New Neutron Guide Hall

News and Events 2004

Dr. Hans-Werner Schock (left) together with Prof. Michael Steiner

■ Two theorists leave HMI to take over professorships outside Berlin

Two members of HMI's department *Theoretical Physics* (SF5) have accepted professorships at German universities outside Berlin. After three years at HMI, Prof. Erwin Frey, head of the department, takes over the chair of statistical and biological physics at the newly founded Arnold Sommerfeld Center for Theoretical Physics of the Ludwig-Maximilians-University Munich. Dr. Klaus Kroy becomes professor in the condensed matter group of the Institute of Theoretical Physics at the University of Leipzig.

■ Solar cells pioneer at SE3

In October 2004, Dr. Hans-Werner Schock took up his activity as leading scientist at the department SE3 *Technology* of solar cells and modules. For solar researchers he is an old acquaintance. Being busy with Chalcopyrite solar cells, looking for relevant literature or examining the corresponding conference volumes, one will inevitably encounter the name Hans-Werner Schock. Dr. Schock ranks among the pioneers of this technology. Since the early seventies he is concerned with thin-film technologies and associated with material analytics. So far, he was active at the University of Stuttgart. Scientific inquiries led him away again and again: On behalf of the UNESCO, he was an advisor at the Universidad National de Colombia in Bogotá. His last excursion led him to the Institute for Energy Conversion, University of Delaware, USA. He directed numerous national and European research projects on photovoltaics, among them the development of solar cells for space travel and a project with research institutions from the states of the Former Soviet Union. The Hahn-Meitner-Institut has been known to him for a long time: In the context of an advisory contract he held at the beginning of the nineties, he established evaporating facilities at the institute. In his new function, he would like to exhaust the potentials of the $CuInS_2$ technology to its borders. Despite this enormous task, there is also a chance to meet Mr. Schock outside the institute: for example in the opera, in the theatre or on the Wannsee lake, then with ice skates or a sail depending upon the water's state of aggregation.

Prof. Alan Tennant, head of the department *Magnetism* (SF2)

■ New head of Department Magnetism

On December 28, 2004, Prof. Alan Tennant took over the post of head of the department *Magnetism* (SF2). In addition, he became Full Professor at the Institute of Condensed Matter Physics at the Technische Universität Berlin.

Alan Tennant has been a regular user of the HMI facility for a considerable length of time. In the 90s, he visited the institute several times attracted by the unique possibility of performing neutron scattering experiments on samples simultaneously exposed to high magnetic fields and low temperatures. This was essential for his pursuit of measuring the exact Hamiltonian in a model-quantum-magnet and thus of bridging the gap between theory and experiment.

This multi-faceted approach to a scientific problem is typical for Alan Tennant's way of doing science. Although neutron scattering is his main method for investigating condensed matter, he has also performed synchrotron experiments and worked extensively with theorists. It is this integrated science he finds most promising, and he is excited about the idea of working at an institute providing all the most important experimental methods for his work: neutron scattering, X-ray scattering and heat capacity measurements.

Alan Tennant's fascination with scientific questions began in his childhood. Inspired by the beauty of his native Scotland he began to wonder about the workings of nature. Led by this fascination, he decided to study physics at the University of Edinburgh. His studies where followed by a PhD at Oxford about *Neutron scattering investigations of spinons* and employments at Oxford University, Oak Ridge National Laboratory in the US, Risø National Laboratory in Denmark, the ISIS facility in England and the University of St Andrews. At ISIS, he held responsibility for developing the research programme on quantum magnetism; in St. Andrews he worked as a lecturer.

The fields of Alan Tennant's scientific interests cover a wide range of current topics in condensed matter physics, from very fundamental research to technologically relevant questions. His main interests are in quantum dominated magnetism at the nanoscale. Here, he is interested in unconventional excitations and the emergence of fractional statistics – statistics intermediate between Bose and Fermi statistics emerging in low dimensional systems. Two fields more relevant for applications are the transition between quantum and classical behaviour in nanomaterials and superconductivity, which he currently investigates on silver fluorides – systems with a structure resembling traditional cuprates.

In his work, Alan Tennant is driven by the desire to understand how nature works and is thrilled by the thought that as a scientist he can be the first one to see particular aspects of nature's behaviour. But he will not only enrich HMI by doing science himself. It is equally important for him to share his knowledge and experience with others and to create an inspiring environment in order to help other scientists and students develop their scientific creativity.

April 21, 2004

Progress of construction work

May 18, 2004

■ Construction of Neutron Guide Hall II finished

In late 2004, the construction work at Hahn-Meitner-Institut's new Neutron Guide Hall – the institute's major construction project – was completed. After the beginning of the work in autumn 2003, the foundation stone was laid in December 2003; in June 2004 the completion of the building shell was celebrated with a topping-out ceremony. The rest of the year had to be used for the interior accessories. Now that the hall has been finished, the scientists begin to install the neutron scattering instruments to be operated there. But before the start of this phase, the staff of the Hahn-Meitner-Institut had the opportunity to get an impression of the hall's interior, where the traditional New Year's reception was held.

Topping-out ceremony (June 30, 2004)

Interior view of the finished but still empty hall

Keeping the leading role in neutron scattering in high magnetic fields

An important goal of the new hall is to secure Hahn-Meitner-Institut's leading role as provider of strong magnetic fields for neutron scattering experiments. The building's layout is adjusted to the need of accommodating a stationary magnet of the highest field. A design study for a 25 T superconducting magnet is on the way. One of the instruments in the new hall, the Extreme Environment Diffractometer (EXED), a powder diffractometer using the time-of-flight technique, has been designed to comply with the needs of experiments using such a magnet. Thanks to the novel multi-spectral beam extraction technology, to be implemented on the new neutron guide devoted to EXED, both thermal and cold neutrons will be available. This will allow access to a wide range of scattering vectors in spite of the magnet's layout limiting the scattering angles to values smaller than 30°. Despite the importance of EXED's dedication to the new magnet, it is an excellent high-resolution powder diffractometer in its own right and will add to the range of instruments at the Berlin Neutron Scattering Center BENSC even before the magnet's arrival.

September 23, 2004

Exterior view of the new neutron guide hall

Beyond magnets

The second new instrument in the Neutron Guide Hall II will be VSANS, Hahn-Meitner-Institut's second neutron small-angle-scattering instrument. The purpose of this instrument is to meet the growing user demand for experiments in the field of soft matter and biological physics. A novel collimation technique developed at the Hahn-Meitner-Institut will allow extending the range of accessible structure sizes to $1\,\mu m$, which is about one order of magnitude beyond the reach of conventional SANS instruments. Finally, the spin-echo spectrometer SPAN will move from the first neutron guide hall and benefit from the higher neutron flux and a better controlled magnetic environment in its new position.

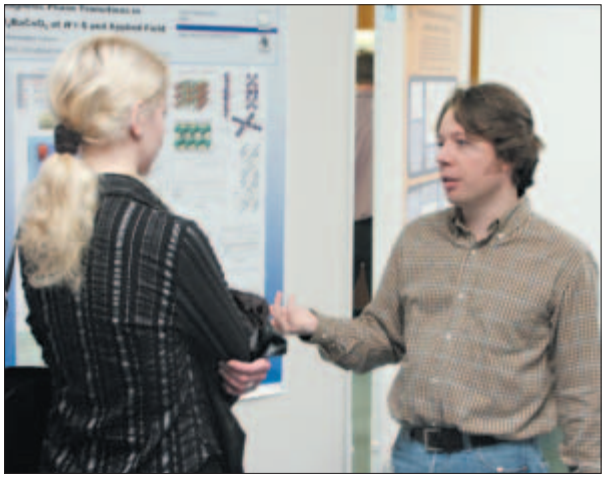
A building with character

The finished hall is a large building with more than 1000 square metres, well suited for the instrumentation and its infrastructure. Architectural elements such as a bluish facade, sun-blinds and a stained glass window contribute to a friendly working atmosphere and even triggered some interest among people fascinated by modern architecture.

An investment for the future

In his address at the topping-out ceremony, the chairman of Hahn-Meitner-Institut's Supervisory Board, Dr. Hermann-Friedrich Wagner from the German Federal Ministry of Education and Research (BMBF) emphasized the institute's outstanding position in the field of research with neutrons. This position is reflected in numerous highly ranked scientific papers presenting results achieved at BENSC instruments and is confirmed in the outcome of recent evaluations. The new hall with its novel instruments will ensure that Hahn-Meitner-Institut can maintain and develop this position for a dynamic future of structural research using neutrons.

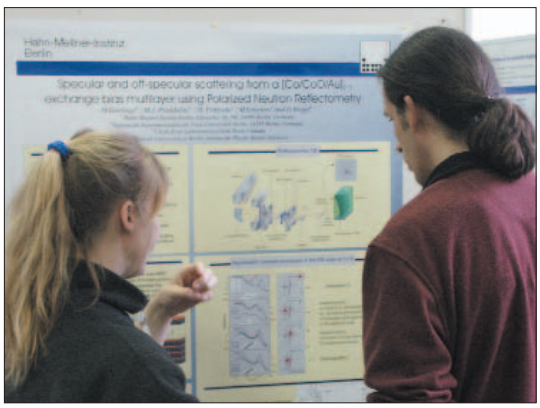
Dr. Hermann-Friedrich Wagner, the chairman of Hahn-Meitner-Institut's Supervisory Board, speaking at the topping-out ceremony



Discussions at the BENSC User-Meeting

■ Meetings and Workshops

In 2004, as in every year the Hahn-Meitner-Institut invited students or researchers to come to Berlin and to participate in the institute's workshops or meetings. Many participants from Germany and abroad came and used the opportunity to learn about the science performed at the Hahn-Meitner-Institut, to present their work and to discuss with other colleagues. Here, we would like to present a brief overview of these workshops and meetings.



Discussion at the BENSC User-Meeting

Future and current neutron researchers meeting at the Hahn-Meitner-Institut

The 25th Tutorial Session on Neutron Scattering

In February, BENSC invited students and young researchers from different countries to take part in the 25th Tutorial Session on Neutron Scattering. During this one-week tutorial, the participants got a broad overview of neutron scattering techniques. After an introductory lecture by the BENSC Director, Prof. Ferenc Mezei, the instrument scientists introduced the participants to the different neutron scattering instruments used at the Hahn-Meitner-Institut. About 30 students from 15 countries attended the course. Perhaps, some of them will come back to Berlin in the near future in order to work as Ph.D. students at HMI or to perform their own experiments as BENSC users.

The 12th BENSC User-Meeting

Three months later, on May 14–15, around 90 experienced BENSC users came to Hahn-Meitner-Institut for the 12th BENSC User Meeting. Here, they had the opportunity to present and discuss their experiments done at Hahn-Meitner-Institut's neutron scattering instruments and to get information about new developments at HMI. During the conference dinner organised at the Hahn-Meitner-Institut canteen, they had time to discuss in a relaxed atmosphere. On May 13, the Thursday preceding the User Meeting, the BENSC User Committee convened in order to evaluate the submitted BENSC proposals and to allocate beam time for the following half-year period.

Participants of the 3rd Berlin Workshop on Orbital Physics and Novel Phenomena in Transition Metal Oxides

Dr. Martina Hedrich (Federal Institute for Materials Research and Testing – BAM) discussing with Prof. Dietrich Behne (HMI, SF6) during the 3rd Workshop on Metalloproteins and Metalloidproteins

New traditions – two workshops hosted for the third time

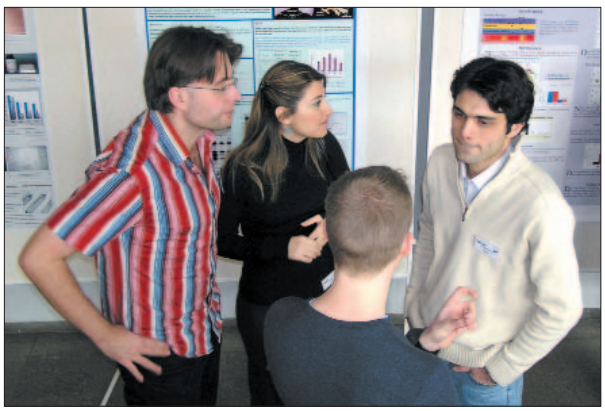
In two fields of science, there is an emerging tradition of coming to Hahn-Meitner-Institut in autumn to discuss the latest scientific results. This is reflected in the fact that two workshops organized in autumn 2004 by departments within the Structural Research Division of the Hahn-Meitner-Institut took place for the third time.

The 3rd Berlin Workshop on Orbital Physics and Novel Phenomena in Transition Metal Oxides

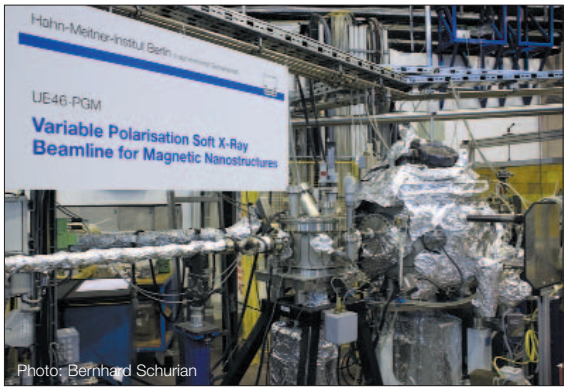
On October 6–7, the department SF2 (*Magnetism*) together with the Physics Department of the University of Hamburg invited researchers to present their latest results on *Orbital Physics and Novel Phenomena in Transition Metal Oxides*. About 40 scientists from Germany and abroad discussed current topics in this field concentrating on relations between magnetism and ferroelectricity in multiferroic oxides as well as superconductivity in Sodium Cobaltites.

The 3rd Workshop on Metalloproteins and Metalloidproteins

Almost two months later, on November 27–28, the department SF6 (*Trace Elements*) together with the GSF National Research Center for Environment and Health in Neuherberg (Bavaria) organised the third Workshop (Herbsttagung) on *Metalloproteins and Metalloidproteins*, which attracted scientists working in this field from Universities, Research Institutes and BioTech-Companies from all over Germany. The topics of the talks and posters covered the whole field ranging from new discoveries of the – benign or malign – roles metals play in proteins in human or animal organisms to new developments of analytic methods.



Students discussing during the 3rd Workshop on Metalloproteins and Metalloidproteins



The UE-46 PGM at BESSY operated by the Hahn-Meitner-Institut. Here, XAFS Experiments as those discussed at the XAFS-workshop are performed

The participants of the IAEA Workshop on Neutron Radiography visiting Park Sanssouci in Potsdam

Discussing instrument developments

The development and improvement of experimental instrumentation were the topics of three further workshops.

Workshop about a new high resolution time-of-flight powder diffractometer with extreme environment conditions (EXED) at the Hahn-Meitner-Institut Berlin

In May, instrument scientists working at different neutron sources came to Berlin to participate in the *EXED workshop* organized by the department SF1 (*Methods and Instruments*). The goal of this workshop was to create an opportunity for discussing the design of the powder diffractometer EXED, which will be installed in Hahn-Meitner-Institut's new neutron guide hall. The fruitful discussions among the thirteen participants will be reflected in improvements to the instrument's final design.

Status seminar Soft X-Ray XAFS at L-Edges

State of the art techniques and objectives using soft X-ray absorption methods were presented at the Status seminar *Soft X-Ray XAFS at L-Edges*, organised at the Hahn-Meitner-Institut by the department SF2 (*Magnetism*) in mid-November. Emphasis was on the physics that can be investigated at the Hahn-Meitner-Institut undulator beamline UE-46 PGM at BESSY. Twenty scientists from several countries presented their view on the investigation of magnetic properties of various materials together with underlying geometrical structures. The speakers stressed that the rapid development in this field was not only due to the availability of new synchrotron sources but also of modern methods of data acquisition and handling.

Second IAEA Research Coordination Meeting on the Development of Improved Sources and Imaging Systems for Neutron Radiography

In late July, the second meeting on the *Development of Improved Sources and Imaging Systems for Neutron Radiography* took place at the Hahn-Meitner-Institut. This series of meetings has been initiated by the International Atomic Energy Agency IAEA with the purpose of facilitating the exchange between scientists experienced in running neutron radiography instruments and those new to this field. As the meetings are particularly aimed at researchers from developing countries, one focus of the discussions were the possibilities of using cost-effective technologies.

Coffee break during the joint workshop on silicon photovoltaics. In the background: the mountains surrounding Kleinwalsertal

Dr. Hermann Schunck (Federal Ministry of Education and Reserach – BMBF) and Prof. Martha Lux-Steiner (Head of department *Heterogeneous Material Systems* – SE2) at the Science Forum on Renewable Energies

Silicon Photovoltaics – Joint workshop of the Hahn-Meitner-Institut and Research Centre Jülich

The Hahn-Meitner-Institut department *Silicon Photovoltaics* (SE1) and the Institut für Photovoltaik (IPV) of the Research Centre Jülich (FZJ) concentrate their research activities on the development of thin-film silicon solar cells. Whereas the IPV focuses on the development of amorphous/micro-crystalline stacked solar cells, the emphasis at the Hahn-Meitner-Institut is on the development of thin-film solar cells made of polycrystalline silicon and on the research on alternative cell concepts based on silicon heterostructures e. g. A-Si:H/c-Si-cells. Evidently, the research programmes at Hahn-Meitner-Institut and FZJ have several topics in common – a fact leading to numerous opportunities for intensive cooperation.

Based on such common topics, the 1st *Photovoltaics Workshop* – a joint research seminar of the two institutes – took place from September 19 to 24, 2004 in the Waldemar Petersen House of the TU Darmstadt in Hirschegg (Kleinwalsertal, Austria). The workshop was attended by 35 scientists and graduate students from SE1 and the IPV. Dr. S. Gall (HMI) and Dr. F. Finger (IPV) organised an ambitious programme covering the whole field: Deposition procedures and growth mechanisms of thin silicon films, the nature of defects, recombination mechanisms, surfaces and interfaces as well as solar cells. The various analytic tools and the procedures used to characterise thin-film semiconductors were discussed, too.

How science can help in the struggle against poverty The Science Forum on Renewable Energies in Bonn

In June 2004, the Solar Energy Research Association (ForschungsVerbund Sonnenenergie – FVS) participated in the *Renewables2004* in Bonn – the official international conference on scientific and political strategies to promote the renewables. The conference, which took place in Bonn, was opened by the German Federal Minister for Economic Cooperation and Development, Mrs. H. Wieczorek-Zeul, and the Federal Minister for the Environment, Nature Conservation and Nuclear Safety, Mr. J. Trittin.

Besides participating in the international conference on June 1st, the FVS was in honour bound to organise the Science Forum, a one-day satellite meeting focused on research on renewable energies. The Science Forum attracted about 300 participants from the international scientific community. Approximately one third came from developing and emerging countries. The Hahn-Meitner-Institut was represented by Prof. M. Lux-Steiner, head of the department *Heterogeneous Material Systems* (SE2), and the Scientific Director, Professor M. Steiner. Prof. Lux-Steiner chaired an excellent panel discussion with Osman Benchikh (UNESCO), Didier Mayer (EUREC Agency), Hans-Josef Fell (German Green Party – Bündnis90/Grüne), John Christensen (Risø National Laboratory and Global Network on Energy for Sustainable Development – GNESD) and Hermann Schunck (Federal Ministry of Education and Research – BMBF). In the discussion, the impact of energy politics on society and economy was highlighted. In general, the programme of the Science Forum

Panel discussion during the FVS Annual Meeting

reflected the level of awareness that the renewables among the most important resources in the struggle to overcome the lack and undersupply of energy.

In addition, the role science, research and development can play in this context was discussed. The participants agreed that the dissemination of research results on renewable energies must be improved in order to increase the share of the renewables in the energy mix.

Audience at the FVS Annual Meeting

The 2004 Annual Meeting of the Solar Energy Research Association (ForschungsVerbund Sonnenenergie – FVS)

Most topics on the agenda of the Annual Meeting of the Solar Energy Research Association (Forschungs-Verbund Sonnenenergie – FVS) in November 2004 belonged to the field of research on *Hydrogen and Fuel Cells*. The FVS as a networking institution can address these topics efficiently and successfully because the member institutes perform their research activities in a strongly multi-disciplinary manner dividing the fields of research among themselves. In addition to that, the partner institutes closely collaborate with industrial companies such as BMW or Viessmann.

In his talk at this meeting, Prof. H. Tributsch (Head of HMI department *Solar Energetics* – SE5) discussed the system of fuels as well as different fuel cells. The talk attracted a great deal of attention because completely new horizons in technology and development of hydrogen systems and fuel cells were presented. At this meeting, it became once again clear that fundamental research might open up new and perhaps simple ways of solving technological problems considered so far to be insurmountable.

Brochures informing about industrial activities in the Structural Reserach division published within the application centre NIXE

New application centre for industrial cooperation

Studying the structure and properties of condensed matter is the main goal of the scientific activities at Hahn-Meitner-Institut's large scale facilities. Many of the methods applied here do not only allow insights into the fundamental properties of matter but can also be highly valuable for industrial research. These methods can reveal information about technologically relevant materials that can help improve industrial products, but which is not accessible with any method available in a commercial laboratory. For example, the great value of neutron scattering is reflected in the high demand for non-destructive measurements of residual stresses deep in the bulk of engineering components, which is only possible with neutrons. Having three different probes – neutrons, ions and synchrotron radiation – at its disposal, Hahn-Meitner-Institut can operate a unique suite of instruments for investigations in materials science.

The Hahn-Meitner-Institut is strongly committed to supporting cooperations with industrial companies in the field of materials research and thus contribute with its expertise and infrastructure to the economic and technolo-gical development of the society. One result of this commitment is the installation of new instruments mainly intended for industrial use such as tomography with neutrons or synchrotron radiation.

In order to promote its offer among potential industrial users, HMI has founded the new application centre NIXE (Neutrons, Ions and X-Rays for Engineering). NIXE's main task is to identify possible applications for the methods and to establish contacts with the relevant industrial companies. Until now, NIXE has published several information flyers presenting the scope of particular methods. For the coming year a workshop for industrial partners is planned to take place at HMI. It will give the participants the opportunity to discuss their questions and ideas with the institute's scientists and to get a first-hand impression of the instrumentation used for the experiments. In addition to its role in promoting the industrial offer, NIXE acts as a first contact for industrial users offering advice on the choice of the right method and the possible forms of cooperation.

The Bavarian Minister-President Edmund Stoiber (left) and Prof. Winfried Petry, Scientific Director of the Neutron Source FRM-II, at the instrument Stress-Spec operated jointly by Hahn-Meitner-Institut and Technische Universität München at FRM II

■ Hahn-Meitner-Institut operates neutron scattering instrument in Munich

The investigation of residual stresses is one of the most successful fields of industrial cooperation in Hahn-Meitner-Institut's Structural Research division. In October 2004, the new instrument Stress Spec dedicated to stress measurements was put into operation at the research reactor FRM II in Garching near Munich. Stress Spec, operated jointly by the Hahn-Meitner-Institut and the Technische Universität München, complements the two instruments for residual stress determination operated at the research reactor BER II in Berlin.

Residual stresses are internal stresses created in engineering components during the manufacturing process. These stresses strongly influence the reliability of the components during operation, with the effect being either beneficial or detrimental depending on the exact nature and distribution of the stresses. Therefore, an exact knowledge of the stress distribution is extraordinarily valuable for the manufacturers.

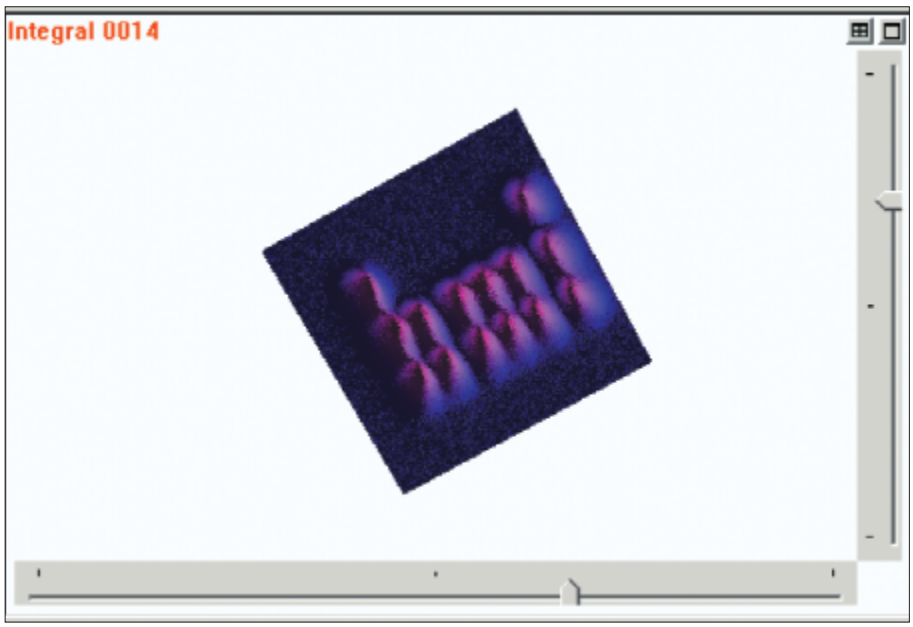
Residual stresses can be determined by means of neutron scattering because they lead to distortions of the crystal structures in the component. When compared to all other methods for measuring the internal stresses, neutron diffraction has two main advantages: it is non-destructive and it provides information about the three-dimensional stress distribution deep in the bulk of the sample.

With its engagement in Garching, HMI secures its leading position as provider of services in the field of non-destructive testing reflected in the high demand for stress measurements from the automotive, aircraft and space industries. By operating three instruments at two neutron sources, the institute can ensure reliable and fast access to the facilities. The instruments used for the determination of residual stresses with neutrons are supplemented by a new instrument using synchrotron radiation at BESSY. This instrument allows determining the stresses in the vicinity of the sample's surface.

■ Contributing to the progress in proton therapy

Since 1998, the Hahn-Meitner-Institut is operating Germany's only proton therapy facility. The proton beam used for the therapy of eye tumours is created in HMI's ion accelerator centre ISL, which most of the time acts as a source of ion beams for scientific experiments. Since the beginning of their activity, the members of the tumour-therapy team did not only treat more than 500 patients but also acquired a unique experience and expertise. This expertise and the high quality of the available proton beam attracted ACCEL Instruments GmbH to come to Hahn-Meitner-Institut in order to test a technique that will be used in a dedicated tumour therapy facility, which is currently under construction in Munich.

Whereas at HMI a narrow proton beam is first widened and then sent through an aperture representing the shape of the tumour, a scanning technique will be used in the new facility. Here, the proton beam is deflected by a system of magnets and thus scans the whole tumour volume. This active technique allows for a more accurate covering of the tumour and helps save resour-



The logo of the Hahn-Meitner-Institut written with a proton beam from ACCEL's scanning set up

ces: no material has to be used for tailor-made apertures and the complete current of the proton beam is used for therapy.

With this cooperation between the Hahn-Meitner-Institut and ACCEL, HMI's tumour-therapy team contributes to the development of the proton therapy technique even beyond the treatment of eye tumours – their traditional field of expertise.

Technology transfer prize goes to solar cell researchers

In 2004, the technology transfer prize of the Hahn-Meitner-Institut was awarded to Dr. Nikolaus Meyer, Dr. Ilka Luck, Dr. Rainer Klenk, Dr. Roland Scheer, Joachim Klaer and Prof. Martha Lux-Steiner from the institute's Solar Energy Division for their work with the title *Producing innovative thin-layer modules the way architectural glass is produced – Founding Sulfurcell Solartechnik*.

The laureates were the first to succeed in making efficient solar modules using Copper-Indium-Sulfide (CIS) deposited on window glass as absorber material. They thus introduced an unusually simple and robust manufacturing process that led to a reduction of the production costs for solar modules by half. In addition to developing the scientific basis for the production of the innovative modules, the laureates were successful in putting together a consortium of renowned investors funding the industrial implementation of their inventions.

The laureates were selected by a jury composed of representatives of industrial companies, the Chamber of Commerce and Industry and the Technology Foundation Berlin. The main criteria for the selection were the project's innovation potential and the prospects of using the new process on an industrial scale.

The prize was presented to the laureates in a prize-giving ceremony in HMI's lecture hall. In his welcome address, Prof. Michael Steiner emphasized the increasing importance of the transfer of knowledge between scientific institutions and industrial companies and the institute's commitment to support the industrial use of results achieved by scientists active at the Hahn-Meitner-Institut. The laureates received the prize from Mr. Joachim Hübscher, member of the management of Siemens Business Services GmbH & Co. OHG Region Ost. The prize money – 5000 € – had been donated by Siemens AG. At the end of the ceremony, Dr. Meyer presented the long path leading from the very first ideas to the beginnings of the industrial production of the novel modules at Sulfurcell Solartechnik.

Klaus Böger, Berlin's Senator for Education, Youth and Sport, visiting HMI's school lab

Prof. Michael Steiner at the school lab

■ HMI's school lab inaugurated

On September 29, 2004, Klaus Böger, the Senator for Education, Youth and Sport of Berlin and Prof. Michael Steiner, the Scientific Director of the Hahn-Meitner-Institut, officially inaugurated the institute's school lab *Blick in die Materie* (Looking into Matter).

The school lab offers pupils from secondary schools the opportunity to perform physics experiments close to real science and often far beyond the usual syllabus of science education at school. Here, the young visitors have the chance to do scientific work on their own and to develop their creativity in approaching and solving scientific problems. The pupils receive support from the lab's staff: a physics teacher and a research scientist from HMI.

The typical visit to the learning lab is the project day (Projekttag) – a group of around 20 pupils come to HMI for one day; they spend the morning performing the experiments and have a guided tour of the institute in the afternoon and, thus, get a taste of the atmosphere at a large scientific institution. In the days preceding their visit, they prepare and discuss the experiments in class using the materials provided by HMI.

The experiments at the school lab cover a broad range of topics from different fields of scientific research at the Hahn-Meitner-Institut, among them solar energy, magnetism and superconductivity. The young experimentalists build and investigate solar cells, determine the critical temperatures of superconductors and study the magnetic properties of matter. The school lab is well equipped with modern experimental instrumentation. One of the highlights of the equipment is the scanning tunnelling microscope used for investigations of the atomic structure of surfaces, e. g. of pyrolytic graphite.

The goals of the school lab are twofold. On the one hand, the lab makes a contribution to secondary school science education and helps foster the interests of young people in natural sciences. On the other hand, the establishment of the lab contributes to the HMI's visibility in the public. By supplementing the offer provided by secondary schools, the institute takes responsibility in a field beyond its usual activities but is very relevant for the development of modern society. This way, interest in the institute's work is triggered among people usually not following recent developments in the world of science. This interest was reflected by the coverage of the inauguration ceremony in the local media. Also the pupils themselves act as young ambassadors of the institute by telling their families and friends about the day in the lab and thus spreading the word about HMI and its research.

Scientists from the department *Silicon Photovoltaics* presenting their work during the *Lange Nacht der Wissenschaften* 2004

Many of the experiments at the school lab are relatively easy to perform and to transport. Thus, they can be used to present the main fields of HMI's scientific activities at the institute's Open Day or other popular science events such as the annual ScienceFair in central Berlin. This way, the school lab also facilitates the exchange between the institute and the general public interested in science.

The founding and operation of the school lab has been made possible by financial support from the Helmholtz-Association. Until now, the Helmholtz-Association has contributed a sum of 340,000 Euros.

By opening the school lab, HMI tries to fill a gap felt by Berlin's science teachers. This is reflected by the fact that already in the first months of the lab's operation the demand exceeded the available time. This was even before the lab had been officially inaugurated and the information about its existence was spread by word of mouth only.

■ HMI opens its doors to the public

Visiting the experimental halls around HMI's research reactor or watching how small metal cubes can be turned into metal foams are only two examples of the attractions offered to the visitors of HMI's Open Day on June 12, 2004. Following a long standing tradition, HMI invited neighbours, friends and the general public to visit the institute and to get a first-hand impression of the research performed here. The institute's scientists enjoyed the opportunity to show their labs and explain their work to an interested and often very impressed audience. Guests interested in doing experiments themselves, had their chance at the school lab. About 1000 people visited the institute in Berlin-Wannsee.

The department of *Silicon Photovoltaics* (SE1) in Berlin-Adlershof participated with most other scientific institutes in Berlin in the annual *Lange Nacht der Wissenschaften*, which took place on the same day. Out of the 12000 people who found their way to Adlershof, more than 3000 flocked to HMI's department in order to learn how new technologies for solar cells are developed.

Scientific discussion during the *Girls' Day*

Prof. Rolf Scharwächter presents the Communicator Prize to Christoph Böhme.

■ Girls' Day 2004

For the fourth time, the Hahn-Meitner-Institut invited schoolgirls aged between ten and sixteen to participate in the *Girls' Day*. 60 girls came on April 22, 2004 to learn more about the broad variety of professions and topics at the institute.

First, they got an introduction to the institute (its history, structure and the scientific topics investigated at the institute). Then, seventeen groups were formed and shown the labs, offices and workshops. The girls had the opportunity to perform experiments, prepare something or collect data; they could get information about different professions and carriers. Every girl could select three groups to learn more about lasers, solar cells, the preparation of a metallic trinket by CAD, designing a web-site or many other activities. In addition, some girls had the chance to visit the canteen and to learn how a canteen works and how lunch and refreshments are prepared.

At two o'clock all girls went home happily and the organizers were satisfied with the commitment of all their colleagues taking part in the arrangement of that day.

■ Christoph Böhme receives HMI's Communicator Prize

Christoph Böhme, a former PhD student and now post-doc at the HMI department *Silicon Photovoltaics* (SE1) received the 2004 Communicator Prize of the Hahn-Meitner-Institut. The Prize is awarded every second year for the best popular presentation of the results of PhD research achieved at HMI. The winner is selected by a jury consisting of scientists, communication specialists and secondary-school pupils. The prize was presented in a ceremony on July 9, 2004 after the candidates' presentations. The Communicator Prize was not the first award Böhme received for his thesis *The Dynamics of spin-dependent charge carrier recombination*. In 2003, he won the Adlershof thesis award and in 2004 the science prize of the chamber of commerce and industry of Northern Hesse.

Fig. 1: The new materials science beamline EDDI operated by the Hahn-Meitner-Institut at BESSY

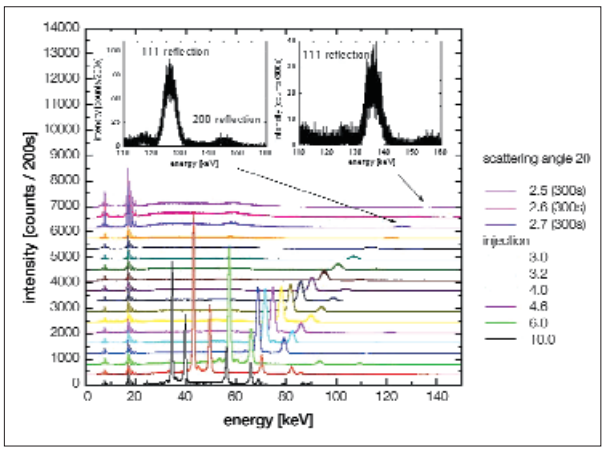


Fig. 2: Energy diffraction spectra of the alloy In718 obtained at the materials science beamline EDDI. The measurements were performed for different scattering angles 2θ at a wiggler field of 6 T. In this case, the peak position can be determined reliably for energies up to approximately 135 keV. With the full wiggler field of 7 T, energies of up to 150 keV can be used.

First experiments at the 7 Tesla Wiggler beamlines

In the course of 2004, the two HMI beamlines installed at the 7 Tesla wiggler at the Berlin electron storage ring BESSY in Berlin-Adlershof went operational. Following the radiation safety O. K. in April, commissioning of the instruments was started. The complex beamline instrumentation, for example an x-ray optics consisting of a silicon double crystal monochromator, two 1 m long bendable silicon mirrors polished to nanometer surface roughness, and many more components, required extensive testing. Since September 2004 the wiggler itself is operated continuously at its maximum field of 7 Tesla, allowing the HMI scientists responsible for the operation of the instruments to perform first successful test experiments.

Fig. 3: MAGS, the new instrument for resonant magnetic scattering operated by the Hahn-Meitner-Institut at BESSY

Photographs on this page: Bernhard Schurian

The materials science beamline for **E**nergy **D**ispersive **Di**ffraction (**EDDI** – see Fig. 1) was designed for the investigation of residual stresses and the microstructure in materials of technical importance. With photon energies above 100 keV, the x-rays may penetrate several hundred micrometers into the sample. This closes the experimental gap between conventional laboratory sources and neutron scattering techniques. First data taken at EDDI proved that data can be taken up to x-ray energies of 150 keV (Fig. 2), surpassing all expectations and allowing even for experiments in transmission geometry, in which the x-ray beam passes through the sample.

The beamline for high-resolution diffraction and resonant **Mag**netic **S**cattering (**MAGS**) is intended to be used mainly for the investigation of the interplay of various types of ordering phenomena like magnetism or superconductivity in metal oxides and intermetallic compounds. First test experiments taken at temperatures down to 6 K showed that the high intensity of the beam allows for the detection of even very weak signals which are produced, e. g., by small structural distortions induced by magnetic ordering.

Both beamlines are now ready for user service starting in April 2005. Like for the neutron scattering instrumentation at BENSC in Wannsee, 70 % of the available beam time will be offered to external users from universities and other research institutions. During their experiments, the guest scientists will be supported by HMI beamline staff.