

The European Neutron and Muon School – an umbrella of schools supported by NMI3



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Calendar

Winter

Fan du LLB

FullProf

Spring

HERCULES

Berlin school on Neutron Scattering (HZB)

ISIS Muon school

Central European Training School

Jaca school (University of Zaragoza)

Summer

Bombannes summer school

Giornatte Didattiche/SISN school

PSI summer school

JCNS Laboratory course

Oxford summer school on neutron scattering

HZG summer school

Autumn

Baltic school (University of Riga/Latvia)

Welcome to the European Neutron and Muon School

NMI3, the Integrated Infrastructure Initiative for Neutron scattering and muon spectroscopy, has been supporting training and education in neutron and muon research since its inception in 2003. With the start of a new funding programme in 2012, NMI3 has decided to focus on a group of selected European schools. Through the creation of the umbrella called the European Neutron and Muon School, NMI3 aims to better coordinate the planning and scheduling of the European neutron and muon schools, and to encourage them to share resources and information. The schools are well distributed over the year and over the European regions and will provide training to students with a variety of training needs and scientific interests. They take place annually or every two years and while most of them are delivered in English, a few are given in their country's language.

This brochure aims to give potential students of the European Neutron and Muon School all the information they need to choose the most appropriate school for them. In the brochure, students will find a calendar, a summary of each school's aims and curriculum, a website and contact details for each school. For more information about a specific school, students are advised to contact the school directly but for more general questions please don't hesitate to contact us at the email address below or visit the NMI3 website at www.nmi3.eu.

NMI3 support

The schools presented in this brochure all receive financial support from NMI3, which they use to offer stipends or pay travel fees for selected students.

How to apply

To apply students must visit the website of the school of their choice and follow the application procedure of the school. Students will also find information about financial support on the school's website.

The different types of schools: Introduction to neutrons / muons

NMI3 supports schools offering an introduction to neutron and muon experimental techniques. In these schools, students are given an overview of the relevant theoretical aspects of the techniques, as well as an opportunity to perform real experiments on state-of-the-art instruments from European neutron and muon facilities. These schools are important to introduce neutrons and muons and their many facets to PhD students and post-doctoral scientists embarking on a research program using neutrons and/or muons. Many of the students of past neutron schools supported by NMI3 are now eminent and internationally-recognised neutron and muon users. The Jülich Laboratory Course in Neutron Scattering, the Oxford School on Neutron Scattering, the Berlin School on Neutron Scattering, the Central European Training School, Fan du LLB, HERCULES, the Italian Society for Neutron Spectroscopy (SISN) school, the Baltic school (University of Latvia), the HZG Summer School (Helmholtz Zentrum Geesthacht) and the ISIS muon school fall into this category.

Thematic schools

Specialist neutron schools focusing on a specific neutron technique, analysis tool or scientific discipline are necessary to attend scientists looking for a more specific type of training. The FullProf school, the Paul Scherrer Institute Summer school on condensed matter, the Bombannes Summer School, and the JACA School (University of Zaragoza) fall into this category.

NMI3, the Integrated Infrastructure Initiative for Neutron scattering and muon spectroscopy has been supporting neutron and muon research since 2003.

Contact us: info@nmi3.eu

Follow us on Facebook: NMI3 and Twitter: @NeutronMuonI3 or register on www.nmi3.eu to receive our newsletter.



JCNS lab course
Picture: Wenzel Schürmann / TUM

Introduction to neutrons and muons

Baltic School on Application of Neutron and Synchrotron Radiation in Solid State Physics and Material Science (BSANS-2012)

Next dates: 1st to 4th October 2012

Riga, Latvia

Frequency: every two years

The school is aimed at graduate students, post-doctoral fellows and scientists who are new to neutrons and X-rays. The participation of more experienced users of neutron and X-ray facilities and scientific discussion between experienced users and young scientists are important components of the school.

During four days, a series of lectures will be given by leading scientists on the following topics

- Neutron sources
- Instrumentation
- Neutron scattering
- Diffraction

- Reflectometry
- Engineering
- Neutrons & X-rays

All lectures will be in English and the school is open to 35-50 participants.

For more information please visit the school website: www1.cfi.lu.lv/teor/BSANS



Riga, the capital of Latvia: Picture courtesy of the organisers



Berlin School on Neutron Scattering

Next in 2013

Berlin, Germany

Frequency: annual

The Berlin Neutron School is one of the oldest established neutron schools. It was founded in 1980 by Prof Hans Dachs and is organised by the Helmholtz Zentrum Berlin für Materialien und Energie (HZB). The aim of the school is to provide an introduction to neutron scattering with an emphasis on hands-on, practical experience using the instruments at the BERII reactor. The first two and a half days of the school consist of detailed lectures on the principles and techniques of neutron scattering followed by a tour of the instruments and an introduction to sample environment. As well as the course lectures given by members of HZB, guest lecturers are invited to discuss current issues in the field of neutron research. For example, in 2010 Prof Michael Steiner (ENSA) talked about the future of neutron sources in Europe and Dr Andrea Denker (HZB) lectured on neutron autoradiography and how this can be used to learn more about paintings and artifacts.

After attending the lectures the students begin the hands-on experiments. They are divided into groups of four to five from similar subject areas and do triple-axis spectroscopy, powder diffraction, small angle scattering, reflectometry, time-of-flight spectroscopy, tomography and spin echo under the guidance of the instrument scientists. The experiments last three hours each and take place over three and a half days. On the last day of the school the students attend lectures on how to use neutron scattering as a tool for research in the areas of biology, chemistry, engineering and physics. At the end of the school a certificate is issued and the students complete a questionnaire. The questionnaire reveals that the students are usually highly satisfied with the school, and we always take into account their suggestions for further improvement.

For more information please visit the website: www.helmholtz-berlin.de/events/neutron-school/

HZB Helmholtz
Zentrum Berlin



Students and instrument scientist during the 2009 Berlin school. Picture: Andre Alain Rouviere/Berlin school

Next dates: 7th to 14th June 2012
Carcans Maubuisson, France

Frequency: every two years

The Bombannes summer school offers a practical approach to scattering methods, introducing today's key techniques: neutrons, X-ray and light sources, to study structure and dynamics in systems containing colloids, polymers, surfactants and biological macromolecules.

The Bombannes school has been introducing the current methodology of static and dynamic scattering techniques and their application to soft matter systems, since the 1990's. It provides advanced training to young researchers with a working place in European laboratories at post-graduate and post-doctoral level.

The school consists in 25 hours of general lectures, divided into two parts. The first half of the week provides a general introduction to scattering experiments.

Basic concepts of data treatment, the notion of contrast, general theorems, instrumentation and resolution effects are introduced.

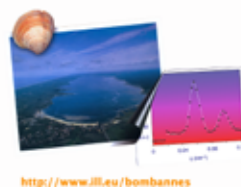
In the second half of the week, applications of static and dynamic scattering techniques to investigate typical soft matter systems such as colloidal suspensions, microemulsions, micelles and surfactant solutions, polymers, biological systems and turbid suspensions are presented. Evening sessions are dedicated to student presentations and contributions.

The number of participants is limited to 35.

For more information please visit the website:
www.ill.eu/bombannes



Students and lecturers at Bombannes 2010: Picture courtesy of the organisers



Bombannes 2012

**11th European Summer School on
"Scattering Methods Applied
to Soft Condensed Matter"**
"Les Bruyères", Carcans-Maubuisson, Gironde, France
7 - 14 June 2012

Next dates: 14th to 18th May 2012

Budapest, Hungary

Frequency: every two years

CETS has been running since 1999. The school is aimed at members of the European Community with a special focus on the Central European region and provides hands-on training at the Budapest Research Reactor facilities.

The aim of this course is to provide insight into neutron scattering techniques (small-angle neutron scattering, three-axis spectroscopy, neutron reflectometry, prompt gamma activation analysis, neutron diffraction, time-of-flight spectroscopy and neutron radiography) and their application for studies of the structure and dynamics of condensed matter. Participants will also gain experimental skills and guidance in data evaluation/interpretation will be provided. The school is a forum for the presentation and discussion of research work by young scientists. Graduate and PhD students are welcome, as well as newcomers to neutron research from the fields of structural research in physics, chemistry and biology.

The training consists of five days of tutorial lectures given by renowned lecturers from European centers like ILL, ISIS and HZB. The lectures are followed by experimental works at the instruments, to introduce students to the art of manipulating instruments at a large-scale facility. Students will get acquainted with sample preparation, experiment planning and running as well as data processing and interpretation of results. The number of participants is limited to 30-35 (restricted by the training facilities available).

For more information please visit the website:
www.kfki.hu/~cets/



Students at CETS 2010: Picture courtesy of the organisers.

Next dates: 3rd to 6th December 2012

Saclay, Gif sur Yvette, France

Frequency : annual

Fan du LLB is an annual school delivered in French and offering young French-speaking researchers a first contact with real experimental neutron scattering. The school is aimed at students and post-docs working in all scientific areas where neutrons can provide valuable insights, although priority is given to those having never had any contact with neutron scattering. After an introduction to neutron sources and neutron scattering, ten different thematic subjects based on different scientific problems that can be addressed by neutron scattering, are proposed to the students. In groups of four to five, the students are then introduced to two

different neutrons scattering techniques, during three days devoted to experiments and data analysis. One of the distinguishing features of the school is that the students often come with their own samples, which are tested during the training together with our demonstration samples. This ensures a good and efficient participation of the students. The course lasts for three and a half days.

The usual number of participants is 35.

For more information please visit the website : www-llb.cea.fr/fan



Students at the 2010 Fan du LLB school. Picture courtesy of the organisers.

Next in 2013

Grenoble, France

Frequency: annual

The aim of the HERCULES session is to train PhD students and postdoctoral scientists to optimally use the state-of-the-art instruments at current and future Large Installations (LI) providing neutrons or synchrotron radiation in Europe. Since their inception in 1991, the HERCULES annual sessions have provided basic theoretical knowledge and experimental know-how to a multidisciplinary audience composed of young biologists, chemists, physicists, geoscientists and industrial scientists.

The HERCULES annual session is organised every year for 70-75 participants. A large part of the school duration is devoted to neutron interactions with matter, neutron production, and the various techniques involving neutron scattering (elastic, inelastic, quasielastic). The duration of the course is 4.5 weeks. To meet the training needs, more than fifty European

experts in all the fields concerned are invited to give lectures and about one hundred scientists from the partner LI deliver the practicals and tutorials.

The sessions include lectures, practicals and tutorials, visits to laboratories and a poster session. Emphasis is put on experimental training (by groups of four participants), resulting in more than one week of practicals with beam in four neutron and synchrotron LI per participant. The practicals usually take place at Swiss Light Source (SLS) at the Paul Scherrer Institute, and at synchrotron SOLEIL, for the synchrotron radiation part, and at the reactor Orphée at Léon Brillouin Laboratory (LLB) and at ILL, for the neutron part.

For more information please visit the website: hercules-school.eu



Students at Hercules 2011. Picture courtesy of the organisers.

Next dates: 24th June to 2nd July 2012
San Giovanni in Valle Aurina, Italy and
Grenoble, France

Frequency: annual

The GD is the school on neutron scattering organised by the Società Italiana di Scattering di Neutroni (SISN). The school is generalist and is aimed at university students, PhD students and young researchers from different disciplines. The school is delivered in Italian and it provides a very general introduction to the various neutron scattering techniques.

The school is divided in two parts: the first part provides a theoretical introduction to neutron scattering and the different neutron scattering

techniques. The students also perform exercises on didactical examples in small groups supervised by a tutor. They are required to participate actively in these exercises. For the second part, the students are transferred to the Institut Laue-Langevin (Grenoble) and take part in experiments on the Italian Collaborative Research Group instruments BRISP and IN13 and on one diffractometer.

For more information please see the website:
www.sisn.it/



Valle Aurina, Italy, where the first half of the school takes place.
Picture courtesy of the organisers.



Next in 2013

Lauenburg near Hamburg, Germany

Frequency: every two years

The HZG Summer school is a five-day long school delivered in English and focusing on the application of neutrons and photons in engineering materials science.

The school aims to provide a systematic overview of the use of neutrons and photons in the field of engineering materials science, to students from all over Europe. The first part of the school is dedicated to a three-day theoretical course introducing scattering and imaging techniques using the two probes. During the course, internationally renowned experts are invited to give talks about broad subjects such as methods, sources and material science. The second part of the school focuses on application and research. It provides insights into current research using photons and neutrons and presents neighbouring fields using these two probes. Advanced PhD. students are given the opportunity to present their work in a dedicated presentation and poster session. The school is usually complemented by a two-day long practical at the HZG outstation at

DESY, where the students are introduced to the instruments of the German Engineering Materials Science (GEMS) Centre at DESY. There, they are guided through measurements on real, working instruments (diffractometers, SANS and tomography instruments). At several data evaluation stations, the students are introduced to evaluation procedures on neutron and X-ray data, in the fields of texture and residual stress analysis as well as tomography and small-angle scattering.

The school is organised by HZG, DESY, HZB, TU Berlin and TU Leoben with financial support from NMI3 and the Gesellschaft zur Förderung des Helmholtz-Zentrums Geesthacht e.V.

For more information visit the website:
www.hzg.de/mw/summerschool/index.html.en

 **Helmholtz-Zentrum
Geesthacht**

Zentrum für Material- und Küstenforschung



students and lecturers at the 2011 HZG summer school. Picture courtesy of the organisers.

Next dates: 3rd to 14th September 2012
Jülich and Garching, Germany

Frequency: annual

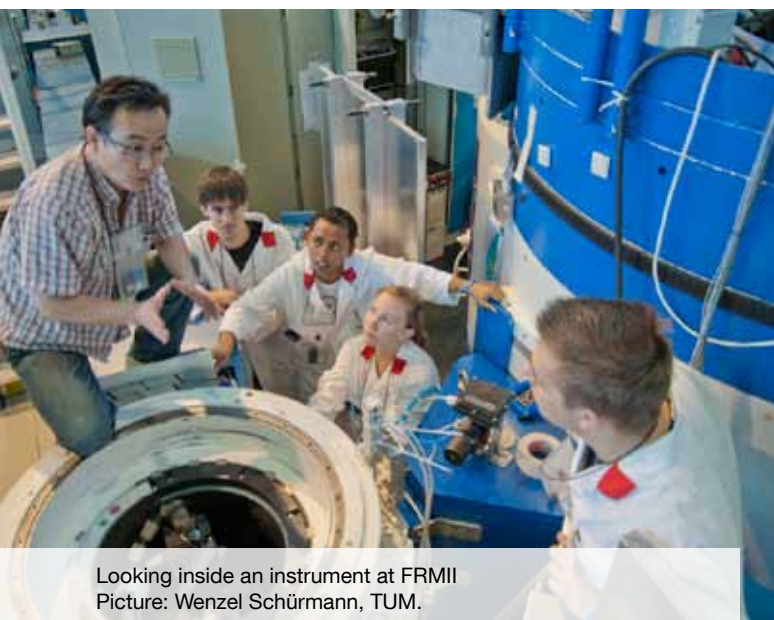
The JCNS Laboratory Course Neutron Scattering is organised annually since 1997 by Forschungszentrum Jülich .

The aim of the course is to give students an insight into neutron scattering, the experimental technique and its scientific power. The laboratory course consists of one week of lectures held at Forschungszentrum Jülich followed by one week of neutron scattering experiments at the research reactor FRM II in Garching, Germany. The lectures include an overview of neutron sources as well as an introduction to scattering theory and instrumentation. In addition, selected topics of condensed matter science are presented. Students get to practice the topics addressed in the lectures through two hours of exercises per day. In the second week, 10–12 neutron scattering instruments are made available free of cost for five days. The participating students work in groups of five. Each group performs one neutron scattering

experiment per day, so that each student experiences working on five different instruments. In summary, the scientific programme of the laboratory course comprises 20 hours of lectures, 20 hours of exercises (half of the time in tutored groups), and 40 hours of experiments (including preparation and reporting). The number of students admitted is typically 50 to 60. The feedback collected from the students is consistently positive and the fact that many of the former participants are now scientists in neutron scattering-related workgroups shows that the course has a lasting success in education.

The whole course including local accommodation and meals is made available for free to the selected students. For non-German EU students, travel expenses are also reimbursed.

For more information please see the website:
www.neutronlab.de



Looking inside an instrument at FRMII
Picture: Wenzel Schürmann, TUM.



Next in September 2013

Oxford, UK

Frequency: every two years

The international Oxford Summer School provides an intensive series of lectures, exercise classes and tutorials in the area of neutron scattering. The students are accommodated in St. Anne's college with the lectures held in the Department of Physics, Oxford University. The course lecturers are all acknowledged international experts in their field. The school offers students a comprehensive exposure to neutron scattering from the theoretical background, through to sources and instrumentation and the application of these techniques to a diverse range of disciplines.

Topics covered during the school include:

- The properties and sources of neutrons
- Neutron Instrumentation
- Theoretical description of neutron scattering
- Elastic scattering and spectroscopy

- Polarised techniques
- Hard and soft condensed matter, biology and engineering research using neutrons

The topics are backed up by tutorial sessions in small groups with the course lecturers. This represents a unique opportunity to discuss the course material with the lecturers, to work through examples drawn from the course material and to share research experiences.

A visit to the ISIS spallation neutron source and the second target station is also included. Two school related evening lectures will be provided. An informative and popular session on science communication is also included. The school is limited in size to 50 residential places.

For more information please visit the website:
www.oxfordneutronschool.org



NEUTRONS
FOR SCIENCE



Science & Technology Facilities Council

ISIS



Students at the 2011 Oxford school.
Picture courtesy of the organisers.

Muon school at ISIS

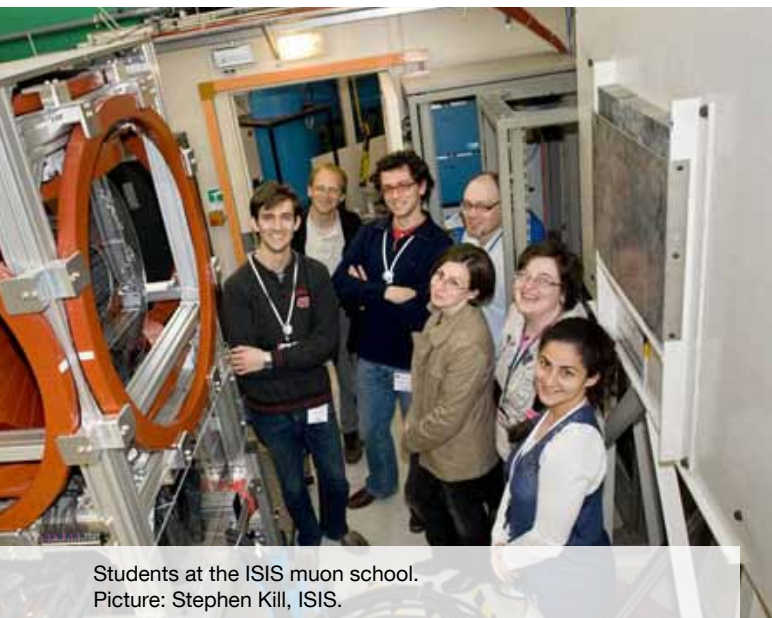
Next in 2013
Didcot, UK

Frequency: annual

The aim of this school is to provide a practical training course for young researchers on the spectroscopic techniques using muons as probes in condensed matter research. The ISIS Pulsed Neutron and Muon Source, at the STFC's Rutherford Appleton Laboratory (RAL), is home to intense beams of pulsed muons for condensed matter investigations. ISIS has previously run five muon spectroscopy training schools (1994, 2003, 2005, 2007 and 2010), which have provided students with first hand practical experience of running a μ SR experiment, together with the background knowledge required to understand the technique's principles. The goal of the training schools was to provide researchers near the start of their

careers with the skills necessary to take the maximum benefit from future facility time, to provide young researchers with valuable experience of working at a large, international facility and to improve knowledge in related fields such as computing and cryogenics.

For more information please visit the website:
www.isis.stfc.ac.uk/groups/muons



Students at the ISIS muon school.
Picture: Stephen Kill, ISIS.



Science & Technology Facilities Council

ISIS

Next dates: 27th to 30th May 2012
Zaragoza, Spain

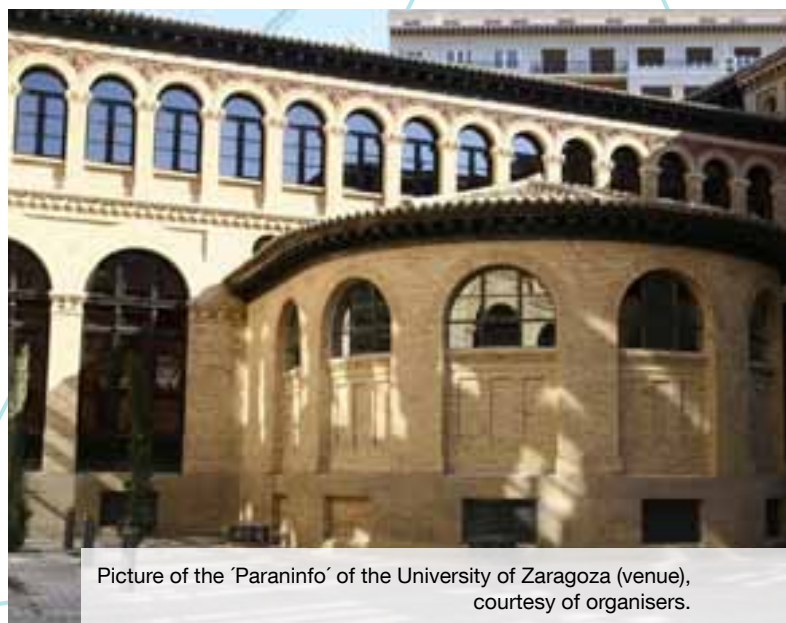
Frequency: irregular

This seminar is open to the wider scientific community and aims to identify the scientific drivers requiring novel and extreme conditions, as well as determine how neutron scattering techniques can contribute to this area of research. The seminar will bring together scientists, engineers and instrument specialists and aims to promote discussion and the exchange of ideas between these three groups. The organisers hope that this exchange will foster ideas for novel and extreme sample environment equipment and instruments, so that new scientific areas can benefit from neutron scattering techniques.

During the seminar, world-class experts will be invited to give tutorials on the following topics: high pressure, high magnetic and electric fields, soft matter equipment, low temperature and high temperature.

These tutorials will be followed by discussions on the technical aspects and future possibilities of the field being discussed. Current capabilities and limitations, but also the type of science that could be investigated provided that certain developments be made, will be addressed. Registration to participate in the seminar is open until the 15th of April 2012. The event registration fee covers participation, a welcome reception, coffee breaks, lunch meals and a gala dinner.

For more information, please visit the website:
www.unizar.es/m4/index.php/events



Picture of the 'Paraninfo' of the University of Zaragoza (venue), courtesy of organisers.

Fullprof school (FPSchool)

Grenoble, France

Frequency: annual

Precise crystallography has significantly contributed to the success and recent developments in materials science, solid-state physics and chemistry. Among the available programs for diffraction data analysis, the FullProf Suite is one of the most widely used packages by the scientific community working in these fields. The aim of the annual school on the FullProf Suite is to contribute directly to the training of the upcoming generation of scientists with intensive hands-on schools focused on the analysis of diffraction data using the FullProf Suite.

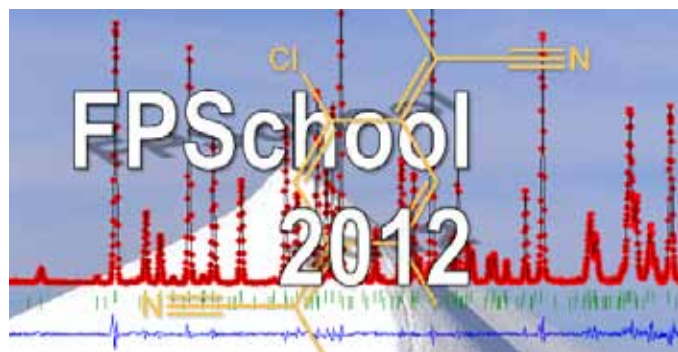
Theoretical one-hour long introductory lectures are followed by hands-on practical computing sessions. The afternoon are mostly dedicated to practical sessions.

In order to favour intensive scientific exchanges, the number of students is limited to 30.

For more information please visit the website: www.ill.eu/news-events/events/fpschool-2012/



Students at the 2011 Fullprof school.
Picture courtesy of the organisers.



Next dates: 11th to 19th August 2012
Institut Montana Zugerberg, Zug & Paul
Scherrer Institut, Villigen, Switzerland

Frequency: annual

The 'PSI Summer School on Condensed Matter Research' first took place in 2002, as a continuation to our traditional summer schools on neutron scattering, which first took place in 1993 in Zuoz/Switzerland. The scope of the annual school is the training of Ph.D. and postdoctoral students in the experimental methods and probing tools provided by PSI to the scientific community: that is neutrons, muons and synchrotron light. Every year the school focuses on a specific topic, such as 'Functional Materials' (2009), 'Magnetic Phenomena' (2010) or 'Phase Transitions' (2011).

The programme of the schools includes lectures introducing basic theories and experimental techniques, mainly given by PSI staff, and comprehensive overviews of particular research fields mainly presented by international expert speakers. The lecturers are recruited internationally and are prominent researchers in their field, in Europe and worldwide. A poster ses-

sion gives the participants the opportunity to present their scientific work.

In between lectures, participants have the chance to deepen their understanding of the methods and topics addressed through discussions with lecturers and PSI staff scientists.

Since 2009, the school is complemented by hands-on practical sessions carried out on instruments provided by SLS, SINQ and SmuS. Twenty to thirty students are selected, divided in small groups, and introduced the experimental techniques with photons, neutrons and muons.

The PSI summer school is open to the Swiss and international scientific community and the language of the school is English.

More information can be obtained on the website: www.psi.ch/summerschool



Students at the 2011 PSI summer school.
Picture courtesy of the organisers.

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