



THE HEBREW UNIVERSITY OF JERUSALEM  
ISRAEL INSTITUTE FOR ADVANCED STUDIES

# 32<sup>nd</sup> Winter School in Theoretical Physics

**100 Years of General Relativity: From Theory to  
Experiment and Back**

**29 December 2014 - 8 January 2015**

All lectures will take place at the Israel Institute for Advanced Studies,  
on the Edmond J. Safra, Givat Ram Campus

**General Director:**

**David Gross** (University of California at Santa Barbara)

**Directors:**

**David Gross** (University of California at Santa Barbara)  
**Eliezer Rabinovici** (The Hebrew University of Jerusalem)

**Scientific Committee:**

**Ofer Aharony** (Weizmann Institute of Science)  
**Shmuel Elitzur** (The Hebrew University of Jerusalem)  
**Amit Giveon** (The Hebrew University of Jerusalem)  
**Barak Kol** (The Hebrew University of Jerusalem)  
**Yaron Oz** (Tel Aviv University)

# Program

## Monday, 29 December

- 08:30 - 09:30     Registration
- 09:30 - 09:45     Greetings
- Menachem Ben-Sasson** (President, The Hebrew  
University of Jerusalem)  
**Michal Linial** (Director, IAS)  
**Eliezer Rabinovici** (The Hebrew University of  
Jerusalem)
- 09:45 - 11:15     **David Gross** (University of California at Santa  
Barbara)
- 11:15 - 11:30     Coffee Break
- 11:30 - 13:00     **Thibault Damour** (Institut des Hautes Études  
Scientifiques)  
General Relativity and Experiment
- 13:00 - 14:15     Lunch
- 14:15 - 15:45     **Mark Van Raamsdonk** (University of British  
Columbia)  
Gravity and Entanglement
- 15:45 - 16:00     Coffee Break
- 16:00 - 17:30     **Jacob Bekenstein** (The Hebrew University of  
Jerusalem)  
Dispensing with Least Action in Field Theory
- 17:30 - 18:30     Tutorial
- 18:30 - 19:45     Reception

## Tuesday, 30 December

- 09:00 - 10:30    **Viacheslav F. Mukhanov** (Ludwig Maximilians  
Universität, München)  
Basics of Cosmology
- 10:30 - 10:45    Coffee Break
- 10:45 - 12:15    **Hermann Nicolai** (Max Planck Institute for  
Gravitational Physics, Potsdam-Golm)  
Maximal Supergravity and Beyond
- 12:15 - 14:00    Lunch
- 14:00 - 15:30    **Mark Van Raamsdonk** (University of British  
Columbia)  
Gravity and Entanglement
- 15:30 - 16:00    Coffee Break
- 16:00 - 17:30    **Thibault Damour** (Institut des Hautes Études  
Scientifiques)  
General Relativity and Experiment
- 17:30 - 18:30    Tutorial

## Wednesday, 31 December

- 09:00 - 10:30    **Viacheslav F. Mukhanov** (Ludwig Maximilians  
Universität, München)  
Basics of Cosmology
- 10:30 - 10:45    Coffee Break
- 10:45 - 12:15    **Thibault Damour** (Institut des Hautes Études  
Scientifiques)  
General Relativity and Experiment
- 12:15 - 14:00    Lunch

- 14:00 - 15:30 **Mark Van Raamsdonk** (University of British Columbia)  
Gravity and Entanglement
- 15:30 - 16:00 Coffee Break
- 16:00 - 17:30 **Joseph Polchinski** (University of California at Santa Barbara)  
String Theory and Black Hole Information
- 17:30 - 18:00 Tutorial
- 19:30 - 00:00 New Year's Eve - A Tour of the Israel Museum and dinner at the "Modern" Restaurant

### Thursday, 1 January

- 09:30 - 10:30 **Viacheslav F. Mukhanov** (Ludwig Maximilians Universität, München)  
Basics of Cosmology
- 10:30 - 10:45 Coffee Break
- 10:45 - 12:15 **Hermann Nicolai** (Max Planck Institute for Gravitational Physics, Potsdam-Golm)  
Maximal Supergravity and Beyond
- 12:15 - 14:00 Lunch
- 14:00 - 15:30 **Mark Van Raamsdonk** (University of British Columbia)  
Gravity and Entanglement
- 15:30 - 16:00 Coffee Break
- 16:00 - 17:30 **Thibault Damour** (Institut des Hautes Études Scientifiques)  
General Relativity and Experiment
- 17:30 - 18:30 Tutorial

## Friday, 2 January

- 09:00 - 10:30    **Hermann Nicolai** (Max Planck Institute for Gravitational Physics, Potsdam-Golm)  
Maximal Supergravity and Beyond
- 10:30 - 10:45    Coffee Break
- 10:45 - 12:15    **Joseph Polchinski** (University of California at Santa Barbara)  
String Theory and Black Hole Information
- 12:15 - 13:00    Lunch
- 13:00 - 16:00    Tour: The Old City of Jerusalem

## Saturday, 3 January

- 08:30 - 17:45    Optional Tour- Masada and the Dead Sea

## Sunday, 4 January

- 09:00 - 10:30    **Juan Maldacena** (Institute for Advanced Study, Princeton)  
Quantum Mechanics and Spacetime
- 10:30 - 11:00    Coffee Break
- 11:00 - 12:30    **Gary W. Gibbons** (University of Cambridge)  
Black Holes
- 12:30 - 14:00    Lunch
- 14:00 - 15:15    **Hermann Nicolai** (Max Planck Institute for Gravitational Physics, Potsdam-Golm)  
Maximal Supergravity and Beyond
- 15:15 - 15:30    Coffee Break

- 15:30 - 17:00    **Joseph Polchinski** (University of California at Santa Barbara)  
String Theory and Black Hole Information
- 17:00 - 18:30    **Viacheslav F. Mukhanov** (Ludwig Maximilians Universität, München)  
Basics of Cosmology
- 18:30 - 18:45    Coffee Break
- 18:45 - 19:30    **Efraim Halevy**  
Charting a Course in a Decade of Turbulence

### Monday, 5 January

- 09:00 - 10:30    **Juan Maldacena** (Institute for Advanced Study, Princeton)  
Quantum Mechanics and Spacetime
- 10:30 - 11:00    Coffee Break
- 11:00 - 12:30    **Gary W. Gibbons** (University of Cambridge)  
Black Holes
- 12:30 - 14:00    Lunch
- 14:00 - 15:00    **Kip S. Thorne** (California Institute of Technology)  
Gravitational Waves: A New Window onto the Universe
- 15:00 - 15:30    Coffee Break
- 15:30 - 16:30    **James P. Peebles** (Princeton University)  
Transformative Advances and Open Issues in the LCDM Cosmology
- 16:30 - 17:30    **Tsvi Piran** (The Hebrew University of Jerusalem)  
Astrophysical Black Holes
- 17:30 - 17:45    Coffee Break

17:45 - 18:45 Tutorial

## Tuesday, 6 January

10:00 - 11:30 **Juan Maldacena** (Institute for Advanced Study, Princeton)

Quantum Mechanics and Spacetime

11:30 - 11:45 Coffee Break

11:45 - 13:15 **Gary W. Gibbons** (University of Cambridge)  
Black Holes

13:15 - 14:30 Lunch

14:30 - 16:00 **Joseph Polchinski** (University of California at Santa Barbara)

String Theory and Black Hole Information

16:00 - 16:15 Coffee Break

16:15 - 17:45 **Juan Maldacena** (Institute for Advanced Study, Princeton)

Quantum Mechanics and Spacetime

17:45 - 18:45 Tutorial

## Wednesday, 7 January

09:00 - 12:30 **Morning Session: The History of General Relativity:**

09:00 - 10:00 **Leo Corry** (Tel-Aviv University)  
Einstein Meets Hilbert on the Way to General Relativity: Who Arrives First?

- 10:00 - 11:00     **Jürgen Renn** (The Max Planck Institute for the History of Science, Berlin)  
The Renaissance of General Relativity - A New Reading (with Alexander Blum)
- 11:00 - 11:45     Coffee Break
- 11:45 - 12:30     Round Table: The History of General Relativity
- 12:30 - 14:00     Lunch
- 14:00 - 18:30     **Afternoon Session: General Relativity in Contemporary Physics:**
- 14:00 - 15:30     Round Table: Astrophysics and Cosmology  
Chair: **David Gross** (University of California at Santa Barbara)
- 15:30 - 16:00     Coffee Break
- 16:00 - 17:30     Round Table: String Theory  
Chair: **David Gross** (University of California at Santa Barbara)
- 17:30 - 18:30     Musical Interlude  
Violinist Rinat Erlichman will play chapters of violin sonatas by Ysaye and Bach  
Exhibit: selected documents from the Einstein Archive  
With Hanoch Gutfreund, the Hebrew University of Jerusalem
- 18:30 - 19:30     **Avner Kaidar** (Technion, Israel Institute of Technology)  
GPS Concepts and Relativity



## Thursday, 8 January

- 09:00 - 10:30    **Nima Arkani-Hamed** (Institute for Advanced Study, Princeton)  
Don't Modify GR (in the IR)-Understand It!
- 10:30 - 11:00    Coffee Break
- 11:00 - 12:30    **Nima Arkani-Hamed** (Institute for Advanced Study, Princeton)  
Don't Modify GR (in the IR)-Understand It!
- 12:30 - 14:00    Lunch
- 14:00 - 15:30    **Nima Arkani-Hamed** (Institute for Advanced Study, Princeton)  
Don't Modify GR (in the IR)-Understand It!
- 15:30 - 16:00    Coffee Break
- 16:00 - 17:00    Tutorial