THE HEBREW UNIVERSITY OF JERUSALEM

THE INSTITUTE FOR ADVANCED STUDIES

SUMMARY OF ACTIVITIES IN MODEL THEORY

ACADEMIC YEAR 1980/81

Jerusalem, 1981

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A special year in Model Theory was held at the Institute with the participation of Fellows and short-term visitors from six countries (Canada, Federal Republic of Germany, France, Great Britain, USA and Israel). The period of activity extended from September 1980 to the end of August 1981 with several articles in preparation and expected to be completed during the next two months.

The subjects discussed and investigated were divided from the beginning into four main areas with seminars held in each of them, as follows:

1. Pure model theory of finitary languages, with seminars organised by J. Baldwin on Tuesdays.

2. Interconnections between model theory and algebra, with seminars organised by G. Cherlin on Tuesdays.

3. Model theory of languages extending the finitary first order ones, with seminars organised by S. Shelah on Wednesdays (at the Mathematics Department).

4. Connections of model theory with (esp. descriptive) set theory, with seminars organised by M. Magidor.

The lectures given in these seminars were often starting points of fruitful discussions and investigations. The borderlines between the four areas mentioned above were, unavoidably, crossed, sometimes to the point where subjects belonging to one of them were lectured on in a seminar belonging to another. This led to fertile collaboration between researchers with predilections in different areas. The best example is an important joint paper by Cherlin, Harrington and Lachlan which, continuing a work of Zilber, studies $\aleph_0$-categorical $\aleph_0$-stable theories (a pure-model theory subject) applying group theory at a crucial point.

Following is a list of some of the more specific subjects which were dealt with by the participants in the various areas (it should be stressed again that some of these subjects are more properly placed on borderlines):

In the first area: the basic theory of stability and forking (Baldwin, Grossberg, Harnik, Harrington, Ziegler); the number of countable models (Harrington, Hesse, Makkai, Shelah), Shelah solving the Vaught conjecture for totally transcendental theories; the number of uncountable models (Baldwin, Harrington, Makkai, Shelah); categorical logic (Makkai); model theory of finite homogeneous structures (Lachlan, Shelah).

In the second area (besides the Cherlin-Harrington-Lachlan paper mentioned above): model theory of modules (Cherlin, Srour, Ziegler); nonstandard analysis of profinite groups (Manevitz, collaborating with J. Hirschfeld and W. Herfort); model theory of ordered abelian groups (Gurevich, Schmidt); building groups with given properties (Eklof, Grossberg, Mekler, Shelah); model theory of abstract dependence relations (Baldwin); nonstandard diophantine analysis (Cherlin, Hesse, Manevitz).

In the third area: the second order monadic theory of various structures (Gurevich, Harrington, Magidor, Shelah), complexity of first order theories via interpretability of second order quantifiers (Baldwin, Shelah); compactness and completeness of uncountable admissible languages (S. Friedman, Harrington, Magidor, Shelah collaborating also with J. Stavi); extensions of the Magidor-Malitz quantifier (Rubin, Shelah); Shelah made also substantial contributions to the model theory of L(Q) and related languages, one sequence of results being prompted by discussions with A. Mekler, while other results were discussed with Kaufmann - in Oberwolfach - and with Steinhorn.

In the fourth area: thin equivalence relations over the set of reals (Harrington, Shelah), operations preserving the Baire property (Magidor, Harnik).

As this nonexhaustive list suggests, there was an atmosphere of cooperation throughout the year. On a typical day, Leo Harrington - an active member of almost all of the discussion groups which were created along the year - would come to the Institute but never reach his office at the end of the hall. The numerous joint authorships are the tangible proof of the collaborations developed during the year. The Proceedings of the Model Theory year will be published as a special volume of the Israel Journal of Mathematics.

The friendly atmosphere was enhanced by rich social activities including suppers, parties, excursions - some organized by Magidor, music afternoons at the Cherlin's, etc. Some visitors became experts on Jerusalem and a few spouses actively attended a Hebrew Ulpan. The general feeling, also based on explicit statements, is that the fellows and the families, as well as the visitors enjoyed their stay in Jerusalem.

This is a good opportunity to thank, on the behalf of all the participants, the administrative staff of the Institute for its devoted and helpful assistance during the Year.

Dr. Victor Harnik

P.S. It is worthwhile to stress the fact that some of the group's activities, namely, the Wednesday seminars were held at the Mathematics Department on the Givat Ram Campus of the Hebrew University. This enhanced the relations with the academic staff of the Mathematics Department who could follow the group's research work and interact fruitfully with the fellows and visitors of the Institute.

Members of the Model Theory Group

1. Prof. J.T. Baldwin — University of Illinois at Chicago Circle, USA

2. Prof. G. Cherlin — Rutgers University New Jersey, USA

3. Prof. Y. Gurevich — Ben Gurion University Beer Sheba, Israel

4. Dr. V. Harnik — University of Haifa, Israel

5. Prof. L. Harrington — University of California at Berkeley, USA

6. Dr. G. Hesse — Technische Universitüt, Hannover, Fed. Rep. of Germany

7. Prof. A.H. Lachlan — Simon Fraser University, Burnaby British Columbia, Canada

8. Prof. M. Magidor — The Hebrew University, Israel

9. Prof. M. Makkai — McGill University, Montreal Canada

10. Dr. J. Makowski — Technion, Haifa, Israel

11. Dr. L. Manevitz — Bar-Ilan University, Ramat Gan Israel

12. Dr. M. Rubin — Ben Gurion University Beer Sheba Israel

13. Prof. S. Shelah — The Hebrew University, Israel

14. Prof. M. Ziegler — University of Bonn, Fed. Rep. of Germany

Graduate Students participating in the

Model Theory Year

1. R. Grossberg   The Hebrew University

2. R. Holtzmann   The Hebrew University

3. G. Srour   McGill University
Montreal, Canada

Short-term Visitors

J.P. Ressayre	France
D. Lascar	France
J. Burgess	USA
S. Friedman	USA
J. Saffe	Fed. Rep. of Germany
P. Eklof	USA
J. Stern	France
W. Hodges	Great Britain
P. Schmidt	Fed. Rep. of Germany
A. Mekler	Canada
J. Schmerl	USA
M. Lerman	USA
C. Steinhorn	USA
H. Gaifman	Israel
M. Jarden	Israel
D. Giorgetta	Fed. Rep. of Germany

Seminar Talks - The Group in Model Theory

Date	Speaker	Topic
14.10.80	G. Cherlin	Superstable Fields
14.10.80	J. Baldwin	Definability of stable types
15.10.80	S. Shelah	Second order quantifiers
15.10.80	Y. Gurevich	The monadic theory of ω_2
21.10.80	J. Baldwin	Definable extensions of types over models
22.10.80	S. Shelah	Second order quantifiers (contd.)
22.10.80	Y. Gurevich	The monadic theory of ω_2 (contd.)
28.10.80	G. Cherlin	Superstable fields (contd.)
28.10.80	J. Baldwin	Symmetry for types over models
28.10.80	S. Shelah	Second order quantifiers (contd.)
28.10.80	Y. Gurevich	The monadic theory of ω_2 (contd.)
4.11.80	G. Cherlin	Superstable fields (contd.)
4.11.80	J. Baldwin	Free extensions
5.11.80	S. Shelah	Second order quantifiers (contd.)
5.11.80	M. Magidor	Shelah's extension of the Galvin-Hajnal theorem
11.11.80	M. Ziegler	Model theory of modules
11.11.80	J. Baldwin	Bounds of types
12.11.80	M. Makkai	Lifting Stone duality to first order logic
12.11.80	M. Magidor	Shelah's extension (contd.)

Date	Speaker	Topic
18.11.80	M. Ziegler	Modules (contd.)
18.11.80	J. Baldwin	Almost definable types
18.11.80	M. Makkai	Lifting Stone duality (contd.)
19.11.80	S. Ben-David	Aronszajn Trees in $\aleph_2$
25.11.80	M. Ziegler	Modules (contd.)
25.11.80	J. Baldwin	The finite equivalence relation theorem
26.11.80	M. Makkai	Lifting Stone Duality (contd.)
26.11.80	S. Ben-David	Aronszajn Trees in $\aleph_2$ (contd.)
2.12.80	A. Lachlan	Pseudo Planes
2.12.80	J. Baldwin	Regular types & Orthogonality
3.12.80	H. Gaifman	Models of Number Theory
3.12.80	S. Ben-David	Aronszajn Trees in $\aleph_2$ (contd.)
9.12.80	A. Lachlan	Pseudo Planes
9.12.80	J. Baldwin	Weights of Types
10.12.80	H. Gaifman	Models of Number Theory (contd.)
10.12.80	M. Rubin	Rubin-Magidor-Malitz Quantifiers
16.12.80	G. Cherlin	Non-finite Axiomatiz-ability of Totally Categorical Theories
16.12.80	M. Makkai	Injective Modules over Noetherian Rings
7. 1.81	G. Cherlin	Finite Axiomatiz-ability of Totally Categorical Theories (FATCT) !

Date	Speaker	Topic
7. 1.81	M. Makkai	Regular Types in Commutative Noetherian Rings
8. 1.81	S. Shelah	Problems in Model Theory
8. 1.81	M. Rubin	Magidor-Malitz Quantifiers I
14. 1.81	G. Cherlin	FATCT II
14. 1.81	J. Baldwin	Notes on Dimension Theory
15. 1.81	J.P. Ressayre	A Harrington-Pairs type result for ZF
15. 1.81	M. Rubin	Magidor-Malitz Quantifiers II
21. 1.81	G. Cherlin	FATCT III
21. 1.81	D. Lascar	Structure Theory and The Number of Models
22. 1.81	J. Makowski	Robinson Property And Compactness
22. 1.81	R. Holtzman	Jensen's Covering Theorem
28. 1.81	G. Cherlin	FATCT IV
28. 1.81	D. Lascar	Progress on Vaught's Conjecture
29. 1.81	J. Makowski	Robinson Property and Compactness (Contd.)
29. 1.81	R. Holtzmann	Jensen's Covering Theorem (contd.)
3. 2.81	G. Cherlin	$\aleph_0$ Categorical ω stable Theories
3. 2.81	R. Grossberg	Classification Theory for non-elementary Classes
4. 2.81	J. Makowski	Robinson Property and Compactness (contd.)
4. 2.81	R. Holtzman	Jensen's Covering Theorem (contd.)
10. 2.81	G. Cherlin	$\aleph_0$ Categorical ω stable Theories (contd.)
10. 2.81	R. Grossberg	Classification Theory for non-elementary Classes (contd.)

Date	Speaker	Topic
11. 2.81	J. Makowski	Robinson Property and Compactness (contd.)
11. 2.81	R. Holtzman	Jensen's Covering Theorem (contd.)
17. 2.81	G. Cherlin	$\aleph_0$ - Categorical ω-stable Theories (contd.)
17. 2.81	R. Grossberg	Classification Theory for non-elementary Classes (contd.)
18. 2.81	S. Friedman	Fragments of $L_{\infty,\omega}$
18. 2.81	L. Harrington	Descriptive Set Theory
25. 2.81	G. Cherlin	$\aleph_0$ Categorical ω-stable Theories (contd.)
25. 2.81	R. Grossberg	Classification Theory for non-elementary Classes (contd.)
26. 2.81	J. Saffe	Countable Models of Super-stable Theories
26. 2.81	L. Harrington	Descriptive Set theory (contd.)
3. 3.81	M. Jarden	Hilbert Irreducibility
3. 3.81	R. Grossberg	Classification Theory for non-elementary Classes (contd.)
4. 3.81	J. Saffe	Countable Models (contd.)
4. 3.81	J. Burgess	Descriptive Set Theory
10. 3.81	M. Jarden	Hilbert Irreducibility (contd.)
10. 3.81	R. Grossberg	Classification Theory for non-elementary Classes (contd.)
11. 3.81	M. Ziegler	Undecidability of finitely axiomatised subtheories of the real closed fields
11. 3.81	L. Harrington	Descriptive Set Theory (contd.)
17. 3.81	J. Baldwin	Dependence Relations
17. 3.81	R. Grossberg	Classification Theory for non-elementary Classes (contd.)

Date	Speaker	Topic
18. 3.81	P. Eklof	Construction of uncountable groups
18. 3.81	M. Magidor	The Core Model
24. 3.81	J. Baldwin	Dependence Relations (contd.)
24. 3.81	R. Grossberg	Classification Theory for non-elementary Classes (contd.)
25. 3.81	M. Rubin	Reconstruction of Topological Spaces of Group of Homeomorphisms
25. 3.81	J. Stern	Partitions into Borel sets of bounded rank
31. 3.81	A. Lachlan	α_T is finite for $\aleph_0$-categorical $\aleph_0$-stable theories
31. 3.81	M. Makkai	The Spectrum of Superstable Theories
1. 4.81	W. Hodges	Definable Constructions
1. 4.81	J. Stern	Partitions into Borel Sets of Bounded Rank (contd.)
7. 4.81	A. Lachlan	α_T is finite for $\aleph_0$-categorical $\aleph_0$ stable theory (contd.)
7. 4.81	M. Makkai	The Spectrum of Superstable Theories (contd.)
8. 4.81	D. Giorgetta	Existentially closed structures in the Continuum.
8. 4.81	J. Stern	Partitions into Borel Sets of Bounded Rank (contd.)
14. 4.81	A. Lachlan	α_T is finite for $\aleph_0$-categorical $\aleph_0$ - stable theory (contd.)
14. 4.81	M. Makkai	The Spectrum of Superstable Theories (contd.)
15. 4.81	A. Mekler	The determinate logic of Ordinals
15. 4.81	M. Magidor	The Core Model (contd.)
28. 4.81	A. Lachlan	α_T is finite for $\aleph_0$-categorical $\aleph_0$ - stable theory (contd.)

Date	Speaker	Topic
28. 4.81	M. Makkai	The Spectrum of Superstable Theories (contd.)
29. 4.81	S. Shelah	On the number of non isomorphic $I_{\infty,\kappa}$-equivalent models .
29. 4.81	M. Magidor	The Core Model (contd.)
5. 5.81	G. Cherlin	Classification of doubly-transitive groups
5. 5.81	J. Baldwin	Tractable Logics
6. 5.81	S. Shelah	An extension of L(Q) with Craig Interpolation
6. 5.81	L. Harrington	On Lebesgue measurability and the Baire Property
12. 5.81	L. Manevitz	Ramsey quantifiers in arithmetic
12. 5.81	L. Harrington	The Vaught conjecture for $\aleph_0$-stable theories
13. 5.81	S. Shelah	An extension of L(Q) (contd.)
13. 5.81	L. Harrington	Lebesgue measurability (contd.)
19. 5.81	L. Harrington	The Vaught conjecture (contd.)
20. 5.81	M. Lerman	Topics in recursive model theory
20. 5.81	L. Harrington	Lebesgue measurability (contd.)
27. 5.81	L. Harrington	The Vaught conjecture (contd.)
28. 5.81	S. Shelah	An extension of L(Q) (contd.)
28. 5.81	L. Harrington	The Vaught conjecture (contd.)
4. 6.81	J. Schmerl	Recursively saturated models of arithmetic
4. 6.81	V. Harnik	Formulas as elements
5. 6.81	Y. Gurevich	Complexity of the monadic Theory of Order
5. 6.81	M. Magidor	The Core Model (contd.)
11. 6.81	C. Steinhorn	The Quantifier "There is a Set of Indiscernibles"
11. 6.81	V. Harnik	Formulas as elements (contd.)

Date	Speaker	Topic
12. 6.81	Y. Gurevich	Complexity of the Monadic Theory of Order (contd.)
12. 6.81	M. Magidor	The Core Model (contd.)
19. 6.81	S. Shelah	$L(Q_{cf})$ has Craig interpolation in $L(aa)$
19. 6.81	M. Magidor	The Core Model (concluded).

LIST OF PUBLICATIONS

MODEL THEORY

	No.	Author	Publication	Month
1)	26/80	S. Shelah	The Spectrum, Problem II. The Infinite Depth Case	Sept. 80
2)	29/80	J. Gurevich, M. Magidor & S. Shelah	The Monadic Theory of ω_2	Nov. 80
3)	30/80	J. Gurevich & S. Shelah	Monadic Theory of Order and Topology in 2FC	Nov. 80
4)	31/80	J.T. Baldwin & S. Shelah	The Structure of Saturated Free Algebras	Dec. 80
5)	32/80	S. Shelah	Constructions of many Complicated Uncountable Structures & Boorlean Algebras	Dec. 80
		S. Shelah	On the number of non-Isomorphic Models in $L_{\infty,\kappa}$ when κ is weakly compact	Dec. 80
		S. Shelah	On the number of non-conjugate subgroups	Dec. 80
6)	33/80	J.T. Baldwin	Recursion Theory & Abstract Dependence	Dec. 80
7)	34/80	J. Gurevich	Decision Problem for Separated distributive lattices	Dec. 80
8)	1/81	M. Makkai	Lifting the Stone duality Theory for propositional Logic to Predicate Logic	Jan. 81
9)	2/81	J. Gurevich & S. Shelah	The Monadic Theory & the "Next World"	Jan. 81
10)	3/81	R. Grossberg	A Remark on a Theorem of Shelah	Feb. 81
11)	4/81	R. Grossberg	On Universal Locally Finite Groups	Mar. 81
12)	5/81	J.T. Baldwin	First Order Theories of Abstract Dependence Relations	May. 81
13)	7/81	Magidor, Shelah & J. Stavi	Countably Decomposable Admissible Sets	June 81
14)	8/81	G. Cherlin, L. Harrington & A. Lachlan	$\aleph_0$-Categorical, $\aleph_0$-Stable Theories	July 81
15)	9/81	L. Harrington & S. Shelah	Counting Equivalence Classes for Co-κ Souslin Equivalence Relations	June 81

16)	11/81	V. Harnik & L. Harrington	Fundamentals of Forking
17)		S.D. Friedman	Model Theory for $L_{\infty\omega_1}$
18)		J. Hirschfeld & L. Manevitz	Non Standard Analysis of Pro-Finite Groups
19)		A. Lachlan	Finite Homogeneous Structures
20)		L. Harrington & M. Makkai	An Exposition of Shelah's "Main Gap": Counting Uncountable Models of ω-stable and superstable theories
21)		J. Baldwin & S. Shelah	Second Order Quantifiers and the Complexity of Theories
22)		P. Eklof, A. Mekler & S. Shelah	Almost Disjoint Abelian Groups
23)		D. Giorgetta & S. Shelah	Existentially Closed Structures in the Continuum
24)		Y. Gurevich & P. Schmidt	No complete Extension of the Theory of Ordered Abelian Groups has the independence Property
25)		Y. Gurevich & L. Harrington	A simplified Proof for the Decidability of the Monadic Theory of the Binary Tree
26)		L. Harrington, M. Makkai & S. Shelah	A Proof of the Vaught Conjecture for ω-stable Theories
27)		S.D. Friedman & S. Shelah	Tall α-recursive Structures
28)		S. Shelah	The Hanf Number of Stationary Logic
29)		G. Srour	Some Clarifications of the Model Theory of Modules
30)		Y. Gurevich & S. Shelah	Complexity of the Monadic Theory of Order
31)		C. Steinhorn	The non finite axiomatizability of $L(\exists^{\beth_\omega})$
32)		A. Lachlan & S. Shelah	On finite homogeneous Structures with 2-placed Relations
33)		L. Harrington M. Makkai & S. Shelah	On the Vaught Conjecture for Superstable Theories
34)		A. Mekler	On Finitely Determinate Structures and Weak Beth for $L(Q)$.