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 Joan Bresnan M. J. Cresswell Martin D. Davis Solomon Feferman Frederic B. Fitch David Kaplan Saul A. Kripke 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 Bas van Fraassen

VOLUME 45

1980

Published quarterly by the Association for Symbolic Logic, Inc. with support from ICSU and from institutional and corporate members The four numbers of Volume 45 were issued at the following dates:

Number 1, pages 1-192, March 21, 1980 Number 2, pages 193-416, May 28, 1980 Number 3, pages 417-640, September 30, 1980 Number 4, pages 641-836, December 9, 1980

All numbers of this volume are copyrighted © 1980 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 45

ASH, CHRIS and ROSENTHAL, JOHN. Some theories associated with algebraically	
closed fields	359
BACON, JOHN. Substance and first-order quantification over individual-concepts	193
BADGER, LEE. Beth's property fails in $L^{<\omega}$	284
BAUMGARTNER, JAMES E. Chains and antichains in $\mathscr{P}(\omega)$	85
BELLER, AARON and LITMAN, AMI. A strengthening of Jensen's 🗆 principles	251
BENNISON, VICTOR L. Recursively enumerable complexity sequences and measure	
independence	417
BLOK, W. J. The lattice of modal logics: An algebraic investigation	221
ВО́нм, CORRADO and MICALI, SILVIO. Minimal forms in λ -calculus computations	165
BRUCE, KIM B. Model constructions in stationary logic. Part I. Forcing	439
CHERLIN, GREGORY. On ℵ ₀ -categorical nilrings. II	291
COHEN, DANIEL E. Degree problems for modular machines	510
DAVID, RENÉ. A result of relative consistency about the predicate WO(δ , x)	483
FITCH, FREDERIC B. A consistent combinatory logic with an inverse to equality	529
GARAVAGLIA, STEVEN. Decomposition of totally transcendental modules	155
GOSTANIAN, RICHARD. Constructible models of subsystems of ZF	237
GUASPARI, DAVID. Definability in models of set theory	9
HARNIK, VICTOR. Game sentences, recursive saturation and definability	35
HIRSCHFELD, JORAM. Finite forcing, existential types and complete types	93
HODES, HAROLD T. Jumping through the transfinite: The master code hierarchy	
of Turing degrees	204
HODGES, WILFRID. Constructing pure injective hulls	544
HOWARD, W. A. Ordinal analysis of terms of finite type	493
JECH, T., MAGIDOR, M. and PRIKRY, K. Precipitous ideals	1
KOPPELBERG, SABINE. Cardinalities of ultraproducts of finite sets	574
LEIVANT, DANIEL. Innocuous substitutions	363
Litman, Ami. See Beller, Aaron.	
MADDUX, ROGER. The equational theory of CA_3 is undecidable	311
MAGIDOR, M. See JECH, T.	
MANASTER, ALFRED B. and ROSENSTEIN, JOSEPH G. Two-dimensional partial	
orderings: Recursive model theory	121
Two-dimensional partial orderings: Undecidability	133
MANEVITZ, LARRY and STAVI, JONATHAN. Δ_2^0 operators and alternating sen-	
tences in arithmetic	144
MEAD, J. and NELSON, G. C. Model companions and k-model completeness for	
the complete theories of Boolean algebras	47

iv

MICALI, SILVIO. See BÖHM, CORRADO.	
NADEL, MARK. On a problem of MacDowell and Specker	612
NELSON, G. C. See MEAD, J.	
NISHIMURA, HIROKAZU. Sequential method in quantum logic	339
NORMANN, DAG and WAINER, STAN S. The 1-section of a countable functional.	549
PILLAY, ANAND. Theories with exactly three countable models and theories with	
algebraic prime models	302
PRIKRY, K. See JECH, T.	
PUTNAM, HILLARY. Models and reality	464
REMMEL, J. B. On r.e. and co-r.e. vector spaces with nonextendible bases	20
Recursion theory on orderings. II	317
ROSENSTEIN, JOSEPH G. See MANASTER, ALFRED B.	
ROSENTHAL, JOHN. See ASH, CHRIS.	
RUBIN, MATATYAHU and SHELAH, SAHARON. On the elementary equivalence of	
automorphism groups of Boolean algebras; downward Skolem Löwenheim theo-	
rems and compactness of related quantifiers	265
SATO, MASAHIKO. A cut-free Gentzen-type system for the modal logic S5	67
SCHMERL, JAMES H. Decidability and \aleph_0 -categoricity of theories of partially	
ordered sets	585
SHELAH, SAHARON. A note on cardinal exponentiation	56
Independence of strong partition relation for small cardinals, and the	
free-subset problem	505
Independence results	563
See Rubin, Matatyahu.	
SPECTOR, MITCHELL. A measurable cardinal with a nonwellfounded ultrapower	623
STARK, W. RICHARD. Martin's axiom in the model theory of L_A	172
STAVI, JONATHAN. See MANEVITZ, LARRY.	
STOLTENBERG-HANSEN, VIGGO. On computational complexity in weakly admis-	
sible structures	353
THOMAS, WOLFGANG. On the bounded monadic theory of well-ordered struc-	
tures	334
TUCKER, J. V. Computability and the algebra of fields: Some affine constructions	103
WAINER, STAN S. See NORMANN, DAG.	
WHEELER, WILLIAM H. Model theory of strictly upper triangular matrix rings	455
MEETINGS AND ABSTRACTS	
European meeting of the Association for Symbolic Logic, Mons, Belgium, 1978.	
By M. BOFFA and P. HENRARD	386
Abstracts of papers	386

TABLE OF CONTENTS

REVIEWS

Reviews	177
Reviews	369
Reviews	629

NOTICES

Notices	191
Notices	415
Notices	639
Notices	835

OFFICERS AND MEMBERS

List of officers a	and members	of the	Association f	for Sy	/mbolic	Logic	805
--------------------	-------------	--------	---------------	--------	---------	-------	-----

INDEXES

Index of contributed papers	643
Index of abstracts	669
Index of reviews by subjects	707

ERRATA

VOLUME 30

Page 452, line 16. For «XXI 373 (2, 3, 4)», read «XXI 372 (2, 3, 4)».

VOLUME 35

Page 671, line 3. For «562 (2)», read «569 (2)».

VOLUME 40

Page 711, column 1, line 20. For «Kliř», read «Klir». Page 744, column 1, line 23. For «Gross», read «Goss».

VOLUME 41

Page 752, line 13. For $\ll \supset_{avf}$, read $\ll \supset_{avF}$.

VOLUME 42

Number 3, cover 2, line 2. For «model», read «modal». Page iv, line 11. For «model», read «modal».

VOLUME 43

Page 154, line 24. For «PETER», read «PÉTER».

VOLUME 44

Number 3, cover 2, line 4. For «MILLER», read «MILLAR». Page 441, line 3. For «Madison 1978», read «Wrocław 1977».

Continued from inside front cover

Hodges, Bedford College, University of London, Regent's Park, London NW1 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.