Strong normalization proof with CPS-translation for second order classical natural deduction, by KOJI NAKAZAWA and MAKOTO TATSUTA	851
Existential definability with bounds on archimedean valuations, by ALEXANDRA SHLAPENTOKH	860
Non-well-foundedness of well-orderable power sets, by T. E. FORSTER and J. K. TRUSS	879
The approximation structure of a computably approximable real, by GEORGE BARMPALIAS	885
Differential forms in the model theory of differential fields, by DAVID PIERCE	923
Elementary properties of the Boolean hull and reduced quotient functors, by M. A. DICKMANN and F. MIRAGLIA	946
A hierarchy for the plus cupping Turing degrees, by YONG WANG and ANGSHEG LI	972
Embedding jump upper semilattices into the Turing degrees, by ANTONIO MONTALBÁN	989
Classical and constructive hierarchies in extended intuitionistic analysis, by JOAN RAND MOSCHOVAKIS	1015

(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 2003 annual subscription price for the two journals is \$450. 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).

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.

Continued on inside back cover

10 9 8 7 6 5 4 3 2 1 08 07 06 05 04 03