Achievements and List of Publications
Prof. emeritus J.A. Makowsky (since 2016)

February 18, 2023

Current fields of research activity: Graph polynomials; Algorithms for graph invariants; Algorithms and descriptive complexity theory; complexity of real and algebraic computations

Past fields of research activity: Mathematical logic, Model theory; Design and theory of databases; Logic in computer science and AI and Logic programming.

Personal Data

Name: Johann Andreas Makowsky

Born: 1948, Budapest (Hungary)

Status: Married, two children

Citizenship: Swiss (Zurich), permanent resident status in Israel

Languages: German, French, English (fluent speaking and writing), Italian and Hebrew (good speaking, limited writing)

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Contents

1   Major Achievements

1.1   Scientific recognition

The common thread in my research is *Model Theory*, a branch of mathematical logic dealing with the mathematical treatment of problems of semantics. From this I was led to do research also in Database Theory, Theory of Programming Languages and their Verification, Data Modeling and Software Engineering, and more recently, Algorithmic Graph Theory and Knot Theory, and a General Theory of Graph Polynomials.

Plenary speaker at major conferences

In each of these fields I received international recognition as a plenary speaker at the respective international conferences.

- Annual European Conference of the Association of Symbolic Logic (Logic Colloquium), twice ;

- Annual meeting of the European Association of Computer Science Logic (CSL), three times;

- Mathematical Foundations of Computer Science (MFCS);

- International Conference on Conceptual Modeling (ER);

- International Conference on Logic for Programming Artificial Intelligence and Reasoning (LPAR);

- Indian Conference on Logic and its Applications (ICLA);

- Computing in Europe (CiE);

- Australasian Logic Conference.

For my 60th birthday in 2008 a special international workshop *Bridging Logic and Computer Science* was organized preceeding the Annual EACSL conference CSL'08 in Bertinoro, Italy, cf. `http://csl2008.cs.unibo.it/program.pdf`. A special issue of *Fundamenta Informaticae*, vol. 98 (2010), was published with some of the papers presented at this workshop.

Program and steering committees

I have served on many program committees of conferences in logic and its applications, and twice I was program committee co-chair: In 1995 for Annual European Meeting of the ASL (Logic Colloquium'95) in Haifa, and in 2003 for the Annual Meeting of the European Association of Computer Science Logic (EACSL) CSL'03 in Vienna. I also served (or still serve) on the Steering Committee of ESSLLI (European Summer School of Logic, Language and Information) and of LICS (IEEE Conference on Logic in Computer Science). I was invited together with M. Grohe to organize a *Joint Special Session* on *Model Theoretic Methods in Finite Combinatorics* at the Annual Joint AMS-ASL Meeting of 2009 (American Mathematical Society and Association of Symbolic Logic).

Editorial responsibilities

I have served on the editorial boards of

- *Archive for Mathematical Logic* (Guest editor);

- *Israel Journal of Mathematics* (Guest editor);

- *Elemente der Mathematik* (Guest editor);

- *Annals of Pure and Applied Logic* (Editor);

- *Methods of Logic in Computer Science* (Editor);

- *Journal of Applied Logic* (Area editor for mathematical logic);

- *Journal of Algorithms, in Cognition, Informatics and Logic* (Area editor for Algorithms in Logic and Decision Procedures);

- *Fundamenta Informaticae* (Editor);

- *Mathematical Logic Quarterly* (Editor);

- *Logical Methods in Computer Science* (Advisory Board).

International professional organizations

EACSL Presidency In 1992 I was among the founding members of the European Association of Computer Science Logic (EACSL) serving since then on its schientific council. In 2002 I was elected vice-president of EACSL. In 2004, upon the premature resignation of the president, I was elected its president (till 2009). Although I was asked to serve a second 5 year term, I stepped down to make place for younger people, I was reelected to the board for another 5 years.

During my presidency I have initiated the now well recognized **Ackermann Award**, and I have strengthened international cooperation between EACSL and other organizations dealing with Logic in Computer Science (LiCS, CiE, ESSLLI, Kurt Goedel Society and EATCS).

LICS Steering Committee From 2004-2009 I served on the LICS Steering Committee as the delegate of EACSL.

Ackermann Award Jury In the capacity of the president of EACSL I served as the chairman of the Jury of the Ackermann Award, the EACSL Outstanding Dissertation Award for Logic in Computer Science.

Other Organizations From 1998-2010 I served for two terms on the board of DVMLG (Deutsch Vereining für Mathematische Logic), the Association of Logic in German speaking countries. During my terms I successfully argued for the internationalization and modernization of DVMLG and initiated its involvement in publishing. I also served on the Council of the Association of Logic in India from 2007-2012.

1.2   Comments on selected papers

My research interests include Model Theory (Classical Model Theory, Abstract Model Theory, Finite Model Theory), Semantics of Programming Languages (Database Theory, Program Verification, Logic Programming), Logic and Complexity. Since 1995 my work concentrated more on Applications of Logic to Graph Theory, Knot Theory and Combinatorics. In each of these areas I made significant contributions. Since 2005 my work concentrates on a model theoretic view of Graph Polynomials and Combinatorial Counting Functions.

Model Theory

My work of 1971-1974 in classical model theory, [1], is referenced in the two major monographs by C.C. Chang and J. Keisler (Model Theory, 3rd edition 1991) and W. Hodges (Model Theory, 1993) and the more specialized monographs by B. Zil'ber (Uncountable Categorical Theories, 1993). The book of M. G. Peretyat'kin (Finitely Axiomatizable Theories, 1997) develops a rich theory

of work done by the author between 1982 and 1993 which was initiated by my Master Thesis of 1971. In P. Rothmaler's Monograph (Introduction to Model Theory, 2000) a whole chapter is devoted to my results of 1971. After my early success in classical Model Theory, I spent two periods of six months in Warsaw, and, under the influence of W. Marek and A. Mostowwski, I turned to Abstract Model Theory.

Abstract Model Theory and Abstract Elementary Classes

My PhD theses marked the beginning of my work in Abstract Model Theory. My papers in abstract model theory (1973-1984) are widely referenced. The multi-author monograph 'Model Theoretic Logics' (J. Barwise and S. Feferman eds., 1985) gives best testimony for this: Besides my own three chapters (one with D. Mundici), many other chapters quote my work. In chapter 18, [1], I present (ca. 80 pages) S. Shelah's and my own contribution to the field. I also initiated and supervised the MSc thesis of Sakae Fuchino, which was published as {em On the categoricity theorem in $L_{\omega_1,\omega}$, Tsukuba Journal of Mathematics, Vol.10, No.1 (1986), 117120.

In chapter 20, [3] I gave the first published presentation of S. Shelah's then unpolished results on "Abstract embedding relations". Both chapters also contain relevant original contributions to the field obtained before 1982 by myself.

It should be noted that later S. Shelah and R. Grossberg renamed the *"Abstract embedding relations"* into *"Abstract Elementary Classes"* and, due to this, Shelah's and my pioneering work from before 1982 was often overlooked.

Database Theory

Between 1978-1980, while visiting the Heberew University, I started to work with Catriel Beeri on the foundations of database theory. Due to my appointment at the Technion–Israel Institute of Technology in the Department of Computer Science, I abandoned my work in Abstract Model Theory.

As a result of my work with Catriel Beeri, mostly unpublished, C. Beeri and M. Vardi picked up many themes I had discussed with C. Beeri before. However, I was the first to define a framework for database dependencies, and to prove undecidability results in this framework. My contributions to *Database Theory* (1980-1995) are referenced in most of the recent Database Theory monographs, but most prominently in the monographs by Ullman (1983), by Abiteboul, Hull and Vianu (Foundations of Databases, 1995), by Mannila and Räihä (The Design of Relational databases, 1992), by M. Levene and G. Loizou (A Guided Tour of Relational Databases and Beyond), and by B. Thalheim (Fundamentals in Entity-Relationship Modelling, 2000). Three contributions in Database Theory had considerable impact. In my paper with A. Chandra and H. Lewis (1980) we gave the first complexity analysis in the emerging field of database dependencies; in my papers with E. Dahlhaus (1985) we anticipated the emerging field

of complex databases and clarified the notion of computable queries over hereditary finite structures; and in my papers with V. Markovits and N. Rotics we contributed to the mathematical foundations of the Entity–Relationship Model. More recently, together with E. Ravve, I returned to the study of the foundations of database design. For this work I was invited to hold a key note address at the 15th International Conference on Conceptual Modeling in 1996. In 2012 I returned to work with E. Ravve and we laid the proper foundations for the role of Boyce-Codd Normalform in database design.

The most important papers in this line of research are [81], [83], [93], [95], [22], [32], [157]. The papers [81], [22], have over 100 Google citations.

Satisfiability and Logic Programming

My paper *Why Horn formulas matter in computer science* addressed the question why Horn formulas (a special class of first order formulas) play a prominent role both in Database Dependencies and in Logic Programming. The paper gives a semantic characterization of Horn formulas (and some generalizations thereof) which explained to a large extent why Negation by Failure has a simple semantics in Logic Programming when restricted to Horn formulas. In another paper with A. Itai, we were the first to show that propositional Horn formulas have a linear satisfiability problem. My paper with A. Sharell *On Average Case Complexity of* **SAT** *for Symmetric Distributions* explains to a large extent why **SAT** can be solved efficiently on the average and was discussed prominently in the historic survey by S. Cook and D. Mitchell *Finding Hard Instances of the Satisfiability Problem: A survey* (DIMACS Series vol. 35, 1997).

The most important papers in this line of research are [18], [19], [45], [27], where the first three have over 100 Google citations.

Finite Model Theory

In 1994, I returned to the theory of generalized quantifiers in the context of *Finite Model Theory and its interaction with Complexity Theory.* Together with Y. Bargury, A. Calò, B. Courcelle, M. Frick, Y. Pnueli and U. Rotics I wrote eleven papers investigating the expressive power of fragments of second order logic and their relationship to complexity classes. I was invited twice (1997, 1999) to give an advanced summer course on these topics at the European Summer School in Logic, Language and Information (ESSLLI). Some of this recent work is already referenced in the monographs by N. Immerman (Descriptive Complexity, 1998) and L. Libkin (Elements of Finite Model Theory, 2004).

The most important papers in this line of research are [98]. [99]. [28], [104], [106], [39], [41], [63], [102].

Clique-width and the Algorithmic Use of Structural Graph Theory

Starting in 1995, I began to work on graph algorithms and on exploiting the fact that many artefact structures have low clique width. With B. Courcelle, E. Fischer, M. Lotz, J. Mariño, K. Meer, E. Ravve and U. Rotics, I have written papers showing that on structures of bounded clique width polynomial time algorithms can be found to compute graph polynomials, knot polynomials and the characteristic polynomial of SAT. Alone, I have put this phenomenon into the larger context of a very general version of the Feferman-Vaught Theorem. This work (over 50 pages) appeared in the special issue of the Annals of Pure and Applied Logic dedicated to A. Tarski's centennary, [41], with over 250 Google citations. I was also the first to show that this technique can be extended to compute the Jones polynomial in knot theory, [43], [37].

I was invited to present this result in 2003 at the three week mini-semester "Knots in Poland" and my paper with M. Lotz appeared in the special issue of Advances in Applied Mathematics on the Tutte polynomial. My papers with Courcelle and Rotics, published around 2000, [34], [35], have by now advanced to be my most quoted paper with over 850, respectively over 250 Google citations. I was invited to give mini-courses on these results in Bordeaux in 2001, at BRICS Summer School also in 2001 and at the European Summer School in Logic, Language and Information (ESSLLI) in 2003.

The most important papers in this line of research are [30], [33], [122], [36], [39], [40], [45]. Surprisingly, there was also a paper applying these methods to quantum computations, which shows that quantum FFT can be classically simulated, [44], which so far has had 39 Google citations.

Towards a general theory of Graph Polynomials

Beginning in 2003, my work deals with the development of a general theory of graph polynomials (including knot polynomials) and their complexity. I was the first to show that the knot invariant called the Jones polynomials is Fixed Parameter Tractable for knot diagrams of tree-width k, [43], with further results in [38].

I have worked in this field with M. Blaeser, H. Dell, P. Tittmann (Germany), A. Goodall, S. Noble and B. Zilber (Great Britain), and M. Hermann (France), E.V. Ravve (Israel), and my graduate students I. Averbouch, B. Godlin, and T. Kotek, and more recently with V. Rakita. I have outlined a research program in my paper *From a zoo to a zoology: towards a general theory of graph polynomials* [47], and I have received an ISF-grant (2007-2010) for this project. The most relevant papers within this program are [50], [51], [160], [69], [71],

Complexity issues of graph polynomials are treated in [151], [40], [49], [66], [164],

The Joint Special Session at the AMS-ASL Meeting of 2009 January 5-8, 2009, Washington, D.C., on *Model Theoretic Methods in Finite Combinatorics*

was largely dedicated to this project at large. Articles emanating from this Special Session did appear in December 2011 as a book in the prestigious series of the American Mathematical Society *Contemporary Mathematics, vol. 558* under the same title, edited by M. Grohe and myself.

In the 12 journal papers 37-40, 43, 46, 48-51, 53-54, the two book chapters 14-15, and the 14 conference papers 41-44, 47-56 I have, together with my co-authors, developed a general theory of graph polynomials. This work is widely acclaimed and in the last few years I was invited to several international conferences and workshops in combinatorics, model theory and logic in computer science to present this work (CiE'2008, ICLA'2009, WoLLIC'2010, FoCM'2011, 12th Asian Logic Conference 2011, CIRM 2008, Bedlevo 2009, AlMoTh'2009, Hranice Castle 2009, Dagstuhl 2010 from the list in my CV).

With my collaborators we have managed to create a new field in graph theory with two Dagstuhl Seminars, two Special sessions at AMS meetings and one SIAM minisymposium.

2009 AMS-ASL Special Session on *Model Theoretic Methods in Finite Combinatorics*, January 2009, Washington DC,
Organizers: M. Grohe and J.A. Makowsky

2014 SIAM Conference on Discrete Mathematics, Minneapolis, June 2014
Minisymposium: *Graph Polynomials: Towards a General Theory*,
Organizers: Jo Ellis-Monaghan, Andrew Goodall and J.A. Makowsky

2016 Dagstuhl Seminar 16241:
Graph Polynomials: Towards a Comparative Theory,
Organizers: Jo Ellis-Monaghan, Andrew Goodall, Johann A. Makowsky, Iain Moffatt

2019 Dagstuhl Seminar 19401: *Comparative Theory for Graph Polynomials*
Organizers: Jo Ellis-Monaghan, Andrew Goodall, Iain Moffatt, Kerri Morgan

2022 Special Session on
Graph and Matroid Polynomials: Towards a Comparative Theory,
AMS-SMF-EMS Joint International Meeting, Grenoble, France, July 2022
Organizers: E.Gion, J.A.Makowsky and J.Oxley

Recurrence Relations for Combinatorial Functions

Starting with open problems in the work of C. Blatter and E. Specker from 1984[1], I got interested in combinatorial functions and their linear recurrence

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[1]Blatter, Chr, and Ernst Specker. "Recurrence relations for the number of labeled structures on a finite set." Logic and Machines: Decision Problems and Complexity: Proceedings of the Symposium Rekursive Kombinatorik held from May 2328, 1983 at the Institut fr Mathematische Logik und Grundlagenforschung der Universitt Mnster/Westfalen. Springer Berlin Heidelberg, 1984.

relations (C-finite sequences) and modular linear recurrence relations (MC-finite sequences). The papers [121], [53 and [73 gradually solve all the open problems from their paper. In [57 and [59 we study variations on holonomic sequences based on lattice paths, in [154 and [62 we study recurrence relations for graph polynomials. An obituary and hommage to E. Specker can be found in [55].

Varia

My remaining papers document my various interests and involvement in questions of algorithmics, non-monotonic logics, program and hardware verification, and software engineering, as a result of collaboration with graduate students or colleagues, or as a reaction to my own reading, but they do not represent long-term involvement in their respective research areas.

1.3 Industrial achievements

mental images

In 1985 I was instrumental, as the chief scientific consultant, in the foundation of `mental images` GmbH, Berlin. This company is by now Europe's leading firm in the development of software related to computer graphics and animation. Virtually all high-end 3D graphic packages offer its MENTAL RAY as their top rendering option.

Until December 2007 I was still acting as a scientific consultant to `mental images` and have also been involved, in the past, in various decision making processes on the management level. In 2007 `mental images` was sold to NVIDIA.

The homepage of `mental images` can be found at `www.mentalimages.com`.

`mental images` was the first company from abroad to join the Industrial Affiliates Program of the faculty of CS at the Technion.

ZURICH

In 1988-1990 I prepared a feasibility study for `ZURICH` Insurances (ZURICH FINANCIAL SERVICES) about the *Insurability of software related risks*.

Finanz & Wirtschaft

In 1987-1988 I was a columnist in the renowned financial newspaper `Finanz & Wirtschaft`, published in Zurich in German. I published a monthly column on computing related issues.

2 Graduate Students

2.1 Ph.D. Theses

1. Definable queries and a completion of QBE.
   A.Zvieli, Ph.D. Thesis , completed January 1984, Technion Haifa.

2. Extensions of propositional dynamic logics.
   M. Tiomkin, Ph.D. Thesis, completed February 1984, Technion Haifa.
   Published as Journal publications [14] and [23].

3. Entity-Relationship Consistency for the Relational Model,
   Victor M.Markowitz, Ph.D.Thesis, completed summer 1987, Technion
   Haifa.
   Published as Conference publication [96], [93], [95] and Journal publication [22].

4. Using structural information for managing very large software systems,
   Yoelle S. Maarek, Ph.D. Thesis (completed with Prof. D. Berry),
   completed January 1989.

5. A protocol for man-machine interfaces,
   Jacob Ukelson, Ph.D. Thesis (started with Dr. M. Rodeh),
   completed Spring 1989. Published as Journal publication. [26].

6. Une architecture pour commande numerique de machine-outil,
   Jean-Charles Gregoire, Ph.D Thesis at the Swiss Federal Institute of Technology in Lausanne (co-advised with Prof. Henri Nussbaumer), completed
   in Summer 1989. Publication in conference [101].

7. Classes of graphs where NP problems become polynomial,
   U. Rotics, Ph.D. Thesis (Complete Spring 1999)
   Technical report no. 784 (J. A. Makowsky and U. Rotics: Optimal Spanners in Partial k-Trees) and 843 (J. A. Makowsky and U. Rotics: The
   T-spanner problem is NP-complete on chordal graphs). Journal publication [30], Conference publication [112], submitted to Journals [34], [35],
   [33].

8. Application of translation schemes to decomposability of problems.
   E.V. Ravve, Ph.D. Thesis (Complete Spring 1999)
   Journal publication [32], Conference publication [107].

9. On the complexity of Schur functions over finite fields,
   G. Kogan, Ph.D. Thesis (Candidacy examination passed Summer 1997,
   student dropped out).

10. Completeness and Universaility Properties of Graph Invariants and Graph Polynomials
    I. Averbouch, Ph.D. Thesis (Completed January 2011)
    Journal publication [50],[51], Conference publication [122],[125],[130].

11. Definability of Combinatorial Functions
    T. Kotek, Ph.D. Thesis (Completed May 2012)
    Journal publication [59], [52], [57], [134], Conference publication [126],[127].
    Publication in collections [159], [160].

12. Harary polynomials and generating graph polynomials
    V. Rakita, Ph.D. Thesis (to be completed in May 2023), [71], [75], [74].

2.2 M.Sc. Theses

13. The model theory of L^{pos}.
    Gert Herrgott, M.Sc. Thesis in Mathematics (co-advised with Prof. W. Rautenberg), Department of Mathematics, Free University, Westberlin, 1979.

14. On the categoricity theorem in $L_{\omega_1,\omega}$.
    Published in: Tsukuba Journal of Mathematics, Vol.10, No.1 (1986), 117120.
    Sakae Fuchino, M.Sc. Thesis in Mathematics (co-advised with Prof. S. Koppelberg), Department of Mathematics, Free University, Westberlin, 1982.

15. Concrete lower bounds for regular resolution.
    Michael Mötz, M.Sc. Thesis in Mathematics (co-advised with Prof. W. Rautenberg and Dr. D. Giorgetta), Department of Mathematics, Free University, Westberlin, 1982.

16. On formal semantics of data bases
    Naphtali Rishe, M.Sc. Thesis (started with N. Francez), completed in Summer 1981, Technion Haifa.

17. A Unifying Approach to the Entity-Relationship and the Relational Models of Data Bases.
    N.Rotics, M.Sc. Thesis, completed in Summer 1984, Technion Haifa.
    Published as Conference Publication [93].

18. MUSICIAN, A Music Processing and Synthesis System,
    A.Ban, M.Sc. Thesis, completed November 1985, Technion Haifa.
    Published as Conference Publication [94].

19. DB-MASTER, an interactive design tool for data base schemes,
    Alain Azagoury, M.Sc. Thesis, completed summer 1987.

20. The expressive power of transitive closure,
    Arie Calò, M.Sc.Thesis, completed spring 1990.
    Published as Conference publication [99].

21. Learning algorithms for connection machines,
    Yiphat Weissberg, M.Sc.Thesis (started with Dr. S. Porat), completed
    summer 1990.

22. Program testing methodologies,
    Moshe Zvi Rupp, M.Sc. Thesis (started with Dr. I. Pomeranz), completed
    winter 1991.
    Technical report no. CS9218. (M.Z. Rupp, J.A. Makowsky, and I. Pomeranz: Adequate Test Sets for Loop Testing)

23. The expressive power of transitive closure and 2–way multihead automata,
    Yaniv Bargury, M.Sc. Thesis, completed spring 1992.
    Published as Conference publication [98].

24. On the average complexity of SAT for flat distributions,
    Avy Sharell, M.Sc. Thesis, completed spring 1993.
    Published as Journal publication. [27 and Technical report No. 746.
    (A. Sharell and J. Makowsky: Probabilistic Lower Bounds for Average
    Case Complexity)

25. Updates and queries for Complex Objects,
    Reuven Asher Hasson, M.Sc. Thesis, completed summer 1992.
    Published as Conference publication [100].

26. Model checking for various products of structures
    Elena Ravve (Mouratova), M.Sc. Thesis, completed December 1994.
    Published as Conference publication [107].

27. Dynamic task allocation in parallel ray tracing,
    Irene Notkin, M.Sc. Thesis (completed with C. Gotsman due to sabbatical), completed January 1995.

28. Dynamic memory allocation in parallel ray tracing,
    Boris Farizon, M.Sc. Thesis (transferred to A. Itai due to sabbatical),
    completed October 1995.

29. On the algebraic complexity of some families of coloured Tutte polynomials,
    Martin Lotz, M.Sc. Thesis (Department of Mathematics, ETH Zurich),
    completed March 2001.

30. NC Grammars and Clique Width,
    Alex Glikson, M.Sc. Thesis, completed 2003
    Conference publication [120

31. BSS Model of Computation over the Reals and Choice Operator,
Yonit Magid, M.Sc., completed 2007

32. Structural Properties of Formulas for which SAT Problem is Easy,
Avi Magid, M.Sc. Thesis, completed 2008

33. Definability and Hankel Matrices.
Nadia Labai, M.Sc. Thesis, completed 2015. Publications: [137], [139], [140], [142], [143], [161].

34. On Weakly Distinguishing Graph Polynomials.
Vsevolod Rakita, M.Sc. Thesis, completed 2020. Conference publication [148], Journal Publication [70].

3 List of Publications

3.1 Theses

1. Kategorizität und endlich Axiomatisierbarkeit, Master Thesis, Department of Mathematics, ETH-Zurich 1971
   Published as journal papers in mathematical logic no. 1 and 3.

2. Δ -logics and generalized quantifiers, Ph.D. Thesis (Diss.Nr.5301) Department of Mathematics, ETH-Zurich, 1974
   Published as journal paper in mathematical logic no. 2 and conference paper no. 76.

3. Habilitation on the basis of the journal papers in mathematical logic no. 7–12 and the conference papers no. 2–4, Freie Universität Berlin, 1981.

3.2 Books and Lecture Notes

1. J.A.Makowsky, Compactness, Embeddings and Definability, Chapter 18 in "Model Theoretic Logics", J.Barwise and S.Feferman ed., Springer 1985, pp.645-716.

2. J.A.Makowsky and D. Mundici, Abstract Equivalence Relations, Chapter 19 in "Model Theoretic Logics", J.Barwise and S.Feferman ed., Springer 1985, pp.717-746.

3. J.A.Makowsky, Abstract Embedding Relations, Chapter 20 in "Model Theoretic Logics", J.Barwise and S.Feferman ed., Springer 1985, pp.747-791.

4. J.A. Makowsky, Logic for Computer Science (Technion Course 234292), 92 pp., reprinted and augmented annualy since 1988, last edition 1997

5. J.A.Makowsky, Model Theory and Computer Science: An Appetizer, Chapter I.6 in the "Handbook of Logic in Computer Science, vol. 1 (Background: Mathematical structures)", S. Abramsky, D.M. Gabbay, T.S.E. Maibaum eds., Oxford University Press, 1992, pp. 763-814.

6. J.A. Makowsky and Y.B. Pnueli, Computable Quantifiers and Logics over Finite Structures, in "Quantifiers: Logics, Models and Computation, Volume I", M. Krynicki, M. Mostowski and L.W. Szczerba eds., Kluwer Academic Publishers, 1995, pp. 313-357.

7. J.A. Makowsky, Translations, Interpretations and Reductions, Course given at ESSLLI'97, Aix-en-Provence, France, August 12-22, 1997 by J.A. Makowsky (assisted by E. Ravve), 280 slides.

8. J.A. Makowsky and E.V. Ravve (editors), Logic Colloquium '95, Proceedings of the 1995 Annual European Summer Meeting of the Association of Symbolic Logic, Haifa, August 1995, Lecture Notes in Logic, vol. 11, Springer Verlag, 1998 348 + xvi pp.

9. J.A. Makowsky, Introduction to Database Systems (Technion Course 236363), Lecture Notes in Hebrew by Gily Leshed and supplemented by Ofer Dubrovsky, Technion 1998.
Second revised edition prepared by Z. Nevo and J.A. Makowsky, Technion 2001.

10. J.A. Makowsky, Logical Aspects of Combinatorial Algorithms, Course given at ESSLLI'99, Utrecht, The Netherlands, August 12-22, 1999 by J.A. Makowsky (assisted by U. Rotics), 180 slides.

11. J.A. Makowsky, Logical Methods in Combinatorial Computations, Course given at ESSLLI'03, Vienna, Austria, August 18-28, 2003 by J.A. Makowsky (assisted by E. Ravve), ca. 180 slides.

12. M. Baaz and J.A. Makowsky (editors), Computer Science Logic, Proceedings of the 17th International Workshop CSL 2003, of the 12th Annual Conference of the EACSL and the 8th Kurt Gödel Colloquium KGC 2003, Vienna, August 2003, LNCS 2803.

13. M. Grohe and J.A. Makowsky (editors), Model Theoretic Methods in Finite Combinatorics, Contemporary Mathematics, vol 558, American Mathematical Society, 2011.

14. J.A. Makowsky, Classical graph properties and graph parameters and their definability in SOL. Structural Graph Theory DocCourse 2014: Lecture Notes: 22.

3.3 Journal Publications

1. J.A.Makowsky, Note on almost strongly minimal theories, Bull. Acad. Pol. Sc. vol 20, No.7, 1972, pp. 529 - 534 (MR 47 # 35)

2. J.A.Makowsky, Langages engendres a partir des formules de Scott, C. R. hebd. Acad. Sc. Paris t. 276 , 1973, pp.1585 - 1587 (MR 49 # 2357)

3. J.A.Makowsky, On some conjectures connected with complete sentences, Fund. Math., vol.81, 1974, pp. 193 - 202 (MR 51 # 2894)

4. J.A.Makowsky, S.Shelah and J.Stavi, Δ-Logics and generalized quantifiers, Annals of Mathematical Logic 10, 1976, pp155-192 (MR 56 # 15362)

5. J.A.Makowsky and A.Marcja, Completeness theorems for modal model theory with the Montague-Chang semantics,I., Zeitschrift fur mathematische Logik und Grundlagen der Mathematik, Bd. 23, 1977, pp 97-104 (MR 58# 5057, ZB 402.03020)

6. J.A.Makowsky and A.Marcja, Problemi di decidibilita in logica topologica, Rend. Sem. Mat. Univ. Padova, vol.56, 1977, pp 67-78 (MR 57# 16035)

7. J.A.Makowsky and S.Tulipani, Some model theory for monotone quantifiers, Archiv fur Mathematische Logik, 18, 1977, pp 115-134 (MR 57# 9474)

8. J.A.Makowsky, Some observations on uniform reduction for properties invariant on the range of definable relations, Fundamenta Mathematicae 99, 1978, pp 199-203 (MR 81e, # 03029)

9. J.A.Makowsky and S.Shelah, The theorems of Beth and Craig in abstract model theory, I.The abstract setting, Transactions of the AMS 256, 1979, pp 215-239 (MR 81b #03041, ZB 428.03032)

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3.5 Other Publications

This list contains a selection of various professionally relevant publications. It does neither contain the items of the computing column of Finanz & Wirtschaft nor my literary essays.

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