



Wilhelm & Else Heraeus Summerschool

Computational Many-Particle Physics

Greifswald, September 18-29, 2006

Preface

Dear participant,

welcome to Greifswald and our Heraeus summer school on "Computational Many Particle Physics", which is organised by the Institute for Physics of the Ernst Moritz Arndt University Greifswald together with the Max Planck Institute for Plasma Physics Greifswald, and generously funded by the Wilhelm and Else Heraeus Foundation.

In this little booklet we summarise the main facts about the school, your accommodation and other useful details. For further questions feel free to ask the local organizers:

Programme:

Prof. Holger Fehske
Dr. Ralf Schneider
Dr. Alexander Weisse

Organisation:

Dr. Thomas Meyer
Gerald Schubert
Beate Kemnitz
Claudia Schönian
Jens Schleede
Marco Rosenbusch

Email:

<mailto:heraeus2006@physik.uni-greifswald.de>

Website:

<http://heraeus2006.physik.uni-greifswald.de/>

School venue and programme

All lectures, the lab-courses, the poster session, and the welcome party will be held at the Institute for Plasma Physics (IPP) in Greifswald. In general, the lectures start at **9 a.m.** every morning.

A few additional events, namely the evening lecture on "Exotic gas discharges" and the guided tour to our observatory (both by Prof. Kersten), as well as the lecture on the "Perspectives of high-performance computing" by Prof. Resch, will take place in the old building of the Institute for Physics (IfP) in the city centre (see the enclosed map).

WE Heraeus Summer School "Computational Many-Particle Physics"
Greifswald, 18th - 29th September 2006

	Mon 09/18/06	Tue 09/19/06	Wed 09/20/06	Thu 09/21/06	Fri 09/22/06	Sat 09/23/06	Sun 09/24/06	Mon 09/25/06	Tue 09/26/06	Wed 09/27/06	Thu 09/28/06	Fri 09/29/06
	Plasma Physics			Cond. Mat. / Stat. Phys.				Cond. Mat. / Stat. Phys.				
9:00	Reiter Intro MC	Reiter Appl. MC	Sydora Appl. Gyrokin.	Janke MC in Stat.Phys.	Janke Cluster MC			Weisse ED / CPT	Jeckelmann DMRG II	Noack ALPS	Quandt ab initio	Pruschke Cluster Methods
	Break							Break				
10:15	Tskhakaya Intro PIC	Filinov Wigner approach	Tskhakaya Appl. PIC	Assaad Intro QMC	Assaad Appl. QMC	Boat Trip	Free Time	Wellein HPC	Noack DMRG III	Evertz SSE	Pruschke DMFT	Alvermann SGF
	Break							Break				
11:30	Sydora Gyrokinetics	Scott Appl. Turbulence	Bonitz PIMC	Wellein HPC	Hager HPC			Hager HPC	Glocke TMRG	Fehske QPT	Gunnarson ab initio	Quandt ab initio
	Lunch Break							Lunch Break				
14:00	Scott Intro Turbulence	Lab Course Plasma related MD	Köhn Hybrid Methods	Lab Course MC QMC	Mishchenko DMC	Noack Physik d. Segelns		Peschel DMRG Concepts	Lab Course HPC ED/KPM	Mishchenko DMC	Lab Course DMRG ab initio	
15:15	Schneider Intro MD	PIC	Schneider Multiscale PSI		Poster Session			Jeckelmann DMRG I	DMRG	Hohenadler QMC EP	DMFT	
	Guided tour IPP				Beer & Sausages							
18:00	Welcome Party		Kersten Exot. Discharge							Resch HPC Perspectives		
			Visit of our Observatory									

Abbreviations

ALPS	Algorithms and Libraries for Physics Simulations	MC	Monte Carlo
Appl.	Applications	MD	Molecular Dynamics
CPT	Cluster Perturbation Theory	PIC	Particle in Cell
DDMRG	Dynamical DMRG	PIMC	Path Integral MC
DMC	Diagrammatic Monte Carlo	PP	Parallel programming
DMFT	Dynamical Mean Field Theory	PSI	Plasma Surface Interaction
DMRG	Density Matrix Renormalization Group	QMC	Quantum MC
ED	Exact Diagonalization	QPT	Quantum Phase Transitions
EP	Electron-Phonon	SGF	Stochastic Green Function approach
HPC	High Performance Computing	SSE	Stochastic Series Expansion
KPM	Kernel Polynomial Method	TMRG	Transfer Matrix Renormalization Group

Detailed programme:

Monday, 18/9/06

- 9:00 Opening
- 9:10 Dr. Detlev Reiter, Jülich
Introduction to Monte Carlo methods (in plasma physics)
- 10:20 Dr. David Tskhakaya, Innsbruck
The Particle in Cell method (PIC)
- 11:30 Prof. Richard Sydora, Alberta
Numerical gyrokinetics for hot plasmas I
- 14:00 Dr. Bruce Scott, Garching
Turbulent plasma dynamics I
- 15:15 Dr. Ralf Schneider, Greifswald
Introduction to Molecular Dynamics
- 16:20 *Guided tour IPP*
- 18:00 *Welcome party*

Tuesday, 19/9/06

- 9:00 Dr. Albrecht Bischof, Hanau
The Wilhelm & Else Heraeus Foundation
- 9:15 Dr. Detlev Reiter, Jülich
MC for particle transport problems
- 10:30 Dr. Vladimir Filinov, Moskau
Wigner function quantum molecular dynamics
- 11:45 Dr. Bruce Scott, Garching
Turbulent plasma dynamics II
- 14:00 Lab course
Plasmas, PIC, MC, MD

Wednesday, 20/9/06

- 9:00 Prof. Richard Sydora, Alberta
Numerical gyrokinetics for hot plasmas II
- 10:15 Dr. David Tskhakaya, Innsbruck
The Particle in Cell method (PIC) – Applications
- 11:30 Prof. Michael Bonitz, Kiel
Classical and path integral Monte Carlo simulation of charged particles in traps
- 14:00 Jörg Köhn, Rostock
Strong-field plasma dynamics in finite metallic systems
- 15:15 Dr. Ralf Schneider, Greifswald
Multiscale methods for plasma surface interactions
- 18:00 **Institute for Physics**
Prof. Holger Kersten, Kiel
Lecture “Exotische Gasentladungen”
Visit of the Observatory

Thursday, 21/9/06

- 9:00 Prof. Wolfhard Janke, Leipzig
Monte Carlo methods in classical statistical physics I
- 10:15 Prof. Fakher Assaad, Würzburg
Quantum Monte Carlo methods for correlated electron systems I
- 11:30 Dr. Gerhard Wellein, Erlangen
Optimization techniques for modern high performance computers
- 14:00 Lab course
MC, QMC, HPC

Friday, 22/9/06

- 9:00 Prof. Wolfhard Janke, Leipzig
Monte Carlo methods in classical statistical physics II
- 10:15 Prof. Fakher Assaad, Würzburg
Quantum Monte Carlo methods for correlated electron systems II
- 11:30 Dr. Georg Hager, Erlangen
Optimization techniques for modern high performance computers
- 14:00 Dr. Andrei Mishchenko, Tsukuba
Diagrammatic Monte Carlo and stochastic optimisation methods
- 15:15 Poster session
Beer & sausages

Saturday, 23/9/06

Boat trip – Sponsored by Intel

- 9:30 Departure from Museumshafen
- 10:00 Departure from MaJuWi
- 16:00 Return
- 16:30 Prof. Reinhard Noack, Marburg
Die Physik des Segelns – The Physics of Sailing

Monday, 25/9/06

- 9:00 Dr. Alexander Weiße, Greifswald
Exact diagonalisation and Kernel polynomial methods
- 10:15 Dr. Gerhard Wellein, Erlangen
Optimization techniques for modern high performance computers
- 11:30 Dr. Georg Hager, Erlangen
Optimization techniques for modern high performance computers
- 14:00 Prof. Ingo Peschel, Berlin
Conceptual background of the Density Matrix Renormalization Group (DMRG)
- 15:15 Prof. Eric Jeckelmann, Hannover
Introduction to the DMRG

Tuesday, 26/9/06

- 9:00 Prof. Eric Jeckelmann, Hannover
DMRG for dynamical correlation functions
- 10:15 Prof. Reinhard Noack, Marburg
Time evolution with DMRG
- 11:30 Stefan Glocke, Wuppertal
The Transfer Matrix Renormalization Group (TMRG)
- 14:00 Lab course
HPC, ED/KPM, DMRG

Wednesday, 27/9/06

- 9:00 Prof. Reinhard Noack, Marburg
The ALPS project
- 10:15 Prof. Hans-Gerd Evertz, Graz
Stochastic Series Expansion (SSE)
- 11:30 Prof. Holger Fehske, Greifswald
Quantum phase transitions in strongly correlated electron-phonon systems
- 14:00 Dr. Andrei Mishchenko, Tsukuba
Diagrammatic Monte Carlo and stochastic optimisation methods
- 15:15 Dr. Martin Hohenadler, Cambridge
Quantum Monte Carlo approaches to electron-phonon models
- 18:00 **Institute for Physics**
Prof. Michael Resch, Stuttgart
Perspektiven des wissenschaftlichen Höchstleistungsrechnens in Deutschland

Thursday, 28/9/06

- 9:00 Dr. Alexander Quandt, Greifswald
Ab initio methods in chemistry and solid state physics I
- 10:15 Prof. Thomas Pruschke, Göttingen
(Dynamical) mean field theories for correlated fermion systems
- 11:30 Dr. Olle Gunnarsson, Stuttgart
Model Hamiltonians from experimental information and ab initio calculations
- 14:00 Lab course
DMRG, ab initio, DMFT

Friday, 29/9/06

- 9:00 Prof. Thomas Pruschke, Göttingen
(Dynamical) mean field theories for correlated fermion systems
- 10:15 Andreas Alvermann, Greifswald
Stochastic Green function approach to disordered systems
- 11:30 Dr. Alexander Quandt, Greifswald
Ab initio methods in chemistry and solid state physics II
- 12:30 Closing

Accommodation and activities

Accommodation for students and catering

Your accommodation is booked in the youth hostel MaJuWi located in Wieck, a sea-side village belonging to Greifswald. For more information see <http://www.majuwi.de/>. Breakfast is scheduled for **8 a.m.** every morning, and at **8:30** a chartered bus will bring you from MaJuWi to the IPP. At the IPP we will serve coffee and biscuits during the breaks. For lunch you will need to cater for yourself. There is a cafeteria in the IPP and a large shopping centre nearby. After the last lecture or course the bus will bring you back from IPP to the youth hostel, where dinner is planned for **6 p.m.** – except for monday (welcome party), both wednesdays (lectures at IPP).

Bus transfer Majuwi - IPP - Majuwi:

	Mo	Di	Mi	Do	Fr	
	18.09.2006	19.09.2006	20.09.2006	21.09.2006	22.09.2006	
Morning	8.30 h	8.30 h	8.30 h	8.30 h	8.30 h	Majuwi → IPP
Evening	20.30 h	17.30 h	17.00 h	17.30 h	17.30 h	IPP → see below
	Majuwi	Majuwi	Rubenowpl.	Majuwi	Majuwi	
	Mo	Di	Mi	Do	Fr	
	25.09.2006	26.09.2006	27.09.2006	28.09.2006	29.09.2006	
Morning	8.30 h	8.30 h	8.30 h	8.30 h	8.30 h	Majuwi → IPP
Evening	17.30 h	17.30 h	17.00 h	17.30 h	12.30 h	IPP → see below
	Majuwi	Majuwi	Rubenowpl.	Majuwi	Majuwi	

Accommodation for speakers

We have booked accommodation for most of you in the guesthouse of the Max Planck Institute for Plasma Physics (MPI IPP), located within short walking distance from the institute (see map). The guesthouse offers small self-contained apartments with kitchen and bathroom. Breakfast is available from the cafeteria of the MPI or you can cater for yourself. You'll get the keys, maps and instructions for your apartment from the guards at the gate of the MPI, who are at your service 24 hours each day.

Public transport:

For more information about public transport in Greifswald visit <http://www.sw-greifswald.com/verkehr>.

Boat trip and other activities:

- On saturday we venture out to the Baltic Sea on two historic sailing ships. Please bring waterproof and warm clothes.
- At the youth hostel you can also rent bikes or canoes and explore the beautiful surroundings of Greifswald.

Map

