THE

JOURNAL of SYMBOLIC LOGIC

EDITED BY

WILLIAM CRAIG Herbert Enderton

Dagfinn Føllesdal

WILFRID HODGES

KIT FINE

YIANNIS MOSCHOVAKIS Anil Nerode

Managing Editor: ALFONS BORGERS

Consulting Editors:

Peter Aczel Jiří Bečvář George Boolos Joan Bresnan John P. Burgess Stephen A. Cook M. J. Cresswell Martin D. Davis Solomon Feferman Jens Erik Fenstad Frederic B. Fitch Hans Kamp David Kaplan Saul A. Kripke Kenneth Kunen Michael Makkai Ruth Barcan Marcus Donald A. Martin J. Donald Monk Gert H. Müller Charles D. Parsons Gabriel Sabbagh Gerald Sacks Arto Salomaa Dana S. Scott Joseph R. Shoenfield Richard A. Shore Steven K. Thomason Bas van Fraassen

VOLUME 46

1981

Published quarterly by the Association for Symbolic Logic, Inc. with support from ICSU and from institutional and corporate members The four numbers of Volume 46 were issued at the following dates:

Number 1, pages 1-208, March 20, 1981 Number 2, pages 209-448, June 1, 1981

Number 3, pages 449-704, October 1, 1981

Number 4, pages 705-920, January 12, 1982

Numbers 1-3 of this volume are copyrighted © 1981 by the Association for Symbolic Logic, Inc. Number 4 of this volume is copyrighted © 1982 by the Association for Symbolic Logic, Inc. Reproduction of copyrighted numbers of the Journal by photostat, photoprint, microfilm, or like process is forbidden, except by written permission, to be obtained through the Business Office of the Association for Symbolic Logic, P. O. Box 6248, Providence, Rhode Island 02940, U.S.A.

CONTENTS OF VOLUME 46

ABRAMSON, FRED G. Locally countable models of Σ_1 -separation	96
APTER, ARTHUR W. Changing cofinalities and infinite exponents	89
Measurability and degrees of strong compactness	249
BECKER, HOWARD. AD and the supercompactness of \aleph_1	822
BELL, J. L. Isomorphism of structures in S-toposes	449
BERLINE, CHANTAL. Rings which admit elimination of quantifiers	56
BLASS, ANDREAS. Some initial segments of the Rudin-Keisler ordering	147
The model of set theory generated by countably many generic reals	732
BOILEAU, ANDRÉ and JOYAL, ANDRÉ. La logique des topos	6
CHARLWOOD, G. An axiomatic version of positive semilattice relevance logic	233
CHERLIN, GREGORY L. and SCHMITT, PETER H. Undecidable L^t theories of	
topological abelian groups	761
DALEY, ROBERT P. Busy beaver sets and the degrees of unsolvability	460
DEKKER, J. C. E. Twilight graphs	539
DE SWART, H. See GIELEN, W.	
DI PAOLA, ROBERT A. A lift of a theorem of Friedberg: A Banach-Mazur func-	
tional that coincides with no α -recursive functional on the class of α -recur-	
sive functions	216
ELLENTUCK, ERIK. Hyper-torre isols	1
FITCH, FREDERIC B. The consistency of system Q	67
GIELEN, W., DE SWART, H. and VELDMAN, W. The continuum hypothesis in	
intuitionism	121
GIRARD, JEAN-YVES and PÄPPINGHAUS, PETER. A result on implications of	
Σ_1 -sentences and its application to normal form theorems	634
GOLDFARB, WARREN D. On the Gödel class with identity	354
HATCHER, WILLIAM S. and HODGSON, BERNARD R. Complexity bounds on	
proofs	255
HODES, HAROLDT. Upper bounds on locally countable admissible initial seg-	
ments of a Turing degree hierarchy	753
HODGSON, BERNARD R. See HATCHER, WILLIAM S.	
HOWARD, W. A. Ordinal analysis of simple cases of bar recursion	17
Joyal, André. See Boileau, André.	
KAKUDA, YUZURU. On a condition for Cohen extensions which preserve pre-	
cipitous ideals	296
KAMO, SHIZUO. Nonstandard natural number systems and nonstandard models.	365
KANAMORI, A. On P-points over a measurable cardinal	59
KEARNES, JOHN T. Modal semantics without possible worlds	77

TABLE OF CONTENTS

KECHRIS, ALEXANDER S. Forcing with Δ perfect trees and minimal Δ -degrees.	803
KLEINBERG, E. M. Producing measurable cardinals beyond κ	643
KNIGHT, JULIA F. Algebraic independence	377
KOPPERMAN, R. D. First-order topological axioms	475
KRAWCZYK, ADAM. Patterns of projecta	287
LA ROCHE, PETER. Effective Galois theory	385
LEIVANT, DANIEL. Implicational complexity in intuitionistic arithmetic	240
On the proof theory of the modal logic for arithmetic provability	531
LIN, CHARLOTTE. Recursively presented Abelian groups: Effective p-group	
theory. I.	617
LÓPEZ-ESCOBAR, E. G. K. On the interpolation theorem for the logic of con-	
stant domains	87
Equivalence between semantics for intuitionism. I	773
MAKKAI, M. An example concerning Scott heights	301
MANASTER, ALFRED B. and REMMEL, JEFFREY B. Partial orderings of fixed	
finite dimension: Model companions and density	789
MEKLER, ALAN H. Stability of nilpotent groups of class 2 and prime exponent.	781
MILLAR, TERRENCE. Vaught's theorem recursively revisited	397
MILLER, DOUGLAS E. The metamathematics of model theory: Discovering	
language in action	490
MUNDICI, DANIELE. An algebraic result about soft model theoretical equiva-	
lence relations with an application to H. Friedman's fourth problem	523
MYCIELSKI, JAN. Analysis without actual infinity	625
NAGLE, MICHAEL C. The decidability of normal K5 logics	319
NORMANN, DAG. Countable functionals and the projective hierarchy	209
Pappinghaus, Peter. See Girard, Jean-Yves.	
POIZAT, BRUNO. Sous-groupes définissables d'un groupe stable	137
Théories instables	513
POSNER, DAVID B. The upper semilattice by degrees $\leq 0'$ is complemented	705
POSNER, DAVID B. and ROBINSON, ROBERT W. Degrees joining to 0'	714
QUINE, W. V. Predicate functors revisited	649
REMMEL, JEFFREY B. Recursive isomorphism types of recursive Boolean alge-	
bras	572
Recursive Boolean algebras with recursive atoms	595
See MANASTER, ALFRED B.	
RICHTER, LINDA JEAN, Degrees of structures	723
ROBINSON, ROBERT W. See POSNER, DAVID B.	
ROGERS, PAT. Preservation of saturation and stability in a variety of nilpotent	
groups	499
SCHMERL, JAMES H. Decidability and finite axiomatizability of theorems of \aleph_0 -	
categorical partially ordered sets	101
SCHMITT, PETER H. See CHERLIN, GREGORY L.	
• •	

TABLE OF CONTENTS

SHELAH, SAHARON. Canonization theorems and applications	345
SMITH, RICK L. Effective aspects of profinite groups	851
SMORYŃSKI, C. Recursively saturated nonstandard models of arithmetic	259
Calculating self-referential statements: Guaspari sentences of the first	
kind	329
SPECTOR, MITCHELL. The k-closed unbounded filter and supercompact cardi-	
nals	31
STEEL, JOHN R. Determinateness and the separation property	41
VEIT, BARBARA. A proof of the associated sheaf theorem by means of categori-	
cal logic	45
Veldman, W. See Gielen, W.	
WANG, HAO. Some facts about Kurt Gödel	653
WEISPFENNING, VOLKER. The model-theoretic significance of complemented	
existential formulas	843
WEISS, WILLIAM. The equivalence of a generalized Martin's axiom to a combina-	
torial principle	817
ZADROZNY, WLODZIMIERZ. A new inner model for ZFC	393
MEETINGS AND ABSTRACTS	
Annual Meeting of the Association for Symbolic Logic, Washington, DC, 1977.	
By Richard Boyd, Chairman	677
Abstracts of papers	677
European Summer Meeting of the Association for Symbolic Logic, Leeds, Eng-	
land, 1979. By F. R. DRAKE and S. S. WAINER	435
Abstracts of papers	435
Meeting of the Association for Symbolic Logic, Santiago, Chile, 1978. By	
AYDA I. ARRUDA, ROLANDO CHUAQUI, NEWTON C. A. DA COSTA and	
IRENE MIKENBERG	180
Abstracts of papers	180
Meeting of the Association for Symbolic Logic, Biloxi, 1979. By DANIEL	
HALPERN, WILLIAM TAIT and JOHN T. BALDWIN	191
Abstracts of papers	191
Meeting of the Association for Symbolic Logic, San Diego, 1979. By ALFRED	
B. MANASTER, THOMAS H. PAYNE and DAVID HARRAH	199
Abstracts of papers	199
Meeting of the Association for Symbolic Logic, Hamilton, New Zealand, 1979.	
By W. G. MALCOLM and M. J. CRESSWELL	204
Abstracts of papers	204
Meeting of the Association for Symbolic Logic, Melbourne, Australia, 1979. By	
JOHN N. CROSSLEY and LLOYD HUMBERSTONE	424
Abstracts of papers	424

Ŷ

TABLE OF CONTENTS

Meeting of the Association for Symbolic Logic, New York, 1979. By GEORGE	
BOOLOS, SY FRIEDMAN and HAROLD HODES	427
Abstracts of papers	427
Meeting of the Association for Symbolic Logic, Karpacz, Poland, 1979. By	
LESZEK PACHOLSKI and JEDRZEJ WIERZEJEWSKI	690
Abstracts of papers	690

REVIEWS

Reviews	158
Reviews	412
Reviews	660
Reviews	864

NOTICES

Notices	207
Notices	447
Notices	703
Notices	919

OFFICERS AND MEMBERS

List of officers and members of the Association for Symbolic Logic	881
INDEX	

Index of reviews	14
------------------	----

ERRATA

VOLUME 34

Page 709, column 1, lines 10–12. Replace this entry by «Empiricism semantics and ontology XVI 292. Reprinted XXXIV 108».

VOLUME 44

Page 289, line 1. For «FROM», read «FORM».

Page 452, ,before line 6. Insert «[3]—, Sur un principle de la théorie des ensembles abstraits, Comptes rendus hebdomadaires des séances de l'Académie des Sciences, vol. 236 (1953), pp. 655–657.».

Page 452, line 6. For «[3]», read «[3']».

Page 692, column 2, lines 32-33. For «XLIV 286», read «(XLIV 286)».

VOLUME 45

Page 632, lines 18 and 48. For «O cálculo», read «O cálculo».

Page 656, before line 31. Insert «LEIVANT, Daniel. Innocuous substitutions......XLV 363-368».

VOLUME 46

Page 175, line 23. For «Cf. VII 92», read «Cf. XXXVI 155».

Page 615. The last paragraph contains a conjecture to the effect that a recursive Boolean algebra **B** such that both the atoms of **B** and the atomless elements of **B** are recursive has the property that: For all recursive Boolean algebras **D** such that the atoms of **D** and the atomless elements

of \mathfrak{D} are recursive, \mathfrak{D} is isomorphic to \mathfrak{B} if and only if \mathfrak{D} is recursively isomorphic to \mathfrak{B} iff \mathfrak{B} is isomorphic to one of F_n , N, Q, H, or a finite product of such Boolean algebras where F_n , \widetilde{N} , \widetilde{Q} , and \widetilde{H} are the interval algebras arising from $\{1, \ldots, n\}, \omega, 1 + \omega$, and $\omega + \eta$ respectively. We proved this conjecture shortly after the submission of the paper and this fact was to be announced in a note added in proof but the note was inadvertently omitted in publication.

vii

Continued from inside front cover

and of student memberships; a detailed description is available from the Association. Information on corporate membership is also available from the Association.

For nonmembers, the current annual subscription price is \$48.00 for a volume in paper form, and \$64.00 for a combination of paper and microform (microfiche or microfilm). Microfiche of each issue is sent by fast mail before the camera copy is sent to the printer. Microfilm copy of a volume is sent at the end of the year. It is available in 16mm positive or negative form, and may be ordered on spools or in Kodak or 3M cartridges.

Back volumes of the JOURNAL are available in paper form, on microfilm, and (beginning with Volume 44) on microfiche. Prices per volume in paper form are as follows: \$20.00 for Volumes 1–17, \$25.00 for Volumes 18–36, \$45.00 for Volume 37, \$53.00 for Volume 38, \$60.00 for Volumes 39–41, and \$72.00 for Volume 42 and later volumes. A Bibliography of Symbolic Logic by Alonzo Church (from Volumes 1 and 3) may be purchased separately; the price is \$9.00 for members or \$12.00 for nonmembers. Volume 45, Number 4, an index issue, is also available separately; the price is \$18.75 for members or \$25.00 for nonmembers. Prices for back volumes on microfilm or microfiche may be obtained by writing to the Association.

Applications for membership in the Association, requests for information, notices of change of address, and all business correspondence should be sent to *The Association for Symbolic Logic*, P. O. Box 6248, *Providence*, RI 02940. Dues and subscriptions to the JOURNAL should be sent to *The Association for Symbolic Logic*, P. O. Box 1571, Annex Station, Providence, RI 02901; all orders must be accompanied by payment.

Notices and announcements for publication in the JOURNAL should be sent to the Secretary of the Association, Louise Hay, Department of Mathematics, University of Illinois at Chicago Circle, Chicago, IL 60680.

Books for review in the JOURNAL should be sent to William Craig or Herbert Enderton, The Journal of Symbolic Logic, U.C.L.A., Los Angeles, CA 90024.

Articles being submitted for publication in the JOURNAL should be sent in duplicate to one of the following editors: Kit Fine, Department of Philosophy, University of Michigan, Ann Arbor, MI 48109; or Dagfinn Føllesdal, Department of Philosophy, University of Oslo, Blindern, Oslo 3, Norway; or Wilfrid Hodges, Bedford College, University of London, Regent's Park, London NWI 4NS, England; or Yiannis Moschovakis, Department of Mathematics, U. C. L. A., Los Angeles, CA 90024; or Anil Nerode, Department of Mathematics, Cornell University, Ithaca, NY 14850.

Each manuscript should be typewritten with wide margins and with double spacing between the lines. Footnotes should be numbered consecutively and should also be typed with wide margins and double spacing, preferably on a separate sheet. Two copies of the manuscript should be sent to the editor, and the author should also keep a complete copy. An article of more than thirty-two printed pages in length may be divided by the editors between two or more, not necessarily consecutive, numbers. Authors receive fifty reprints of each article and additional reprints may be purchased if desired.

Authors of papers (excluding reviews) accepted for publication in the JOURNAL are notified of the approximate number of printed pages. At that time they are asked, if funds are available from supporting institutions or grants, to arrange for payment of page charges of \$30.00 per printed page. This request involves no financial obligation for the author, and acceptance of the paper will not be affected by whether payment is made.

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.