

CONTENTS OF VOLUME 87

AIREY, DYLAN, JACKSON, STEVE, and BILL, MANCE. Descriptive complexity in Cantor series.....	1023
ALVIR, RACHAEL, BURCHFIELD, HANNAH, and KNIGHT, JULIA F. Copying one of a pair of structures.....	1201
ALVIR, RACHAEL, CALVERT, WESLEY, GOODMAN, GRANT, HARIZANOV, VALENTINA, KNIGHT, JULIA, MILLER, RUSSELL, MOROZOV, ANDREY, SOSKOVA, ALEXANDRA, and WEISSHAAR, ROSE. Interpreting a field in its Heisenberg group.....	1215
ANDREWS, URI and SORBI, ANDREA. Initial segments of the degrees of ceers.....	1260
APTER, ARTHUR, W. Indestructibility when the first two measurable cardinals are strongly compact.....	214
ASPERÓ, DAVID and MOTA, MIGUEL ANGEL. Retraction – Measuring club-sequences together with the continuum large.....	870
BAAZ, MATTHIAS and ZACH, RICHARD. Epsilon theorems in intermediate logics.....	682
BERARDUCCI, ALESSANDRO and MAMINO, MARCELLO. Asymptotic analysis of Skolem’s exponential functions.....	758
BERG, INEKE VAN DER. see JANELIDZE, ZURAB	
BEZHANISHVILI, GURAM, CARAI, LUCA, and MORANDI, PATRICK J. Modal operators on rings of continuous functions.....	1322
BILL, MANCE. see AIREY, DYLAN	
BOUDOU, JOSEPH, DIÉGUEZ, MARTÍN, and FERNÁNDEZ-DUQUE, DAVID. Complete intuitionistic temporal logics for topological dynamics.....	995
BRAUNFELD, SAMUEL and LASKOWSKI, MICHAEL C. Counting siblings in universal theories.....	1130
BRENDLE, JÖRG and PARENTE, FRANCESCO. Combinatorics of ultrafilters on Cohen and random algebras.....	109
BURCHFIELD, HANNAH. see ALVIR, RACHAEL	
CALVERT, WESLEY. see ALVIR, RACHAEL	
CARAI, LUCA. see BEZHANISHVILI, GURAM	
CHASE, HUNTER and FREITAG, JAMES. Model theory and combinatorics of banned sequences.....	1
COLLA, EUGENIO and ZAMBELLA, DOMENICO. Ramsey’s coheirs.....	377
DAMJANOVIC, ZLATAN. Mutual interpretability of weak essentially undecidable theories.....	1374
DIÉGUEZ, MARTÍN. see BOUDOU, JOSEPH	
DOLICH, ALFRED, MILLER, CHRIS, SAVATOVSKY, ALEX, and THAMRONGTHANYALAK, ATHIPAT. Connectedness in structures on the real numbers: O-minimality and undecidability.....	1243
DOWNEY, ROD and HARRISON-TRAINOR, MATTHEW. A minimal set low for speed.....	1693
DOWNEY, ROD, GREENBERG, NOAM, HARRISON-TRAINOR, MATTHEW, PATEY, LUDOVIC, and TURETSKY, DAN. Relationships between computability-theoretic properties of problems.....	47
EGROT, ROB and HIRSCH, ROBIN. First-order axiomatisations of representable relation algebras need formulas of unbounded quantifier depth.....	1283
EHRlich, PHILIP and KAPLAN, ELLIOT. Surreal ordered exponential fields – Erratum.....	871
ELEKES, MÁRTON, FLESCH, JÁNOS, KISS, VIKTOR, NAGY, DONÁT, POÓR, MÁRK, and PREDTETCHINSKI, ARKADI. Games characterizing limsup functions and Baire class 1 functions.....	1459
ESKEW, MONROE and FRIEDMAN, SY-DAVID. Embeddings into outer models.....	1301
ETEDADIALIABADI, MAHMOOD and GAO, SU. On extensions of partial isomorphisms.....	416
FARKAS, BARNABÁS and ZDOMSKYY, LYUBOMYR. Ways of destruction.....	938
FERNÁNDEZ-DUQUE, DAVID. see BOUDOU, JOSEPH	
FERREIRA, SALVADOR GARCÍA and GUZMÁN, OSVALDO. More on Fréchet–Urysohn ideals....	829
FILIPÓW, RAFAŁ and KWELA, ADAM. Yet another ideal version of the bounding number.....	1065
FISCHER, VERA and MONTROYA, DIANA CAROLINA. Higher independence.....	1606

FLESCH, JÁNOS. see ELEKES, MÁRTON	
FREITAG, JAMES. see CHASE, HUNTER	
FRIEDMAN, SY-DAVID. see ESKEW, MONROE	
GALATOS, NIKOLAOS and JOHN, GAVIN ST. Most simple extensions of FL_c are undecidable	1156
GANCHEV, HRISTO A., SH, KALIMULLIN, ISKANDER, MILLER, JOSEPH S., and SOSKOVA, MARIYA I. A structural dichotomy in the enumeration degrees	527
GAO, SU, JACKSON, STEVE, KROHNE, EDWARD, and SEWARD, BRANDON. Forcing constructions and countable Borel equivalence relations	873
GAO, SU. see ETEDADIALIABADI, MAHMOOD	
GOLDBRING, ISAAC and KEISLER, H. JEROME. Continuous sentences preserved under reduced products	649
GOODMAN, GRANT. see ALVIR, RACHAEL	
GREENBERG, NOAM. see DOWNEY, ROD	
GUZMÁN, OSVALDO. see FERREIRA, SALVADOR GARCÍA	
HAMKINS, JOEL DAVID and WILLIAMS, KAMERYN J. The Σ_1 -definable universal finite sequence	783
HARIZANOV, VALENTINA. see ALVIR, RACHAEL	
HARRISON-TRAINOR, MATTHEW and MONTALBÁN, ANTONIO. The tree of tuples of a structure.....	21
HARRISON-TRAINOR, MATTHEW. see DOWNEY, ROD	
———, see DOWNEY, ROD	
HAWTHORNE, CHRISTOPHER. Contributions to the theory of F -automatic sets	127
HAYUT, YAIR and MAGIDOR, MENACHEM. Subcompact cardinals, type omission, and ladder systems	1111
HAYUT, YAIR, MAGIDOR, MENACHEM, and POVEDA, ALEJANDRO. Identity crisis between supercompactness and Vöpenka's principle.....	626
HIRSCH, ROBIN. see EGROT, ROB	
JACKSON, STEVE. see AIREY, DYLAN	
———, see GAO, SU	
JACOBSEN-GROCOTT, JOSIAH. A characterization of the strongly η -representable many-one degrees.....	1631
JANELIDZE, ZURAB and BERG, INEKE VAN DER. A Dedekind-style axiomatization and the corresponding universal property of an ordinal number system	1396
JOHN, GAVIN ST. see GALATOS, NIKOLAOS	
JOHNSON, WILL and YAO, NINGYUAN. On non-compact p -adic definable groups.....	188
JOHNSTON, REESE and RAGHAVAN, DILIP. Complexity of index sets of descriptive set-theoretic notions	894
KAPLAN, ELLIOT. see EHRLICH, PHILIP	
KAPLAN, ITAY, SEGEL, ORI, and SHELAH, SAHARON. Boolean types in dependent theories	1349
KEISLER, H. JEROME. see GOLDBRING, ISAAC	
KENTARO, SATO. see NEMOTO, TAKAKO	
KHANIKI, ERFAN. New relations and separations of conjectures about incompleteness in the finite domain.....	912
KHOUSSAINOV, BAKH and TAKISAKA, TORU. Infinite strings and their large scale properties.....	585
KISS, VIKTOR. see ELEKES, MÁRTON	
KNIGHT, JULIA F. see ALVIR, RACHAEL	
KNIGHT, JULIA. see ALVIR, RACHAEL	
KRAJÍČEK, JAN. Information in propositional proofs and algorithmic proof search.....	852
KROHNE, EDWARD. see GAO, SU	
KWELA, ADAM and LEONETTI, PAOLO. Density-like and generalized density ideals.....	228
———, see FILIPÓW, RAFAŁ	
LASKOWSKI, MICHAEL C. see BRAUNFELD, SAMUEL	

LÁVIČKA, TOMÁŠ and VERNER, JONATHAN L. Completely separable MAD families and the modal logic of $\beta\omega$	498
LEONETTI, PAOLO. see KWELA, ADAM	
LIANG YU. see PAULY, ARNO	
LIU, LU and PATEY, LUDOVIC. The reverse mathematics of the thin set and Erdős–Moser theorems	313
MAGIDOR, MENACHEM. see HAYUT, YAIR	
———, see HAYUT, YAIR	
MAMINO, MARCELLO. see BERARDUCCI, ALESSANDRO	
MATET, PIERRE. Applications of PCF theory to the study of ideals on $P_\kappa(\lambda)$	967
MATTHEWS, RICHARD. Taking Reinhardt’s power away	1643
MEIR, NADAV. Pseudo-finite sets, pseudo-o-minimality—Erratum.....	436
MILLER, CHRIS. see DOLICH, ALFRED	
MILLER, JOSEPH S. GANCHEV, HRISTO A.	
MILLER, RUSSELL. HTP-complete rings of rational numbers.....	252
———, see ALVIR, RACHAEL	
MONTALBÁN, ANTONIO. see HARRISON-TRAINOR, MATTHEW	
MONTOYA, DIANA CAROLINA. see FISCHER, VERA	
MORANDI, PATRICK J. see BEZHANISHVILI, GURAM	
MORASCHINI, TOMMASO. On equational completeness theorems	1522
MORGAN, CHARLES. Mitchell-inspired forcing, with small working parts and collections of models of uniform size as side conditions, and gap-one simplified morasses.....	392
MOROZOV, ANDREY. see ALVIR, RACHAEL	
MOTA, MIGUEL ANGEL. see ASPERÓ, DAVID	
NAGY, DONÁT. see ELEKES, MÁRTON	
NEMOTO, TAKAKO and KENTARO, SATO. A marriage of Brouwer’s intuitionism and Hilbert’s finitism I: arithmetic.....	437
NORMANN, DAG and SANDERS, SAM. On the uncountability of \mathbb{R}	1474
PARENTE, FRANCESCO. see BRENDLE, JÖRG	
PASTEN, HECTOR. Notes on the DPRM property for listable structures	273
PATEY, LUDOVIC. Ramsey-like theorems and moduli of computation	72
———, see DOWNEY, ROD	
PATEY, LUDOVIC. see LIU, LU	
PAULY, ARNO, WESTRICK, LINDA, and LIANG YU. Luzin’s (N) and randomness reflection.....	802
POÓR, MÁRK. see ELEKES, MÁRTON	
POVEDA, ALEJANDRO. see HAYUT, YAIR	
PREDTETCHINSKI, ARKADI. see ELEKES, MÁRTON	
RAGHAVAN, DILIP. see JOHNSTON, REESE	
ROSSEGGER, DINO. Degree spectra of analytic complete equivalence relations	1663
SAMI, RAMEZ L. Variations on Δ^1_1 determinacy and \aleph_{ω_1}	721
SANDERS, SAM. see NORMANN, DAG	
SAVATOVSKY, ALEX. see DOLICH, ALFRED	
SCHILHAN, JONATHAN. Tree forcing and definable maximal independent sets in hypergraphs	1419
SCHINDLER, RALF and WILSON, TREVOR M. The consistency strength of the perfect set property for universally Baire sets of reals	508
SEGEL, ORI. see KAPLAN, ITAY	
SELIVANOV, VICTOR. A Q-Wadge hierarchy in quasi-Polish spaces	732
SEWARD, BRANDON. see GAO, SU	
SH, KALIMULLIN, ISKANDER. see GANCHEV, HRISTO A.	
SHELAH, SAHARON. see KAPLAN, ITAY	
SORBI, ANDREA. see ANDREWS, URI	
SOSKOVA, ALEXANDRA. see ALVIR, RACHAEL	
SOSKOVA, MARIYA I. see GANCHEV, HRISTO A.	
SZEWCAK, PIOTR and WEISS, TOMASZ. Null sets and combinatorial covering properties	1231

TACHTSIS, ELEFTHERIOS. Almost disjoint and MAD families in vector spaces and choice principles	1093
TAKISAKA, TORU. see KHOUSSAINOV, BAKH	
TARAFDER, SOURAV. Non-classical foundations of set theory	347
TEOH, ZU YAO. Structural considerations of Ramsey algebras	1677
THAMRONGTHANYALAK, ATHIPAT. see DOLICH, ALFRED	
TURETSKY, DAN. see DOWNEY, ROD	
VASEY, SEBASTIEN. On categoricity in successive cardinals	545
VERNER, JONATHAN L. see LÁVIČKA, TOMÁŠ	
VIDAL, AMANDA. Undecidability and non-axiomatizability of modal many-valued logics	1576
WEISS, TOMASZ. see SZEWCZAK, PIOTR	
WEISSHAAR, ROSE. see ALVIR, RACHAEL	
WELCH, PHILIP D. Closed and unbounded classes and the Härtig quantifier model	564
WESTRICK, LINDA. see PAULY, ARNO	
WILLIAMS, KAMERYN J. see HAMKINS, JOEL DAVID	
WILSON, TREVOR M. see SCHINDLER, RALF	
YAACOV, ITAI BEN. Reconstruction of non- \aleph_0 -categorical theories	159
YAO, NINGYUAN. see JOHNSON, WILL	
ZACH, RICHARD. see BAAZ, MATTHIAS	
ZAMBELLA, DOMENICO. see COLLA, EUGENIO	
ZDOMSKYY, LYUBOMYR. see FARKAS, BARNABÁS	
ZINDULKA, ONDŘEJ. Meager-additive sets in topological groups	1046



**UNITED STATES
POSTAL SERVICE®**

**Statement of Ownership, Management, and Circulation
(All Periodicals Publications Except Requester Publications)**

1. Publication Title Journal of Symbolic Logic	2. Publication Number 4 - 010	3. Filing Date 10/1/2022
4. Issue Frequency quarterly March-June-September-December	5. Number of Issues Published Annually 4	6. Annual Subscription Price \$528.00
7. Complete Mailing Address of Known Office of Publication (Not printer) (Street, city, county, state, and ZIP+4®) Association for Symbolic Logic Department of Mathematics University of Connecticut		Contact Person Richard A Shore Telephone (Include area code) 607-279-6135
8. Complete Mailing Address of Headquarters or General Business Office of Publisher (Not printer) Association for Symbolic Logic Department of Mathematics University of Connecticut		
9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor (Do not leave blank)		
Publisher (Name and complete mailing address) Richard A Shore 14 Kenwood Avenue Newton MA 024569		

Editor (Name and complete mailing address)
Enrique Casanovas, Department of Mathematics and Computer Science, University of Barcelona, Gran Via 585, 08007 Barcelona, Spain

Managing Editor (Name and complete mailing address)
Enrique Casanovas, Department of Mathematics and Computer Science, University of Barcelona, Gran Via 585, 08007 Barcelona, Spain

10. Owner (Do not leave blank. If the publication is owned by a corporation, give the name and address of the corporation immediately followed by the names and addresses of all stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, give the names and addresses of the individual owners. If owned by a partnership or other unincorporated firm, give its name and address as well as those of each individual owner. If the publication is published by a nonprofit organization, give its name and address.)

Full Name	Complete Mailing Address
Association for Symbolic Logic	Department of Mathematics University of Connecticut 341 Mansfield Road, U-1009 Storrs, CT 06269-1009, USA

11. Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities. If none, check box None

Full Name	Complete Mailing Address

12. Tax Status (For completion by nonprofit organizations authorized to mail at nonprofit rates) (Check one)
The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes:
 Has Not Changed During Preceding 12 Months
 Has Changed During Preceding 12 Months (Publisher must submit explanation of change with this statement)

13. Publication Title		14. Issue Date for Circulation Data Below	
Journal of Symbolic Logic		JUNE 2022	
15. Extent and Nature of Circulation		Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
a. Total Number of Copies (<i>Net press run</i>)		878	561
b. Paid Circulation (<i>By Mail and Outside the Mail</i>)	(1) Mailed Outside-County Paid Subscriptions Stated on PS Form 3541 (Include paid distribution above nominal rate, advertiser's proof copies, and exchange copies)	207	194
	(2) Mailed In-County Paid Subscriptions Stated on PS Form 3541 (<i>Include paid distribution above nominal rate, advertiser's proof copies, and exchange copies</i>)	0	0
	(3) Paid Distribution Outside the Mails Including Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Paid Distribution Outside USPS®	316	315
	(4) Paid Distribution by Other Classes of Mail Through the USPS (e.g., First-Class Mail®)	0	0
c. Total Paid Distribution [<i>Sum of 15b (1), (2), (3), and (4)</i>]		524	509
d. Free or Nominal Rate Distribution (<i>By Mail and Outside the Mail</i>)	(1) Free or Nominal Rate Outside-County Copies included on PS Form 3541	0	0
	(2) Free or Nominal Rate In-County Copies Included on PS Form 3541	0	0
	(3) Free or Nominal Rate Copies Mailed at Other Classes Through the USPS (e.g., First-Class Mail)	0	0
	(4) Free or Nominal Rate Distribution Outside the Mail (<i>Carriers or other means</i>)	0	0
e. Total Free or Nominal Rate Distribution (<i>Sum of 15d (1), (2), (3) and (4)</i>)		0	0
f. Total Distribution (<i>Sum of 15c and 15e</i>)		524	509
g. Copies not Distributed (<i>See Instructions to Publishers #4 (page #3)</i>)		355	52
h. Total (<i>Sum of 15f and g</i>)		878	561
i. Percent Paid (<i>15c divided by 15f times 100</i>)		100%	100%

* If you are claiming electronic copies, go to line 16 on page 3. If you are not claiming electronic copies, skip to line 17 on page 3.



Statement of Ownership, Management, and Circulation
(All Periodicals Publications Except Requester Publications)

16. Electronic Copy Circulation

	Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
a. Paid Electronic Copies		
b. Total Paid Print Copies (Line 15c) + Paid Electronic Copies (Line 16a)		
c. Total Print Distribution (Line 15f) + Paid Electronic Copies (Line 16a)		
d. Percent Paid (Both Print & Electronic Copies) (16b divided by 16c × 100)		

I certify that 50% of all my distributed copies (electronic and print) are paid above a nominal price.

17. Publication of Statement of Ownership

If the publication is a general publication, publication of this statement is required. Will be printed

Publication not required.

in the December issue of this publication.

18. Signature and Title of Editor, Publisher, Business Manager, or Owner

Date

Richard A Shore

10/1/2022

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

THE JOURNAL OF SYMBOLIC LOGIC (ISSN print: 0022-4812, ISSN online: 1943-5886) is published quarterly, in the months of March, June, September, and December, by the Association for Symbolic Logic, Inc., Department of Mathematics, University of Connecticut, 341 Mansfield Road, U-1009, Storrs, CT 06269-1009, USA. Periodicals postage is paid at Storrs CT and at additional mailing offices. The JOURNAL is distributed with THE BULLETIN OF SYMBOLIC LOGIC. The 2022 annual subscription price for the two journals, in either print or electronic form, is US\$1005 or £630; the print/electronic bundle prices are \$1153 or £724: visit <http://cambridge.org/bsl> for more information. **Postmaster:** Send address changes to **Journals Customer Services Department, Cambridge University Press, One Liberty Plaza, New York, NY 10006, USA.** Business correspondence should be sent to the Secretary-Treasurers of the Association, Russell Miller and David Solomon (address below).

Subscription orders for the JOURNAL and BULLETIN, or REVIEW should be sent to subscriptions.newyork@cambridge.org. All orders must be accompanied by payment by check, credit card (Visa, MasterCard, JCB or American Express only), or debit card. To receive a replacement copy of the JOURNAL, please report damaged, defective or missing issues within nine months of the date of publication.

All back volumes of the JOURNAL are available: volumes 1 through 74 are via JSTOR; volumes 1 through 85 via Cambridge University Press, <http://journals.cambridge.org/jsl> – access to the latter is free to members. Volume 26 is an index for Volumes 1–26, and Number 4 of Volume 45 is an index for Volumes 27–45. Number 4 of Volume 55 is a cumulative index for Volumes 27–55 (it includes the index published in Volume 45, Number 4, except for listings of reviews by subject, which has been discontinued). A revised edition of **A Bibliography of Symbolic Logic**, by Alonzo Church, may be purchased separately. Members of the Association may purchase back volumes for their personal use at a 50% discount. The discount also applies to institutional members. Orders should be sent to **Cambridge University Press**, address above. Reviews of articles and books in logic which in the past were published in the JOURNAL have been moved to the BULLETIN, beginning with the March 2000 issue.

Individual membership in the Association is open to anyone interested in its work. Annual dues for members are US\$102, £78 sterling or €85 (\$51, £39 sterling or €43 for student, emeritus and unemployed members; see <http://asonline.org/membership/individual-membership/> for more information, including conditions and privileges). Dues include subscriptions to the current volumes of the JOURNAL, the BULLETIN, and the REVIEW.

Institutional membership in the Association is available to any academic institution or department. Annual institutional membership dues for 2022 are US\$1200 (full) or \$790 (basic); privileges include choices of current subscriptions, back volumes, and student memberships.

Requests for information, applications for *new* membership, renewals of institutional membership, business correspondence, and notices or announcements for publication in the BULLETIN should be sent to **ASL, Department of Mathematics, University of Connecticut, 341 Mansfield Road, U-1009, Storrs, CT 06269-1009, USA.** The electronic mail address of the Association's business office is asl@uconn.edu. Requests for back issues should be sent to Cambridge University Press, address above.

POSTMASTER: Individual membership *renewals*, notices of change of address, and dues payments, should be sent to **Association for Symbolic Logic, c/o Journals Customer Services Department, Cambridge University Press, One Liberty Plaza, New York, NY 10006, USA**, USmemberservices@cambridge.org.

The paper used in the JOURNAL is acid-free and falls within the guidelines established to ensure permanence and stability.

The JOURNAL has been registered with the Copyright Clearance Center, Inc. The appearance of a code at the bottom of the first page of an article indicates the copyright owner's consent for copying beyond that permitted by Sections 107 or 108 of the US Copyright Law, provided that the per-copy fee stated in the code is paid directly to **Copyright Clearance Center Inc., 222 Rosewood Drive, Danvers, MA 01923, USA.** This consent does not extend to copying for general distribution, for advertising or promotion purposes, for creating new collective works, or for resale. Specific written permission for such copying must be obtained from the Association.

Cambridge Core

For further information about this journal
please go to the journal web site at:

[cambridge.org/jsl](https://doi.org/10.1017/jsl)



CAMBRIDGE
UNIVERSITY PRESS