The Minerva Winter School on Photo Induced Dynamics and Charge Transport in Molecular Systems

Technion - Israel Institute of Technology, Haifa, Israel

March 1-8 2006

Supported by the Minerva Center for Nonlinear Physics of Complex Systems.

Directors: Jan Michael Rost, Nimrod Moiseyev
Organization: Shachar Klaiman

In light of the increased specialization in different fields and as a result of the specialization of different research groups, it has become increasingly difficult for graduate students who wish to enter a new field to acquire the necessary knowledge needed. The current format of international conferences, although suited for seasoned scientists already familiar with all aspects of a particular field and who wish to be briefed on recent advances is not as rewarding to newcomers to the field.

The Minerva winter school is intended to provide an alternative setting for graduate students and post doctoral students in which they will be introduced to new fields in a series of pedagogic lectures followed by exercises.

The lectures will be given by prominent scientists related to the fields addressed in the winter school. Succeeding every lecture a set of solvable questions will be given by the lecturer to be worked out in the exercise. Every day will be concluded with a presentation of the solutions to the questions in the exercise by the participants themselves.

Aside of providing the necessary ground to enter the new field, the Minerva winter school will be a perfect setting for students from Germany and Israel and different research groups to get to know each other. Unlike other scientific activities the Minerva winter school will actively endorse this scientific interaction by assigning internationally mixed groups of up to five people for the exercises.

Local costs and accommodations will be covered by the organizers as well as partial funding of travel expenses. The number of participants is limited to 13 students from Germany and 13 Students from Israel. Please fill the enclosed Registration form.
Deadline for registration is January 31, 2006.

Lectures Planned (Three 90 Minute sessions each)

Impulsive excitation: The interaction of ultra-short pulses with molecules

Ronnie Kosloff

Abstract

I will start from the two-level-system (TLS) the influence of Chirp then move to the coordinate dependent two level system. The influence of dissipation and dephasing (decoherence). Comparison with time dependent perturbation theory. The dynamical "hole" and its use in ultra-short spectroscopy.

The Theory of Resonances Using Non Hermitian Quantum Mechanics

Nimrod Moiseyev

Abstract

Resonance phenomena appear widely in different fields of science and technology. Different types of resonances, i.e. shape and Feshbach resonances, will be discussed using both Hermitian and Non-Hermitian quantum mechanics. Within these formalisms different methods for calculating the resonance positions, lifetimes and cross-sections will be explained.

Photo Ionization Mechanisms in Extended Systems: From Single Photon to Strong Laser Fields

Jan Michael Rost

Abstract

The lectures will begin with the basic coupling mechanism of light (photons) to charged particles (electrons). Motivating and introducing the dipole approximation for single photon absorption, we will illustrate how this mechanism operates by contrasting atoms with extended systems such as clusters. We will move on by discussing multiphoton phenomena when the laser field is strong, such as above threshold ionization and high harmonic generation. The lectures will end by illustrating the perspectives for imaging electron dynamics in space and time which arise from ultrashort pulses (attosecond physics) and X-ray pulses generated by future X-ray free electron lasers.

Born-Oppenheimer Approximation and Beyond

Lorenz S. Cederbaum

Abstract

This is a basic lecture on the subject. The lecture will start by introducing the Born-Oppenheimer expansion and then the standard Born-Oppenheimer approximation. Next, the Group-Born-Oppenheimer approximation is introduced and discussed. Gauge potentials and quasidiabatic states and the question of strictly diabatic states constitute the following subject. Depending on how much time is left, analysis in powers of (1/M)^1/4 and other topics like the Born-Oppenheimer approximation in the presence of magnetic fields will be addressed.

Electron Transport Through Molecular Wires

Uri Peskin

Abstract

Electronic transport in Donor-Bridge-Acceptor complexes and through molecular junctions will be formulated. Simple analysis tools such as tight binding models, the projection operator formalism and the harmonic approximation will be reviewed and applied in this context. Celebrated results such as Markus rate expression, McConnell's superexchange formula and Landauer's transport equation will be derived. Different transport mechanism will be analyzed using these theoretical tools.

Preliminary Schedule:

	1/3/06	2/3/06	3/3/06	4/3/06	5/3/06	6/3/06	7/3/06	8/3/06
	Wed.	Thu.	Fri.	Sat.	Sun.	Mon.	Tue.	Wed.
09:00-10:30	Ronnie Kosloff	J. M. Rost	Ronnie Kosloff	Excursion	Nimrod Moiseyev	L.S Cederbaum	Uri Peskin	Conclusions
10:30-11:00	Coffee Break	Coffee Break	Coffee Break		Coffee Break	Coffee Break	Coffee Break	
11:00-12:30	J. M. Rost	Nimrod Moiseyev	J. M. Rost		L.S Cederbaum	Uri Peskin	L.S Cederbaum	
12:30-14:00	Lunch Break	Lunch Break	Lunch Break		Lunch Break	Lunch Break	Lunch Break	
14:00-15:30	Nimrod Moiseyev	Ronnie Kosloff	Exercise		Uri Peskin	Exercise	Exercise	
15:30-16:00	Coffee Break	Coffee Break			Coffee Break			
16:00-18:00	Exercise	Exercise	Presen		Exercise	Presen	Presen	
18:00-19:00	Presen.	Presen			Presen.			

Registration Form

To be sent either by email to: amanecer@tx.technion.ac.il ,
or by mail to: Shachar Klaiman
Chemistry Faculty
Technion 32000

Last Name	
First Name	
Sex	
Degree	
Organization	
Institute/Department	
Street	
City and Postal code	
Country	
Telephone	
Fax	
Email Address	
Comments	