THE

JOURNAL SYMBOLIC LOGIC

EDITED BY

ALONZO CHURCH BURTON S. DREBEN

AZRIEL LÉVY ANIL NERODE

DAGFINN FØLLESDAL GERALD E. SACKS

Managing Editor: ALFONS BORGERS

Consulting Editors:

ALAN ROSS ANDERSON YEHOSHUA BAR-HILLEL C. A. BAYLIS Jiří Bečvář JONATHAN F. BENNETT HANS HERMES PAUL BERNAYS ANDRZEJ BLIKLE C. C. CHANG WILLIAM CRAIG MARTIN DAVIS EDWARD E. DAWSON VERENA H. DYSON

CALVIN C. ELGOT EBERHARD M. FELS FREDERIC B. FITCH G. HASENJAEGER CAROL R. KARP H. JEROME KEISLER DONALD L. KREIDER DONALD MONK RICHARD MONTAGUE Andrzej Mostowski GERT H. MÜLLER F. C. OGLESBY

Rózsa Péter MICHAEL O. RABIN ABRAHAM ROBINSON GENE F. ROSE BARKLEY ROSSER ARTO SALOMAA KURT SCHÜTTE DANA SCOTT JOSEPH R. SHOENFIELD J. F. THOMSON JEAN VAN HEIJENOORT CHARLES E. M. YATES

VOLUME 36, NUMBERS 3-4

PUBLISHED QUARTERLY BY THE ASSOCIATION FOR SYMBOLIC LOGIC, INC WITH SUPPORT FROM THE U.S. NATIONAL SCIENCE FOUNDATION, FROM UNESCO THROUGH ICSU, AND FROM INSTITUTIONAL AND CORPORATE MEMBERS

THE

JOURNAL

OF

SYMBOLIC LOGIC

EDITED BY

ALONZO CHURCH Burton S. Dreben

Azriel Lévy ANIL NERODE DAGFINN FØLLESDAL GERALD E. SACKS

Managing Editor: ALFONS BORGERS

Consulting Editors:

ALAN ROSS ANDERSON Yehoshua Bar-Hillel C. A. BAYLIS Jiří Bečvář IONATHAN F. BENNETT HANS HERMES Paul Bernays Andrzei Blikle C. C. CHANG WILLIAM CRAIG MARTIN DAVIS EDWARD E, DAWSON VERENA H. DYSON

CALVIN C. ELGOT EBERHARD M. FELS FREDERIC B. FITCH G. HASENJAEGER CAROL R. KARP H. JEROME KEISLER DONALD L. KREIDER DONALD MONK RICHARD MONTAGUE Andrzej Mostowski GERT H. MÜLLER F. C. OGLESBY

Rózsa Péter MICHAEL O. RABIN ABRAHAM ROBINSON GENE F. ROSE BARKLEY ROSSER ARTO SALOMAA Kurt Schütte DANA SCOTT JOSEPH R. SHOENFIELD J. F. THOMSON JEAN VAN HEIJENOORT CHARLES E. M. YATES

Volume 36, Numbers 3-4 1971

Published quarterly by the Association for Symbolic Logic, Inc with SUPPORT FROM THE U.S. NATIONAL SCIENCE FOUNDATION, FROM UNESCO THROUGH ICSU, AND FROM INSTITUTIONAL AND CORPORATE MEMBERS

The four numbers of Volume 36 were issued at the following dates:

Number 1, pages 1-192, July 27, 1971

Number 2, pages 193-384, November 7, 1971

Number 3, pages 385-592, January 18, 1972

Number 4, pages 593-809, June, 1972

All numbers of this volume are copyrighted by the Association for Symbolic Logic, Inc. Reproduction of copyrighted numbers of the Journal by photostat, photo-print, 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 02904, U.S.A.

Reprinted 1985

TABLE OF CONTENTS

Trees. By Thomas J. Jech	1
Logical connectives for intuitionistic propositional logic. By DEAN P. McCullough	15
On size versus efficiency for programs admitting speed-ups. By John Helm and Paul Young	21
Support structures for the axiom of choice. By David Pincus	28
The generalized continuum hypothesis is equivalent to the generalized	
maximization principle. By JOEL I. FRIEDMAN	39
ω -homomorphisms and ω -groups. By C. H. APPLEBAUM	55
A minimal pair of Π_1° classes. By CARL G. JOCKUSCH, Jr. and ROBERT I. SOARE	66
On strongly minimal sets. By J. T. BALDWIN and A. H. LACHLAN	79
Semantics for RK _l . By M. K. RENNIE	97
The next admissible set. By K. J. BARWISE, R. O. GANDY and Y. N. MOSCHO-	
VAKIS	108
On the undecidability of finite planar graphs. By SOLOMON GARFUNKEL and	
HERBERT SHANK	121
A class of decidable intermediate propositional logics. By C. G. McKay	127
Weakly atomic-compact relational structures. By G. Fuhrken and W.	
TAYLOR	129
Reviews	141
Notice of the Association for Symbolic Logic	190
A symposium in honor of Alfred Tarski	190
Notice of a colloquium on exact philosophy	191
Some theorems on R-maximal sets and major subsets of recursively enumer-	
able sets. By Manuel Lerman	193
Infinitary analogs of theorems from first order model theory. By JEROME	216
MALITZ	216
Decision problems for tag systems. By Stål Aanderaa and Dag Belsnes.	229
On theories categorical in their own power. By H. JEROME KEISLER	240
On effectively discontinuous type-2 objects. By Thomas J. Grilliot	245
A logic stronger than intuitionism. By SABINE GÖRNEMANN	249
Two interpolation theorems for a Π_1^1 predicate calculus. By Shoji Maehara	0.00
and Gaisi Takeuti	262
Recursively enumerable sets which are uniform for finite extensions. By	271
DONALD A. ALTON	271
Natural well-orderings. By DAVID ISLES	288
Some contrasts between degrees and the arithmetical hierarchy. By ALFRED	201
B. MANASTER	301
On large cardinals and partition relations. By E. M. KLEINBERG and R. A.	205
SHORE	305
Can there be no nonrecursive functions? By Joan Rand Moschovakis .	309
Reviews	316
Notice of a meeting of the Association for Symbolic Logic	356
U.SJapan logic seminar, Tokyo 1969. By Gaisi Takeuti	357
Abstracts of papers	357
Chicago 1967 meeting of the Association for Symbolic Logic. By W. W. TAIT.	359
Madison 1970 meeting of the Association for Symbolic Logic. By H. JEROME	360
Keisler and Kenneth Kunen	368
Second Scandinavian Logic Symposium. By JENS ERIK FENSTAD	378
An application of nonstandard analysis to game theory. By EUGENE WESLEY.	385
On measures on complete Boolean algebras. By KAREL PRIKRY	395
Elementary embeddings and infinitary combinatorics. By Kenneth Kunen.	407
Resolution in type theory. By Peter B. Andrews	414

TABLE OF CONTENTS

A splitting theorem for simple Π_1^1 sets. By James C. Owings, Jr	433
A note on a theorem of Vaught. By Joseph G. Rosenstein	439
On the notion of algebraic closedness for noncommutative groups and fields.	
By Abraham Robinson	441
Incompleteness of a formal system for infinitary finite-quantifier formulas.	• • •
By John Gregory	445
A quasi-intuitionistic set theory. By Leslie H. Tharp	456
A remark on infinitary languages. By JÖRG FLUM	461
Nonstandard topology and extensions of monad systems to infinite points.	401
By Frank Wattenberg	463
Countable vector spaces with recursive operations. Part II. By J. C. E. DEKKER	477
Existence and feasibility in arithmetic. By Rohit Parikh	494
Reviews	509
	203
Meeting of the Association for Symbolic Logic, Santiago, Chile 1970. By	576
ROLANDO CHUAQUI	576
Abstracts of papers	576
Announcements of the journal Nous	580
Notice of a directory of historians of mathematics	580
Notice of a meeting of the Association for Symbolic Logic	580
Meeting of the Association for Symbolic Logic, Los Angeles, 1971. By	
David Kaplan	581
Abstracts of papers	581
Generalized prime models. By Robert Fittler	593
Negative solution of the decision problem for sentences true in every sub-	
algebra of $\langle N, + \rangle$. By Ralph McKenzie	607
Deducibility and many-valuedness. By D. J. SHOESMITH and T. J. SMILEY	610
Definability problems for modules and rings. By Paul Eklof and Gabriel	
SABBAGH	623
On descendingly incomplete ultrafilters. By KENNETH KUNEN and KAREL	
Prikry	650
Simplifications of the recursion scheme. By M. D. GLADSTONE	653
Reviews	666
Meeting of the Association for Symbolic Logic, Atlantic City, 1971. By	
MICHAEL O. RABIN and MICHAEL MORLEY	696
Abstracts of papers	696
Notice of two directories of philosophy	710
List of officers and members of the Association for Symbolic Logic	711
Index of reviews	753
Notice of a symposium on generalized recursion theory	809
Notice of a logic conference and meeting of the Association for Symbolic	
Logic, Orléans, France, 1972	809
Notice to logicians planning visits to Europe	809
The state of the s	