



**VICTOR ROTHSCHILD MEMORIAL SYMPOSIA  
THE HEBREW UNIVERSITY OF JERUSALEM**

**Israel Institute for Advanced Studies  
The 30th Jerusalem Winter School in Theoretical Physics  
with the support of the European Science Foundation**

# **EARLY GALAXY FORMATION IN LCDM**

**December 31, 2012 – January 10, 2013**

**General Director: David Gross (KITP and UCSB)  
Directors: Avishai Dekel (HUJI) & Reinhard Genzel (MPE)**

## **PROGRAM**

The lectures will take place at the IAS lecture hall, Feldman building 1st floor, The Hebrew University, Edmond J. Safra Campus, Givat Ram, Jerusalem

Coffee breaks between lectures at the IAS, and a daily lunch in Bretter House

### **Monday, December 31**

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|-------------|--|
| 09:00-09:30 | Registration at IAS lobby  |
| 09:30-11:00 | <b>Joel Primack</b> (UC Santa Cruz)<br><i>1. Introduction to LCDM Cosmology</i>                          |
| 11:30-13:00 | <b>Avi Loeb</b> (Harvard University)<br><i>1. Basic Principles of Structure Formation</i>                |
| 13:00-14:30 | Lunch  |
| 14:30-16:00 | <b>Frank van den Bosch</b> (Yale University)<br><i>1. Structure Formation: From Linear to Non-Linear</i> |
| 16:30-18:00 | <b>Mark Krumholz</b> (UC Santa Cruz)<br><i>1. Physics of Star-Forming Clouds</i>                         |
| 20:00       | New Year's Party (+ dinner) at Beit Belgia on campus   |

## Tuesday, January 1

(Note the special time slots in this day)

- 09:30-11:00            **Re'em Sari** (The Hebrew University of Jerusalem)  
*1. Galactic Dynamics I*
- 11:30-12:50            **Avi Loeb** (Harvard University)  
*2. The First Galaxies and Reionization*
- 12:50-14:00            Lunch
- 14:00-15:00            **Charles Bennett** (Guest Lecture, Johns Hopkins University)  
*Cosmology from the Cosmic Microwave Background*
- 15:20-16:40            **Frank van den Bosch** (Yale University)  
*2. Extended Press-Schechter Theory*
- 17:00-18:20            **Mark Krumholz** (UC Santa Cruz)  
*2. Two Problems: Initial Mass Function and Star Formation Rate*

## Wednesday, January 2

- 09:00-10:40            **Avi Loeb** (Harvard University)  
*3. Formation and Mergers of Massive black Holes*
- 11:10-12:50            **Mark Krumholz** (UC Santa Cruz)  
*3. Stellar Feedback in Galaxies*
- 12:50-14:00            Lunch
- 14:00-18:00            Excursion to the Old City of Jerusalem

## Thursday, January 3

- 09:00-10:30            **Re'em Sari** (The Hebrew University of Jerusalem)  
*2. Galactic Dynamics II*
- 11:00-12:30            **Romeel Davé** (University of Arizona)  
*1. Galaxy Formation with Inflows and Outflows*
- 12:30-14:00            Lunch
- 14:00-15:30            **Simon Lilly** (ETH Zurich)  
*1. Getting the Information: Imaging, Spectroscopy, etc.*
- 16:00-17:30            Seminars
- 20:00                    (Lecturers Dinner in Darna)

### Friday, January 4

- 09:00-10:30            **Reinhard Genzel** (MPE Garching)  
*1. Star-Forming Galaxies*
- 11:00-12:30           **Romeel Davé** (University of Arizona)  
*2. Signatures of Inflows and Outflows*
- 12:30-14:00           Lunch

### Saturday, January 5

- 08:00-17:00           Excursion to the Dead Sea and Masada

### Sunday, January 6

- 09:00-10:30           **Reinhard Genzel** (MPE Garching)  
*2. Observational Methods and Kinematics*
- 11:00-12:30           **Romain Teyssier** (University of Zurich and CEA Saclay)  
*1. Basic Principles of Cosmological Simulations*
- 12:30-14:00           Lunch
- 14:00-15:30           **Simon Lilly** (ETH Zurich)  
*2. Statistical Descriptions of the Galaxy Populations*
- 16:00-17:00           **Timothy Heckman** (Johns Hopkins University)  
*1. Introduction to Active Galactic Nuclei*
- 19:00                    (Lecturers Dinner at the Mona Restaurant)

### Monday, January 7

- 09:00-10:30           **Reinhard Genzel** (MPE Garching)  
*2. Gas in Galaxies and Feedback*
- 11:00-12:30           **Romain Teyssier** (University of Zurich and CEA Saclay)  
*2. Galaxy Formation Physics and its Numerical Implementation*
- 12:30-14:00           Lunch    (in parallel: Physics Colloquium by Reinhard Genzel)
- 14:00-15:30           **Simon Lilly** (ETH Zurich)  
*3. Phenomenological Interpretation Using the Continuity Approach*
- 16:00-17:30           Seminars

## Tuesday, January 8

- 09:00-10:30 **Romeel Davé** (University of Arizona)  
*3. Mergers and Transitional Populations*
- 11:00-12:30 **Romain Teyssier** (University of Zurich)  
*3. Cosmological Simulations of Galaxy Formation*
- 12:30-14:00 Lunch

## Wednesday, January 9

- 09:00-10:30 **Frank van den Bosch** (Yale University)  
*3. Structure of Dark Matter Halos*
- 11:00-12:30 **Avishai Dekel** (The Hebrew University of Jerusalem)  
*1. Feeding High-z Galaxies from the Cosmic Web*
- 12:30-14:00 Lunch
- 14:00-15:30 **Timothy Heckman** (Johns Hopkins University)  
*2. Introduction to Starbursts*
- 16:00-17:30 **Joel Primack** (UC Santa Cruz)  
*2. Topics in Simulations (Dust, Comparison Project)*
- 20:00 School Banquet at The Eucalyptus

## Thursday, January 10

- 09:00-10:30 **Frank van den Bosch** (Yale University)  
*4. Semi-Analytic Modeling*
- 11:00-12:30 **Avishai Dekel** (The Hebrew University of Jerusalem)  
*2. Violent Disk Instability and Inflow to Spheroids and Black Holes*
- 12:30-14:00 Lunch
- 14:00-15:30 **Timothy Heckman** (Johns Hopkins University)  
*3. Black Holes: Fueling and Feedback*
- 16:00-17:30 **Joel Primack** (UC Santa Cruz)  
*3. Challenges and Alternatives to LCDM and Dark Matter Particles*
- 17:30 End of School