MM^{+70}

Menachem Magidor's 70th Birthday Conference

Hebrew University of Jerusalem
February 17-19, 2016

THE HEBREW UNIVERSITY OF JERUSALEM

Co-funded by the European Union

Israel Mathematical Union האגוד הישראלי למתמטיקה

Association for Symbolic Logic

1 Supporters and Committees

1.1 Organizing Committee

- Laura Fontanella (The Hebrew University of Jerusalem)
- Itay Kaplan (The Hebrew University of Jerusalem)
- Asaf Karagila (The Hebrew University of Jerusalem)
- Assaf Rinot (Bar-Ilan University)

1.2 Sponsors and Supporters

We are grateful for the support of the following:

- The Hebrew University of Jerusalem
- European Union, through a Marie-Curie IEF project
- Israel Mathematical Union (IMU)
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2 Practical Information

2.1 Jerusalem

Jerusalem is about 800 meters (2640 feet) above sea level; at geographic latitude 31 47'N and longitude 35 13'E. More information and weather updates may be found on the following websites:

- Israel: `http://www.israelweather.co.il/forecast/index_english.html`
- Jerusalem specifically: `http://www.02ws.co.il/?&lang=0`

Up-to-date information on current events and attractions in Jerusalem may be found on the following websites:

- `www.jerusalem.muni.il`
- `www.jerusalemite.net`
- `www.jerusalem.com`

2.2 Transportation from and to Ben-Gurion Airport

You will be arriving at Ben-Gurion Airport, which is located about 15 minutes from Tel Aviv and 40 minutes from Jerusalem. Private taxis to Jerusalem can be found as you exit the arrivals terminal, and cost about 70USD. You could also take the "Nesher" Taxi, a shared door-to-door shuttle, for the set price of 64 Shekels (about 18USD). It operates 24 hours a day and can be easily found to your right as you exit the arrivals terminal. Either way, please ask the driver to drop you off at your designated hotel. To arrange a pick up at your hotel you can ask at the reception of your hotel to arrange this, or contact "Nesher" directly in Tel. 972-2-5257227. Please remember to do this 12 hours in advance.

2.3 Hotel

Many of the visitors will be staying at the *Jerusalem Gardens* hotel, 4 Vilnay Street, Jerusalem. The hotel is about an 8-minute walk from the Givat Ram Campus. Tel. 972-2-6558888.

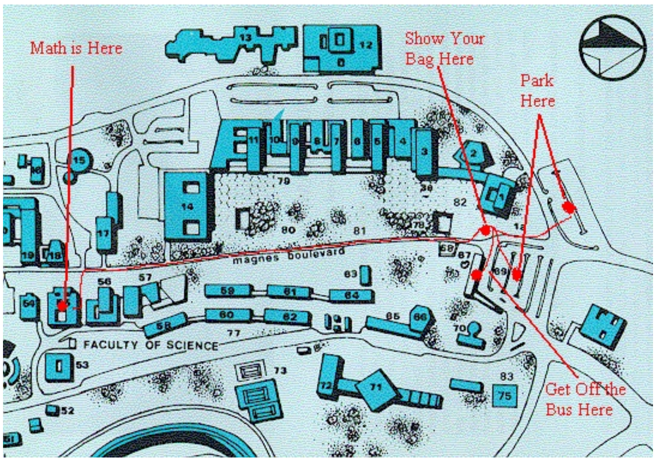
2.4 Conference Webpage

`http://math.huji.ac.il/~mm70/`

2.5 Conference Venue

The Conference will take place at Room #2, Manchester building #55 (mathematics department), located at The Hebrew University, the Edmond J. Safra Campus, Givat Ram (The Hebrew University has several campuses).
A map of The Hebrew University, Givat Ram Campus appears on the following website:

`http://www.huji.ac.il/huji/maps/givatramCampus.htm`



Note: you may be required to show your passport or other I.D. when entering the campus through the main gate, and bags may be checked. This is common practice in many public places in Israel.

2.6 Registration

Wednesday, 09:00-09:30.

2.7 Reception

Wednesday, 18:00-20:00, Belgium House (a few steps from the Manchester building).

2.8 Meals

– Breakfast will be available at the hotel.

– Lunch will be provided at Belgium House. Your name tag is your lunch coupon!

– Coffee, tea and cookies will be provided during the breaks, at the lobby of the math department building.

2.9 Network Connection

Please bring your laptop with you, if you wish to use a computer during the conference for your personal needs. There is free access to wireless Internet (WiFi) at the Givat Ram campus. Participants, who have laptop computers with wireless capabilities, can gain basic Internet access: the network name is (SSID) "HUJI-guest"; in addition there is an "eduroam" network available.

3 Registered Participants

Uri Abraham	Ur Ben-Ari-Tishler	Eilon Bilinsky
Stuti Awasthi	Tom Benhamou	Ari Brodsky

Erez Buchweitz
Shani Cohen
Shmuel Dahari
Ohad Drucker
Laura Fontanella
Hillel Furstenburg
Isaac Gorelic
Yair Hayut
Arie Hinkis
Haim Horowitz

Itay Kaplan
Asaf Karagila
Yechiel Kimchi
Menachem Kojman
Chris Lambie-Hanson
Arkady Leiderman
Dani Livne
Dor Marciano
Roy Shalev
Sidney Morris

Sunil Prajapati
Assaf Rinot
Mati Rubin
Gil Sagi
Šárka Stejskalová
Piotr Szewczak
Boaz Tsaban
Spyridon Tsaros
Alessandro Vignati
Thilo Weinert

MM^{+70} Schedule: Wednesday

9:00-9:30 *Registration*

9:30-9:45 *Opening Remarks*

9:45-10:30 **Joan Bagaria**
On the consistency strength of n-stationarity

10:30-11:00 *Coffee Break*

11:00-11:45 **Peter Koepke**
Set Theory and Formal Mathematics

11:45-12:30 **Arthur Apter**
The tall and measurable cardinals can coincide on a proper class

12:30-14:00 *Lunch Break*

14:00-14:45 **Moti Gitik**
Compact Cardinals

14:45-15:30 **Philip Welch**
Mutual stationarity revisited

15:30-16:00 *Coffee Break*

16:00-16:45 **Matteo Viale**
Systems of filters

16:45-17:30 **Juliette Kennedy**
On the Philosopher's Second Sailing, or: Reading Gödel on the Euthyphro

18:00-19:30 *Reception*

MM^{+70} Schedule: Thursday

9:00-9:45 **Mirna Džamonja**
Consistency results and combinatorics at singular cardinals and their successors

9:45-10:30 **Saharon Shelah**
How free can a quite complicated Abelian group be

10:30-11:00 *Coffee Break*

11:00-11:45 **Matt Foreman**
Epic Fails

11:45-12:30 **John Steel**
A comparison lemma for iteration strategies

12:30-14:00 *Lunch Break*

14:00-14:45 **Boban Veličković**
New techniques in iterated forcing

14:45-15:30 **Jean Larson**
Partition Relation Perspectives

15:30-16:00 *Coffee Break*

16:00-16:45 **Dima Sinapova**
The tree property at the single and double successors of a singular cardinal

16:45-17:30 **Bill Mitchell**

MM^{+70} Schedule: Friday

9:00-9:45 **Ralf Schindler**
Varsovian models

9:45-10:30 **Jouko Väänänen**
Inner models from extended logics

10:30-11:00 *Coffee Break*

11:00-11:45 **James Cummings**
Trees on ω_1 and ω_2

11:45-12:30 **Hugh Woodin**
Formulating the axiom $V = \mathrm{Ultimate}\ L$

MM^{+70} Abstracts

Arthur Apter

The tall and measurable cardinals can coincide on a proper class

Starting from an inaccessible limit of strong cardinals, we force to construct a model containing a proper class of measurable cardinals in which the tall and measurable cardinals coincide precisely. This is joint work with Moti Gitik which extends and generalizes an earlier result of Joel Hamkins.

Joan Bagaria

On the consistency strength of n-stationarity

A subset S of a limit ordinal δ is said to be 0-stationary in δ if it is unbounded, and it is said to be n-stationary, for $n > 0$, if for every $m < n$ and every m-stationary subset T, there exists $\alpha \in S$ such that $T \cap \alpha$ is m-stationary in α. Thus, S is 1-stationary iff it is stationary in the usual sense, and it is 2-stationary iff it reflects all stationary sets. We will present some recent work, joint with Salvador Mancilla and Menachem Magidor, that pins down the consistency strength of the existence of n-stationary sets, for $n < \omega$. The results generalize some well-known results of A. Mekler and S. Shelah (1989) on stationary reflection.

James Cummings

Trees on ω_1 and ω_2

We show that ω_2 can have the tree property in a model where there is a Kurepa tree. This answers a question raised by Monroe Eskew.

Mirna Džamonja

Consistency results and combinatorics at singular cardinals and their successors

We review some old and some recent results in this field, one of the areas in which Menachem made an enormous contribution.

Matthew Foreman

Epic Fails

Sometimes failure can be just as interesting as success. This lecture discusses some unsuccessful projects from the 1980's related to the value of θ, generalizing Martin's Maximum to cardinals above ω_1, and various non-stationary towers. Some flaky large cardinal axioms will also be discussed. Most of the failures are joint work.

Juliette Kennedy

On the Philosopher's Second Sailing, or: Reading Gödel on the Euthyphro

In this talk I will discuss some of Gödel's conversations with Sue Toledo in the years 1972-5.

Peter Koepke

Set Theory and Formal Mathematics

Formal mathematics, i.e., the programme of completely formalizing mathematical statements and proofs (with computer assistance), has made spectacular progress in recent years. Difficult and extensive mathematics like T. Hales' proof of the Kepler conjecture have now been formalized using the HOL light and Isabelle proof assistants. It appears plausible for formal mathematics to be employed in mathematical research and education within the course of one or two decades. Set theory as a mathematical foundation is found at the core of current libraries of formalized mathematics, so that logicians and set theorists should take an interest in formal mathematics and its further development. In my talk I shall discuss:

- basic priciples of formal mathematics;
- the Isabelle proof assistant;
- set theory in Isabelle and other systems;
- using natural language and natural argumentation in proof systems;
- future prospects and problems.

Jean Larson

Partition Relation Perspectives

We will look at partition relations from various perspectives, and discuss recent results and open problems.

Ralf Schindler

Varsovian models

In joint work with Gunter Fuchs we show that if $L[E]$ is tame, has no strong cardinal, and does not know how to fully iterate itself, then $L[E]$ has class many grounds and their intersection is a lower part model, the "minimal core" of $L[E]$. In sharp contrast, in joint work with Grigor Sargsyan, building upon earlier work of himself and Martin Zeman, we show that if $L[E]$ is least with a strong cardinal above a Woodin cardinal, then $L[E]$ has only set many grounds. Its smallest ground is of the form $L[E', \Sigma]$, where $L[E']$ is the fully iterable (in $L[E]$) core model of $L[E]$ and Σ is a partial iteration strategy for $L[E']$. In particular, $L[E', \Sigma]$ has no proper ground.

Saharon Shelah

How free can a quite complicated Abelian group be

We like to build Abelian groups (or R-modules) which on the one hand are as free as possible, or just $\aleph_{\omega+1}$-free, and on the other hand, are complicated in suitable sense. We choose as our test problem having no non-trivial homomorphism to $\mathbb{Z}$ (known classically for $\aleph_1$-free, recently for $\aleph_n$-free).

If our universe is similar enough to **L** - this is well known. If we choose being complicated as "not being free", then by an old work of Magidor and myself the first fix point of the alephs is the exact bound - can prove existence for every smaller cardinal, but consistently no more. This justified the choice above.
We succeed to prove the existence of even $\aleph_{\omega_1 \cdot n}$-free ones. For this we prove the existence of suitably free Black Boxes.
Also continuing the work with Magidor, the cardinal above cannot be improved that is: modulo suitable large cardinals, we can force that every $\aleph_{\omega_1 \cdot \omega}$-free Abelian group, e.g. has non-trivial homomorphism to $\mathbb{Z}$.

Is the choice of the test problem justified? We believe the legion of theorems on building in ZFC using black boxes the existence of $\aleph_1$-free Abelian groups and relative can be improved too using those black boxes. Particularly when for $\aleph_{\omega \cdot n}$-freeness. To justify the choice of the test question we deal with the representation of any suitable ring as the ring of endomorphisms of a quite free Abelian groups.

Dima Sinapova

The tree property at the single and double successors of a singular cardinal

A long term project is set theory is to get the consistency of the tree property at every regular cardinal greater than $\aleph_1$. Until recently, it was not known how to do this simultaneously for successors of singular strong limit cardinals. I will show that assuming large cardinals, one can consistently get the tree property at the first and double successor of a singular strong limit cardinal. Then I will discuss a joint result with Spencer Unger, that this can be achieved at $\aleph_{\omega^2}$.

John Steel

A comparison lemma for iteration strategies

We shall discuss a general method for comparing structures that are constructed from coherent sequences of extenders, together with information about how to iterate themselves. The method leads to

Theorem. *Suppose V is normally iterable by the strategy of choosing unique cofinal well-founded branches, and suppose there is a superstrong cardinal; then there is a canonical inner model M satisfying GCH + "there is a superstrong cardinal" + "I am iterable"*

Matteo Viale

Systems of filters

Since Menachem has been already exposed several times to my recent works, I will focus on the work of two PhD students in Torino (Giorgio Audrito and Silvia Steila) to which I'm marginally contributing, but which I believe worth of attention. The starting point has been the following observation: there is a well developed theory of the generic version of large cardinals in the range between supercompactness to huge, these generic large cardinals are well described by means of forcings given by (towers of) normal ideals on $\mathcal{P}(X)$ where X ranges in a suitable index set. It seems that much less investigation has been devoted to analyze what can be the generic large cardinal counterpart of strongness and superstrongness.

Audrito and Steila came up with a definition of Systems of Filters which incorporates as special instances both the (classical or generic) large cardinal notion based on the notion of extender (Strongness and superstrongness) as well as the (generic or classical) ones based on the notion of (towers of) normal (ultra-)filters (supercompactness, almost hugeness, hugeness). Frankly I find their definition very smart and worth being spread out also because it provides a simple framework in which all (classical or generic) large cardinal notion in which the notion of normality is involved can be simply characterized specifying certain parameters in the system of filters aiming to describe them.

I will also outline how by means of this definition of System of Filters one can give combinatorial characterizations of Systems of Filters yielding the strongness (respectively, supercompactness/hugeness) of the corresponding (generic) ultrapower embedding. I contributed to this latter part of their work.

Philip Welch

Mutual stationarity revisited

We survey the current state of affairs around the notion, due to Foreman and Magidor, of *mutually stationary* sequences of sets, in particular on such sequences below $\aleph_\omega$.

Hugh Woodin

Formulating the axiom V = Ultimate L

We discuss new results which show (under reasonable assumptions) that there are no supercompact cardinals in the models

$$\mathrm{HOD}^{L(A,\mathbb{R})} \cap V_\Theta$$

where $\Theta = \Theta^{L(A,\mathbb{R})}$ and A is universally Baire.

Thus for the formulation of the axiom V = Ultimate L as reflection into such models, one must restrict to Σ_2-sentences. This has the advantage of simplifying the statement of the axiom but it complicates obtaining some of the consequences.