

FEMTO



- Newsletter

FEMTO (Interaction of superintense, femtosecond laser fields with atoms, solids and plasmas) is a program of the European Science Foundation in the Physical and Engineering Sciences. For more information see the web site: [ht://www.esf.org/physical/pp/FEMTO/](http://www.esf.org/physical/pp/FEMTO/)



It is the wish of the Steering Committee to publish this Newsletter at least four times in the year. Contributions are welcome from all the groups working in the field. Any news or material to be included in this newsletter should be sent to Dimitri Batani at the email address batani@mi.infn.it or fax + 39 02 2392208

PHYSICAL & ENGINEERING SCIENCES

Copyright © 1999 ESF. All Rights Reserved.

SUMMARY

*The FEMTO Programme, a short presentation

FORTHCOMING EVENTS:

- *Workshop on "Relativistic Effects in Laser-Matter Interactions"
- *Conference on "Atoms and Molecules in Super-Intense Laser Fields" Maratea, Italy, September 9 - 14, 2000.
- *Summer school on "Matter in Super-intense Laser Fields" in Erice (Sicily), July 8-14, 2000.

NEWS:

- *Prof. Charles Joachain, FEMTO Chairman, receives Alexander von Humboldt Award.
- *Workshop on "ICF Computing and Fast Ignitor Physics with Femtosecond Lasers".
- *New Physics Department in Milan
- * Post Doc positions in Milan

FROM THE LABORATORIES:

- *Relativistic electron jets observed at LULI.

The FEMTO Programme, a short presentation

The Programme on "Interaction of superintense, femtosecond laser fields with atoms, solids and plasmas" (short name: FEMTO) is a programme of the European Science Foundation in the Physical and Engineering Sciences. Its chairman is Prof. Charles Joachain from the Université Libre in Brussels.

FEMTO arises from the merging of two previous proposals "Interaction of superintense, femtosecond laser fields with atoms and solids" presented to the ESF by C.Joachain and "Fast Ignitor Physics with short pulse high intensity lasers" presented by D.Batani (Università di Milano - Bicocca). One of the goal of the programme is hence to bring together the two scientific communities of atomic physics and plasma physics.

Research will focus on the following areas at the forefront of the rapidly expanding domain of femtosecond laser interactions:

1. Multiphoton ionisation of atoms in strong laser fields.
2. Dynamics of small molecules intense laser fields.
3. New physical mechanisms and novel applications for high-order harmonic generation.
4. Generation of pulses in the attosecond (10^{-18} s) range.

5. Relativistic effects in laser-atom and laser-plasma interactions.
6. Physics related to the "fast ignitor" approach to inertial confinement fusion (ICF).
7. Study of exotic states of matter for basic physics and astrophysics.

The programme will allow the groups involved to expand their existing collaborations and strengthen the leadership of Europe in this important scientific domain, where there is no pan-European funding at the present time.

The programme has been financially supported by the following countries: Belgium, France, Germany, Italy, Portugal and Sweden. The contributing organisations are:

Belgium:

Fonds National de la Recherche Scientifique

Germany:

Max-Planck-Gesellschaft

Hermann v.Helmholtz-Gemeinschaft Deutscher Forschungszentren (HGF)

Italy:

Istituto Nazionale per la Fisica della Materia (INFN)

Consiglio Nazionale delle Ricerche (CNR)

France:

Centre National de la Recherche Scientifique

Commissariat à l'Energie Atomique

Portugal:

Instituto de Cooperaçao Ciêntifica e Tecnológica Internacional

Sweden:

Naturvetenskapliga Forskningsradet

Czech Republic:

Academy of Sciences of the Czech Republic.

The FEMTO annual budget amounts to 620 kFF (FF = French Francs). Its duration is 5 years, from 1999 to 2003. Most of the activities of the programme are co-ordinated by a "Core Committee" whose members are D. Batani, C.J. Joachain, M. Koenig and W. Sandner. ESF Contacts are Mrs. Catherine Werner or Dr. Hans U. Karow. Email: cwerner@esf.org Fax: +33 (0) 3 88 37 05 32

The programme includes the following activities:

1. GRANTS and SHORT VISITS

Requests for short scientific visits (about one week) and short fellowships (about one month) should be addressed to a member of the Core Committee or Ms. C.Werner.

Only teams from the participating countries can benefit from the FEMTO programme financial support.

2. WORKSHOPS

A few workshops will be organised each year on the topics included in the research lines of the programme. This will be announced both by email, on the programme web site and in this newsletter.

3. EURESCO Conferences.

The EURESCO Committee has accepted our proposal on "Matter in Super-Intense Laser Fields", i.e. two conferences, to be held respectively in 2000 and 2001. The ESF support is 25000 EURO per conference.

The first conference on "Atoms and Molecules in Super-Intense Laser Fields" will be held in Maratea, Italy, on September 9 - 14, 2000. Chairman: C.Joachain, vice-chairman: D.Batani. Details on this first conference will be given in the next issue of "Femto-newsletter".

The second conference on "Short Pulse, Superstrong Laser-Plasma Interactions" will be held in San Feliu de Guixols, Spain, on September 29 - October 4, 2001. Chairman: D.Batani, vice-chairman: P.Agostini.

4. SUMMER SCHOOL.

A Summer school on "Matter in Super-intense Laser Fields" will be held in Erice (Sicily) on July 8-14, 2000. It will cover the atomic, molecular and plasma aspects of super-intense laser-matter physics. The school is being organised, among the others, by C.Joachain, D.Batani and S.Martellucci (Univ. Rome)

Details on the school and complete instructions for applicant will be given in the issue of FEMTO-Newsletter.

XX

Workshop on "ICF Computing and Fast Ignitor Physics with Femtosecond Lasers" Garching, July 1999

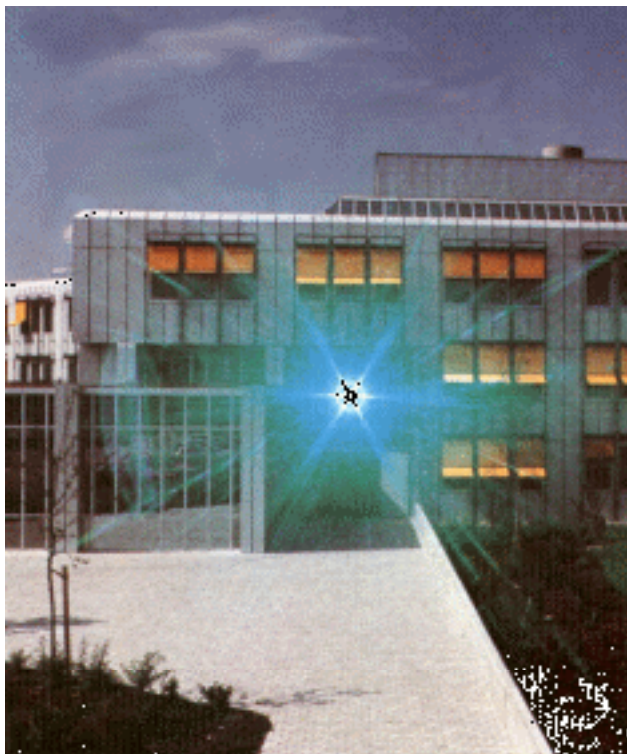
A successful workshop was held at MPQ Garching on July 7-9. Thanks to the financial help within the ESF "FEMTO" project, the participation of seven researchers from outside Germany, and of 2 young German researchers from Darmstadt was supported.

This workshop was held in the past as the annual workshop of the European ICF Computing Group. This year it has been extended to include Fast Ignitor Physics with Femtosecond Lasers, which is one of the most innovative topics for inertial fusion (ICF) and at the same time relates to a new branch of laser plasma physics of high importance to fundamental research as well as a number of applications. The focus of this workshop was on numerical aspects and code development in close contact to actual experiments. The workshop programme discussed recent developments in hydrodynamic simulations tied to ICF targets and beam-plasma experiments and those in particle-in-cell simulations adequate for laser-plasma interaction at ultra-high (relativistic) intensities.

The hydrodynamic codes MULTI 1D and 2D were reviewed by R. Ramis. Recent designs of hohlraum targets for heavy ion beam ICF were presented by J. Ramirez.

Workshop Organiser:

Prof. Dr. J. Meyer-ter-Vehn
Max-Planck-Institute for Quantum Optics
Hans-Kopfermann-Str. 1
D-85748 Garching, Germany
Tel: xx49-89-32905-137
Fax: xx49-89-32905-200
e-mail: meyer-ter-vehn@mpq.mpg.de



A laser beam shines through the entrance door of MPQ in Garching

List of participants supported by ESF:

Stefano Atzeni
 ENEA-Frascati
 Via Enrico Fermi 27
 I-00044 Frascati (Roma)
 Italy
 Tel: +396 9400 5399
 Fax: +396 9400 5735
 e-mail: atzeni@frascati.enea.it

Dimitri Batani
 Dipartimento di Fisica and INFN
 University of Milano - Bicocca
 Via Emanueli 15
 I-20126 Milano
 Italy
 Tel: +39 02 239 2232
 Fax: +39 02 239 2208
 e-mail: batani@mi.infn.it

Marco Borghesi
 Imperial College
 Blackett Laboratory
 Prince Consort Road
 London SW7 2BZ
 UK
 Tel: +44 171 5947 654
 Fax: +44 171 5947 657
 e-mail: m.borghesi@ic.ac.uk

Jonathan Davies
 Instituto Superior Tecnico
 Av. Rovisco Pais
 P-1049-001 Lisbon

Portugal
 Tel: +35 184 19321
 Fax: +35 184 44555
 e-mail: jdavies@alfa.ist.utl.pt

Javier Honrubia
 Universidad Politecnica
 Jose Gutierrez Abascal 2
 E-28006 Madrid
 Spain
 Tel: +34 91 3363112
 Fax: +34 91 3363002
 e-mail: honrubia@iies.es

Rafael Ramis Abril
 Departamento de Fisica Aplicada
 E.T.S.I. Aeronauticos
 P. Cardenal Cisneros 3
 E-28040 Madrid
 Spain
 Fax: +341 3366 303
 e-mail: rafael@faia.upm.es

Julio Ramirez
 Departamento de Fisica Aplicada
 E.T.S.I. Aeronauticos
 P. Cardenal Cisneros 3
 E-28040 Madrid
 Spain
 Fax: +341 3366 303

Hartmut Ruhl
 TQE (Theoretical Quantum Electronics)
 TU Darmstadt
 Hochschulstrasse 4A
 64289 Darmstadt
 Germany
 Fax: +49-6151-163279
 Tel: +49-6151-162381
 e-mail: Hartmut.Ruhl@physik.tu-darmstadt.de

Steffen Hain
 TQE (Theoretical Quantum Electronics)
 TU Darmstadt
 Hochschulstrasse 4A
 64289 Darmstadt
 Germany
 Fax: +49-6151-163279
 Tel: +49-6151-162381
 e-mail: Steffen.Hain@Physik.TH-Darmstadt.DE

PROGRAMME of the workshop on "ICF Computing and Fast Ignitor Physics with Femtosecond Lasers" held at MPQ Garching, July 7-9, 1999

Wednesday, July 7

D. Batani (Univ. Milano - Bicocca)
 The ESF Programme "FEMTO".
 Fast ignition and electron transport experiments.

J. Meyer-ter-Vehn (MPQ Garching)
New frontiers for the European ICF Computing Group
related to femtosecond laser-plasma interaction
R. Ramis (UP Madrid)
New developments with respect to the code MULTI-2D

J. Honrubia (UP Madrid)
The code SARA for ICF computations

I. Hofmann (GSI Darmstadt) Mittwochnachmittag
Inertial Fusion and Heavy Ions at GSI

J. Ramirez (UP Madrid)
Design of a reactor target for heavy ion fusion

M. Basko (CEA Cadarache)
Modelling neutron transport in cylindrical ICF

A. Kemp (MPQ Garching)
Magnetised targets driven by heavy ion beams

Thursday, July 8

K. Witte (MPQ Garching)
Femtosecond laser plasma experiments at MPQ

M. Borghesi (Queen's University, Belfast)
IC short pulse experiments for fast ignitor applications:
channelling, guiding and fast electron propagation.

J. Davies (Istituto Superior Tecnico, Lisbon)
Fast electron transport in solid targets and relevance to the
fast igniter

S. Atzeni (ENEA Frascati)
Fast ignition of ICF targets

Visit of MPQ ATLAS laser facility

S. Hain (TU Darmstadt)
Propagation of intense laser radiation in matter.

H. Ruhl (TU Darmstadt)
High absorption, large current generation and transport in
ultra-intense laser plasma interaction.

D. Batani (Univ. Milano-Bicocca)
Some recent experimental results on gold equation of state
at pressures up to 100 MBar

M. Honda (MPQ Garching)
Transport of 100 MA laser-driven electron beams in plasma

Discussion: Urgent problems in fast ignition physics

Friday, July 9

K. Eidmann (MPQ Garching)
First demonstration of solid density matter at 300 eV
generated with 150 fs laser pulses
R. Pfund (MPQ Garching)
PIC-simulation of femtosecond-laser interaction with solids

Th. Schlegel (TU Darmstadt)
Fast electron generation with femtosecond laser pulses

S. Anisimov (RAS, Moscow)
On the gas dynamics of femto-second laser ablation

N. Inogamov (MPA Garching)
1. About an interaction between a neutron star and an
accretion disk
2. The geometry of 3D interpenetration of contacting fluids
during development of the Rayleigh-Taylor and Richtmyer-
Meshkov instabilities:

G. Tsakiris (MPQ, Garching)
Relativistic electron jets from femtosecond laser plasma
interaction

E. Fill (MPQ, Garching)
Relativistic plasma pumping of X-ray lasers

M. Kaluza (MPQ, Garching)
Ionisation of high Z atoms in strong laser fields

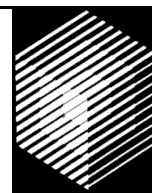
Discussion: Future of European ICF Computing Group

end

announcement



**POST-DOC
POSITIONS**



Two 2-year Post Doc Positions are available at the Laser-Plasma Group of the new Milan's University. Candidates should be Italian or E.U citizens and should have a Ph.D in Physics or Engineering obtained in an Italian or European university (a research experience after graduation, at least 3 years long, may be considered equivalent to a Ph.D. A sample copy of each of the candidate's paper should be sent with the application form).

The research programs will concern:

A) Generation of hot electrons in the interaction of short pulses with solid targets, in the framework of the studies on "fast ignition" of fusion targets.

B) Dense Plasmas created by laser driven shock waves and Equation of State.

The selected candidates will participate to experiments performed at the European Large Scale Laser Facilities.

For information and for requesting a copy of the application form, contact dr. Dimitri Batani, email batani@mi.infn.it fax 39-02-2392208

announcement

A workshop on "Relativistic Effects in Laser-Matter Interactions", will be held at the Orme des Merisiers (Saclay) on November 19-20, 1999, in the framework of the FEMTO Programme. The organisers of the workshop are Pierre Agostini and Alfred Maquet, whose address is given below.

One of the main goals of the workshop is to bring together the two scientific communities of atomic physics and plasma physics. We wish also to give the opportunity to young researchers to present their works.

The program will include the following topics:

- relativistic dynamics of atoms in strong fields,
- relativistic laser-plasma interactions,
- ion-induced attosecond vs. subfemtosecond laser photon fields

Researchers wishing to participate are invited to contact the workshop organisers as soon as possible. If they come from a country supporting the FEMTO Programme (Germany,

Italy, France, Belgium, Sweden, Portugal), their expenses can be covered within the limit of 5000 French Francs.

Alfred Maquet,
Laboratoire de Chimie Physique-Matiere et Rayonnement
Universite Pierre et Marie Curie,
(Unite Mixte de Recherches du CNRS, UMR 7614)
11, rue Pierre et Marie Curie, F-75231 Paris Cedex 05
France
Tel: +33 (0)1 44 27 62 77
Fax: +33 (0)1 44 27 62 26
e-mail : alm@ccr.jussieu.fr
web site : [ht://www.ccr.jussieu.fr/lcpmr/](http://www.ccr.jussieu.fr/lcpmr/)

Pierre Agostini
DSM/DRECAM
Service des Photons Atomes et Molecules
Centre d'Etudes de Saclay 91191 Gif Sur Yvette
Tel +33 016 908 5162
Fax +33 016 908 8707
e-mail agop@santamaria.saclay cea.fr

XX
Award Ceremony, held in May 31, 1999 in Berlin,



Prof. Charles Joachain, FEMTO Chairman, receives Alexander von Humboldt Award from Professor Reimar Lüst, President of the A. von Humboldt Foundation.

NEW DEPARTMENT OF PHYSICS IN MILAN

The new Physics Department of the new "Università degli Studi di Milano - Bicocca" has been inaugurated on September 29. The Department includes the activities on plasma physics (laser-plasmas, thermonuclear plasmas, magnetic plasmas and plasma applications) which were previously conducted at the University of Milan. The Department is named after Giuseppe Occhialini, the great Italian physicist, whose short profile is given below.

The inauguration, chaired by G. Marchesini, director of the new department, has seen the participation of M. Fontanesi (rector of the new university and plasma physicist himself), J. Steinberger (Nobel Prize for Physics in 1988), F. Bassani (President of SIF - the Italian Physical Society) and L. Scarsi, head of the satellite Beppo-Sax research team.

Giuseppe "Beppo" Occhialini: A Profile

Giuseppe Occhialini was born in 1907 in Fossombrone and graduated in Florence in 1929. At the age of 24 he joined the Cavendish Laboratory in Cambridge, under the supervision of Patrick M.S. Blackett. He brought to the Cavendish the coincidence counter technique, pioneered by Bruno Rossi, and applied it to the Wilson chamber. The famous picture of the first electromagnetic shower was obtained with this device, providing a firm confirmation of the discovery of the positron by C. Anderson.

After the Second World War he moved to the Will Laboratory and Cecil F. Powell in Bristol UK. There, using a novel approach involving the use of photographic emulsions for detection of elementary particles, he contributed to the discovery of the pi-meson decay in 1947.

Blackett (in 1948 "for his development of the Wilson cloud chamber and his discoveries therewith in the field of nuclear physics and cosmic radiation") and Powell (in 1950 "for his development of the photographic method in the study of nuclear processes and for his discoveries concerning mesons") separately won the Nobel Prize for their work on elementary particles.

Both awards were made in difficult, Cold War years, and Occhialini had never made a secret of his political ideas. Pontecorvo summed it up nicely, in a famous toast: "I drink not to Beppo, but to us all: may we collaborate with him, it is a practically sure way of winning a Nobel Prize".

In 1952 Occhialini became professor of advanced physics in Milan where research groups, focused on cosmic-ray studies (the 'G-stack collaboration'), elementary particle physics ('K-collaboration') and space physics, were founded under his leadership. He founded and became first director of LFCTR (which later became IFCTR; this institute is now named after him: Istituto di Fisica Cosmica e Tecnologie Relative "G.P.S. Occhialini").



Beppo, together with E. Amaldi and others, played a crucial role in starting the European Space Research Organisation, and in giving an impetus to its scientific programme, from which the present-day European Space Agency still benefits. He was one of the founding fathers of the COS-B project. The European Physical Society appointed Occhialini in 1993 (its 25th Anniversary) as one of their Honorary Members.

In a sad coincidence, Giuseppe (Beppo) Occhialini died on 30 December 1993 within a few weeks of Bruno Rossi and a few months of Bruno Pontecorvo, three of the greatest Italian physicists of the same generation.

Although this workshop is not organised in the framework of the FEMTO programme we introduced it in this Newsletter since we think that it will be of interest to many of its readers

announcement

Dear colleague,

We have the pleasure to draw your attention on the

FOURTH INTERNATIONAL WORKSHOP ON FAST IGNITION OF FUSION TARGETS

3rd - 5th APRIL 2000

TO BE HELD AT THE ECOLE POLYTECHNIQUE,
91128 PALAISEAU, FRANCE.

Organising Committee:

Patrick MORA, Centre de Physique Theorique, Ecole Polytechnique Jean-Claude GAUTHIER, LULI, Ecole Polytechnique.

To be in the previous workshops tradition (Berkeley, Garching, RAL), the focus of this meeting is intense laser-matter interactions of relevance to the fast ignitor concept.

The goal of this fourth workshop is to bring together people (not more than 40-50) from both theory/simulation and experiment actively working on this novel concept, to assess its potential and physics limits, and to identify key areas for research in the next future.

Topics to be considered are:

- 1) High intensity, subcritical, laser-plasma interaction: channelling, capillary studies, interaction of the laser pulse with the plasma channel, parametric instabilities in the ultrafast regime, heating pulse interaction with large scale preformed plasmas and/or imploded spherical plasmas.
- 2) High intensity, supercritical, laser-plasma interaction: hole boring, ponderomotive force effects.
- 3) Hot electron sources, electron jets, and electron transport: transport inhibition, hot electron heating, filamented electron transport and anomalous collective electron stopping.
- 4) Generation of giant magnetic fields: their effects on electron propagation.
- 5) Nuclear physics: high-energy photons and high-energy charged-particle production, their interaction with solid matter.
- 6) NEW laser technology to reach super-relativistic intensities.
- 7) Simulations (fluid, kinetic, MHD, particle-in-cell, etc).

We would like to change slightly the format of the workshop (more in the spirit of the first workshop in Berkeley) by having sessions of 1h30 or 2h with, respectively, 2 or 3 review speakers and a moderator who will promote and direct a 30mn final discussion. We think that this kind of "on the spot" discussion is eventually more profitable than a formal "round table" after (or before) dinner.

Moderators will be suggested by the international advisory board (a member list can be found on the web site below). Please indicate where you would like to contribute in the list above, noting that we will possibly respond by asking you to give a review talk or to lead a discussion.

The duration of the meeting will be 3 days, including a visit of the LULI facility. A small block of (approximately

10) inexpensive rooms will be made available at the Ecole hotel, for students and post docs. A list of hotels in Paris, conveniently located close to the RER public transportation to Palaiseau is provided on the web site below. There is a possibility of VERY limited financial support if required.

Pre-registration is highly recommended because registration several weeks in advance is required to visit Ecole Polytechnique.

You will find a pre-registration form at the web site:

<http://www.luli.polytechnique.fr/fi4/>

If you do not have access to the world-wide web, please let us know and we will mail a copy of the registration form to you. Maps to guide you by car, train and RER to the laboratory can be found on the website.

If you have any questions, please feel free to contact us anytime. The LULI's staff look forward to seeing you in April 2000.

Yours sincerely,

JCG and PM

Jean Claude Jacques GAUTHIER , LULI
Ph : [33] 1 69333260,
Fax: [33] 1 69333009
E-mail: gauthier@greco2.polytechnique.fr
Ecole Polytechnique
Route de Saclay,
91128 Palaiseau cedex (France)

Patrick Mora
Centre de Physique Theorique
Ecole Polytechnique
Route de Saclay,
91128 Palaiseau cedex (France)
Tel: +33 1 69 33 37 99
Fax: +33 1 69 33 30 08
E-mail: mora@cpht.polytechnique.fr

OPTO & Laser EUROPE writes about our Programme

From O&LE, April 199, p. 5

"Femtosecond funds from Europe

The European Science Foundation has approved physics programmes to run over the next five years. This programme will include research dealing with superintense femtosecond laser fields with atoms, solids and plasmas"

This year's Hirscheegg meeting will include the Hirscheegg' 2000 COLLOQUIUM on Wednesday morning, February 2, on the occasion of the 60th birthday of J. Meyer-ter-Vehn and the 20th anniversary of the Hirscheegg meetings.

The Colloquium will address topics of particular importance for the future of high energy density science and nuclear fusion. Invited speakers are:

S. Anisimov (Landau Institute, Moscow),
V. Fortov (Russian Academy of Sciences, Moscow),
F. Krausz (Technische Universitaet Wien),
J. Lindl (Lawrence Livermore Laboratory),
F. Wagner (IPP Greifswald).

The Hirscheegg' 2000 Colloquium will take place at the Ifen Hotel in Hirscheegg. After the talks there will be a reception in the Ifen Hotel.

There will be no printed proceedings. We encourage, however, to publish original contributions to this workshop in a regular issue of 'LASER and PARTICLE BEAMS'.

A xerox unit will be available at the meeting, preparation and distribution of preprints is recommended. Please have at least one set of mastercopies of your transparencies available.

Conference Chairman
Dr. Andreas Tauschwitz, GSI
Planck-Str. 1
64291 Darmstadt
Tel.: +49 6159 71 2723
Fax.: +49 6159 71 2992
A.Tauschwitz@gsi.de

Conference Secretary
Mrs. Ch. Eidmann
Theoretische Quantenelektronik (TQE)
Hochschulstr. 4a
Technische Universitaet Darmstadt

Conference fee

The conference fee is 120 DM and includes our conference overhead, refreshments during the coffee breaks, and the conference dinner on Wednesday night. For a limited number of participants, especially for students, the conference fee can be waived. Please contact the organisers.

Accommodation

Most participants will as in recent years stay at the Waldemar-Petersen-Haus. There are a few single and double rooms available. We therefore ask you to sign up for double and four-bed rooms.

Single room rate: 400 DM
Double room rate: 350 DM
Four-bed rate: 300 DM
Four-bed student rate: 250 DM

The rates include breakfast, dinner, and lunch. There will be an offer of lunch boxes and a soup (self service). We plan to have a conference dinner Wednesday night.

Participants not staying at the Waldemar-Petersen-Haus are requested to make their own arrangements. The Hotel Birkenhoehe has reserved a number of rooms for conference participants.

Hotel-Pension Birkenhoehe
Oberseitestr. 34
A-6692 Hirscheegg /Austria
Fax +49 08329 55 87 12
Tel +49 08329 55 87

Information on other hotels, pensions, Ferienwohnungen can be obtained from the

Verkehrsamt Kleinwalsertal : Tel:+49 8329 51 14-0 Fax:+49 8329 51 14 21

Please contact the conference secretary Mrs. Ch. Eidmann before November 26th, 1999.