



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

The Institute for Advanced Studies

The 25th Jerusalem Winter School in Theoretical Physics

General Director: David Gross

**Condensed Matter Physics and Quantum Information with
Cold Atoms**

Directors: Peter Zoller, Ronnie Kosloff and Ehud Altman

26 December 2007 - 4 January 2008

PROGRAM

WEDNESDAY, 26.12 07

- 08:00-08:50 *Registration*
- 08:50-09:00 *Greetings*
Eliezer Rabinovici (IAS Director)
- 09:00-12:30 **Morning Session**
- Ignacio Cirac** (MPI, Garching)
I: Quantum simulations
- 10:30-11:00 *Coffee break*
- Assa Auerbach** (Technion, Haifa)
I: Quantum Magnetism
- 12:30-14:00 *Lunch break, Beit Belgia*
- 14:00-18:30 **Afternoon Session**
- Ady Stern** (Weizmann Institute)
I: Non abelian anyons and how to identify them in experiments

15:30-16:00

Coffee break

Gora Shlyapnikov (CNRS, Orsey)

I: *From few-body to many-body physics in atomic Fermi gases: Molecules in two-component Fermi gases*

Nir Davidson (Weizmann Institute)

Seminar: *Control of decoherence of many-body excitations in a BEC*

18:30

Reception at the IAS lobby

THURSDAY, 27.12.07

09:00-12:30

Morning Session

Ignacio Cirac

II: *Quantum simulations*

10:30-11:00

Coffee break

Assa Auerbach

II: *Quantum magnetism*

12:30-14:00

Lunch break, Beit Belgia

14:00-18:30

Afternoon Session

Dorit Aharonov (Hebrew University)

I: *Quantum computation: A bird's eye view*

15:30-16:00

Coffee break

16:00-17:30

Gora Shlyapnikov

II: *From few-body to many-body physics in atomic Fermi gases: Molecular and atomic regimes in Fermi mixtures*

17:30-18:30

Discussion and tutoring

FRIDAY, 28.12.07

09:30-13:00

Morning Session

Dorit Aharonov

II: *The search for new quantum algorithms inspired by physics: Adiabatic systems, Markov chains and TQFT*

11:00-11:30

Coffee break

Ady Stern

II: *Non abelian anyons and how to identify them in experiments*

13:00

Lunch, Beit Belgia

SATURDAY, 29.12.07

All day tour to the Dead Sea, Massada & Ein Gedi

SUNDAY, 30.12.07

09:00-12:30

Morning Session

Ignacio Cirac

III: *Quantum simulations*

10:30-11:00

Coffee break

Dorit Aharonov

III: *Adiabatic quantum evolution: The computational perspective*

13:00-14:00

Lunch break, Beit Belgia

14:00-18:30

Afternoon Session

Assa Auerbach

III: *Quantum vortices*

15:30-16:00

Coffee break

16:00-17:30

Kirill Shtengel (UC, Riverside)

I: *Non-Abelian anyons and topological quantum computation*

17:45-18:45

Discussion and tutoring

MONDAY, 31.12.07

09:00-12:30

Morning Session

Gora Shlyapnikov

III: *From few-body to many-body physics in atomic Fermi gases: Novel phases in strongly interacting Fermi mixtures*

10:30-11:00

Coffee break

Immanuel Bloch (Gutenberg Universität, Mainz)

I: *Introduction to ultracold atoms in optical lattices*

13:00-14:00

Lunch break, Beit Belgia

14:00-18:30

Afternoon Session

Victor Gurarie (University of Colorado, Boulder)
I: *Degenerate Fermi gases with p-wave interactions*

15:30-16:00

Coffee break

Subir Sachdev (Harvard University)
I: *The Fermi gas near unitarity*

17:30-18:30

Poster session

21:00

New Year's party (at the Almora Restaurant in Even Sapir)

TUESDAY, 1.1.08

10:30-13:00

Morning Session

Immanuel Bloch
II: *Creating strongly correlated quantum phases with ultracold atoms in optical lattices*

11:30-12:00

Coffee break

Victor Gurarie (University of Colorado, Boulder)
II: *Degenerate Fermi gases with p-wave interactions*

13:00-14:00

Lunch break, Beit Belgia

14:00-15:30

Kirill Shtengel
II: *Non-Abelian anyons and topological quantum computation*

15:30-16:00

Coffee break

16:00-17:00

Colloquium: Subir Sachdev
Quantum criticality and black holes

17:30-18:30

Discussion and tutoring

WEDNESDAY, 2.1.08

09:00-12:30

Morning Session

Immanuel Bloch
III: *Quantum information with ultracold atoms in optical lattices*

10:30-11:00

Coffee break

Subir Sachdev
II: *The superfluid-insulator quantum phase transition*

12:30-18:00 Guided Tour in Jerusalem (including lunch in Ramat Rachel)

THURSDAY, 3.1.08

09:00-12:30 **Morning Session**

Eugene Demler (Harvard University)

I: *Strongly correlated many-body systems:
from electronic materials to cold atoms to photons*

10:30-11:00 *Coffee break*

Subir Sachdev (Harvard University)

III: *Quantum phases of antiferromagnets*

12:30-14:00 *Lunch break, Beit Belgia*

14:00-18:30 **Afternoon Session**

Eugene Demler (Harvard University)

II: *Strongly correlated many-body systems:
from electronic materials to cold atoms to photons*

15:30-16:00 *Coffee break*

16:00-17:00 **Gershon Kurizki** (Weizmann Institute)

Seminar: *What is decoherence and how to control it ?*

17:10-18:30 **Mikhail Lukin** (Harvard University)

I. *Manipulating photons in atomic ensembles*

18:30-19:30 *Poster session*

FRIDAY, 4.1.08

09:00-12:30 **Morning Session**

Eugene Demler (Harvard University)

III: *Strongly correlated many-body systems:
from electronic materials to cold atoms to photons*

10:30-11:00 *Coffee break*

Mikhail Lukin (Harvard University)

II. *Strongly interacting photons in 1D systems*

13:00 *Lunch, Beit Belgia*

All lectures up to Friday, January 4 will take place at the Institute for Advanced Studies
Feldman Building, Room 130 (first floor)
On the Hebrew University, Edmond J. Safra Campus at Giv'at Ram, Jerusalem

Registered School participants are also invited to take part in the
workshop on

Quantum Noise in Correlated Systems

at the Weizmann Institute on Sunday, January 6, 2008.

Program

09:00-09:20	Welcome
09:20-10:30	Peter Zoller (Innsbruck University) <i>Cold atoms as a driven open quantum optical system</i>
10:30-11:00	<i>Coffee break</i>
11:00-12:00	Immanuel Bloch (University of Mainz) <i>Probing quantum matter in optical lattices</i>
12:00-13:00	Jean Dalibard (ENS, Paris) <i>Interference experiments between quantum gases</i>
13:00-15:00	<i>Lunch break</i>
15:00-16:00	Alain Aspect (Institute D'Optique, Orsay) TBA
16:00-16:30	<i>Coffee break</i>
16:30-17:30	Moty Heiblum (Weizmann Institute) <i>Quantum noise in transport</i>
17:30-18:30	Yoseph Imry (Weizmann Institute) <i>Coherence, decoherence and quantum noise in mesoscopic systems</i>