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Swiss Neutron Scattering Society

EDITORIAL:

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ON THE COVER:

An artist's view of the new SINQ backscattering spectrometer MARS by Georgina McIntyre. A detailed description of the instrument and its novel features can be found in this issue.

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The President's Page

DEAR MEMBERS

Presently, three governments (the Spanish, Swedish and Hungarian) have put forward official bids of typically one third of the investment costs in order to host the European Spallation Source ESS. This demonstrates the attractiveness of ESS but, on the other hand, poses the problem of the selection of its final location (since there exists no given procedure for such a decision making process in Europe). Anyhow, there is momentum and a there is consensus that no viable alternative to ESS exists. I have asked the neutron facility managers to send me information about their source and the corresponding possible lifetime. The result of these (somewhat optimistic) replies can be seen in Fig. 1. A translation into beam weeks (Fig. 2) shows that these numbers will decrease beyond 2020 due to shut-downs of ageing facilities. This can in part be compensated by ESS; certainly more than the pure beam weak numbers indicate, since a beam week at ESS will be more productive than one at an existing facility. A delay in building ESS or an earlier shut-down of existing sources (at the end of their "assured" lifetime) would result in a gap in the neutron capacity (at a level of slightly more than half of its present value).

However, in the past neutron sources have not been shut-down at the end of their life cycle but rather for political/financial (Risø, Studsvik, FRJ-2) or for technical (Brookhaven) reasons. Hence, to run sources to their age limit is not an automatism but demands a high degree of awareness of all influences able to threaten a lasting operation. The two major threats are that such a source is regarded as needless or as dangerous. To counter the first of these two points is the duty of the scientists by doing excellent science and to "sell" the results to other scientists, to politicians and to the public. Source designers, builders and operators are responsible for the second point. They have to guarantee that the source is neither regarded as dangerous nor that it actually is dangerous for the public or the environment. Risk management at such complex installations is not an easy task but has to be done thoroughly by eliminating or reducing known risks and by providing procedures for the management of the unexpected. The worst thing is to run into disaster open-eyed.

With the hope that all sources will reach their design lifetime and the hope for a successful quest for the ESS the future of neutron scattering looks bright, however both will not come true automatically but needs work and dedication.

Peter Allenspach

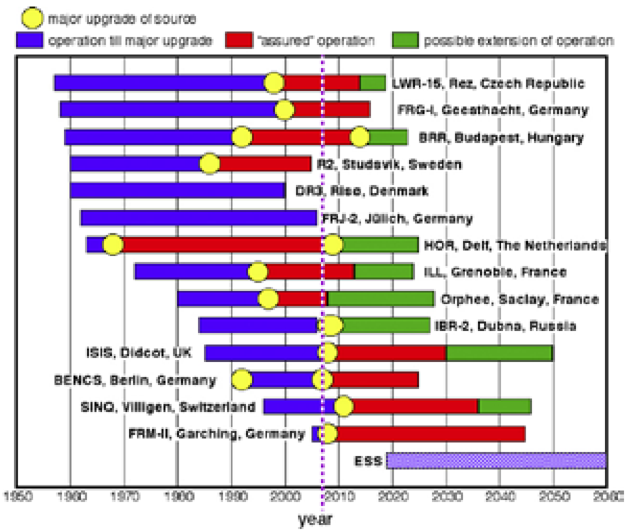

Fig. 1: Lifetime of different neutron sources provided by the corresponding facility managers.

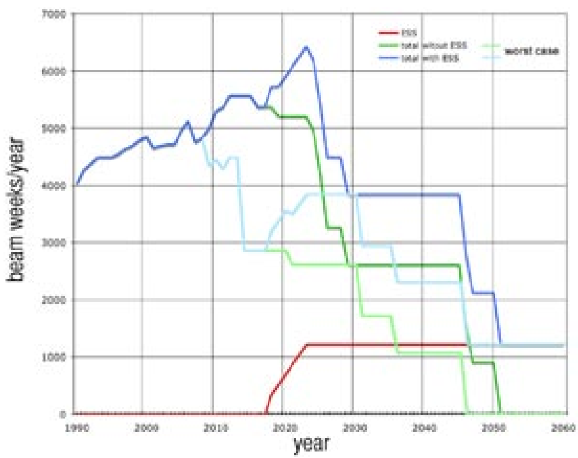

Fig. 2: Calculation of for scenarios based on the data from Fig. 1 and the number of beam weeks per year and facility. Worst case: All sources stop at the end of their "assured" operation period.

Minutes of the SGN/SSDN General Assembly on 26/06/2007

Date/Locality:	June 26, 2007, University of Lund (during ECNS 2007)
Begin:	16:50
End:	17:30
Participants:	16 members of the society, 1 non-member

1. WELCOME

The president of the SGN/SSDN, Peter Allenspach welcomes the participants to the general assembly 2007. He proposes that the order of the agenda will be slightly changed since he has to leave earlier for other obligations and the assembly agrees.

2. MINUTES OF THE GENERAL ASSEMBLY 2006

The minutes of the General Assembly of the SGN/SSDN from 10/05/2006 published in Swiss Neutron News 29 (June 2006) are accepted without objections.

3. ANNUAL REPORT OF THE CHAIRMAN

P. Allenspach reports on the activities of the SGN/SSDN in the year 2006:

a) The SGN continued its activities regarding the supply of a 16T self-shielding magnet for the instruments of the SNS in Oak Ridge. The contract with SNS was signed. Next steps are functional tests of the magnet at the manufacturer (Bruker, Zürich) and thereafter tests with neutrons at SINQ. The return for the Swiss neutron scattering community will be granted access to the instrumentation at SNS.
b) The Swiss use of the ILL is very sound on a level between 3.3 and 4.2%.

c) Latest News on the ESS project will be announced during the session on neutron sources during the ECNS conference the other day.
d) The approach to establish the SGN/SSDN as a member of the Swiss academy of science was postponed to the year 2007 due to other obligations of the chairman related to the ESS project.
e) A welcome reception was offered by the society during the 'PSI Summer School on Condensed Matter Research 2006' in Zuoz.
f) Two new issues of 'Swiss Neutron News' were published, numbers 29 and 30, both issues are on the web: http://sgn.web.psi.ch/sgn/snn.html
g) Presently the society has 202 members.

4. NEWS FROM ENSA

a) ENSA has now been turned into a "Swiss club" with location in Niederweningen/ZH. It is released from paying taxes and is now allowed to possess property e.g. for donating the Walter-Hälg-prize.
b) The 2007 Walter-Hälg-prize will be granted to Jeffrey Penfold from the ISIS facility and the new Lewy-Bertaut-prize to Henrik Rønnow/EPF Lausanne. The prizes will be awarded during a special ceremony during ECNS 2007 in Lund.
c) Regarding the new ESS initiative P. Allenspach again refers to the dedicated session of the ECNS conference the other day.

5. SGN/SSDN ACTIVITIES 2007

a) A new initiative will be taken to establish the SGN/SSDN as member of the Swiss Academy of Science, which could not be realized in 2006.
b) On April 28, 2007 a dedicated symposium was organized at PSI on the occasion of the 90th birthday of the SGN honorary member Prof. Walter Hälg. Many SGN members attended the symposium. A special highlight was the presentation of the former Swiss Bundesrat Kaspar Villiger, who was a student of Walter Hälg.
c) The SGN will again sponsor the Zuoz summer school on condensed matter research by a welcome reception.

6. MISCELLANEOUS

P. Allenspach asks the audience about their priorities for the next ECNS conference 2011. The candidate cities are Venice, Prague and Edinburgh. J. Mesot proposes to put special emphasis on the support of young scientists and students. The conference fee again should include lunch on site to enhance discussions among the participants. Venice or Prague would be welcome.

On September 21 a symposium will be organized at PSI to celebrate the 10th anniversary of SINQ. Invitations will also be sent to the SGN members.

T. Gutberlet proposes that the SGN partly funds one or two Ph.D. students in the field of neutron scattering in Switzerland. The amount of funding could be in the order of CHF 100–200,– per month. S. Janssen refers to the very limited funds available but proposes to discuss that issue in the next board meeting.

7. NEWS FROM THE INSTITUT LAUE LANGEVIN ILL

The ILL director C. Vettier reports on recent news from the institute:

a) Beam time allocation and user service
   Over the last years the number of requested days per proposals has decreased, hence more proposals ask for short beam time periods. The average overload factor of the instruments is between 1.5 and 2.0 except for the SANS instruments, where the overload is higher.
   The block allocation of beamtime on the SANS instruments for Biology works well and the respective teams start to collaborate.
   The ILL intends to introduce the system of longterm proposals. One condition for the allocation of such proposals is the relation to technical developments at ILL such as instrument components or sample environment devices.
   From September 2007 on it will be possible to apply for computing time (simulation of experiments) together with ordinary beam time requests. This initiative is part of the C(omputing)-lab at ILL.
   The EASY Access System will grant diffraction beamtime to scientists, who need a rapid structural characterization of samples and data analysis. Access will be open all year long and it will not be necessary to go through the standard ILL proposal system.
b) Instrumentation
   Three new instruments are on the ILL roadmap: WASP (neutron spin echo), D33 (small angle scattering) and THALES (triple-axis spectrometer). Upgrades on existing instruments are on their way for IN16B (backscattering) and LADI (Laue diffraction). The following instrument projects have been postponed: DRACULA and TOPTOF.
   The following neutron guides will be replaced H112, H12, H5 and H14.
   The instruments 'D1A, IN3, IN10, DB21, IN14' will phase out during the next years.
   The ILL/ESRF partnership for Soft Condensed Matter is on good track. As one of the first measures a joint soft matter laboratory will be installed soon.
c) Miscellaneous
   J. L. Martinez will become new ILL French Associate Director and Head of the Science division to replace Christian Vettier.

8. REPORT OF THE TREASURER

S. Janssen presents the annual balance sheet 2006:

Assets SGN/SSDN on 1.1.2006: **SFr. 4833,35**

	Receipts [SFr]	Expeness [SFr]
Membership-fees (cash box)	550,–	
Membership-fees (postal check acc.)	740,–	
Donations (cash box)	90,–	
Total expenses		676,50
– Apéro Zuoz (2006)		547,50
– Expenses PC account		45,60
– Present Güdel		83,40
Credit for accrued interest	3,–	
Total	1383,–	676,50
Net earnings 2006:		**706,50**
Assets SGN/SSDN on 31.12.06:		**5539,85**

Balance sheet 2006:

Assets [SFr]	**Liabilities [SFr]**
Postal check account	3731,35
Cash box	1808,50
Assets on 31.12.06	**5539,85**

9. REPORT OF THE AUDITORS

Both Auditors (W. Fischer, K. Krämer) have examined the bookkeeping and the balance 2006. They accepted it without any objections. The participants therefore unanimously vote for a release of the SGN/SSDN board.

Bericht der Revisoren

Die Rechnungsrevisoren haben die Belege, die Abrechnungen und die Bilanz für das Jahr 2006 geprüft und für in Ordnung befunden!

5.2.07		22.1.07	
Datum	Dr. W. Fischer, PSI	Datum	Dr. K. Krämer, Uni Bern

10. BUDGET 2007

The treasurer presents the following proposal for the budget 2007:

	Receipts [SFr]	Expenditures [SFr]
member fees	800,–	
interests	5,–	
fees PC account		40,–
Prof Hälg 90		1500,–
Zuoz Apero 2007		600,–
Total	805,–	2140,–
balance 2007	**– 1335,–**	

The participants accept the budget proposal unanimously.

11. ELECTIONS

The attending members are asked to elect the new SGN/SSDN board and the two auditors for the period 2007–2010. All present board members and the previous auditors volunteer again for another term of office.

S. Janssen (in absence of Peter Allenspach) asks the audience, if any other candidate is proposed for one of the functions. This is not the case.

He then proposes to elect all candidates in a single vote per acclamation. The members agree to that procedure and elect the following members unanimously for the next three years:

President: Peter Allenspach, Paul Scherrer Institut

Board members: Silvio Decurtins, University of Bern; Bernd Schönfeld, ETH Zürich

Secretary: Stefan Janssen, Paul Scherrer Institut

Auditors: Walter Fischer, Paul Scherrer Institut; Karl Krämer, University of Bern

S. Janssen, SGN secretary
July 9, 2007

Polarized Neutron Reflectometry at AMOR: Status and Examples

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Probing magnetism in magnetic layers and thin films has received increasing interest in the recent years [1]. Examples demonstrating the importance to study these phenomena include the exchange coupling between similar ferromagnetic layers separated by paramagnetic or semiconducting spacer layers, the exchange bias effect between ferro- and antiferromagnetic layers, the exchange spring effect between hard and soft magnetic layers, reorientation phase transitions, and the proximity effect between ferromagnetic and superconducting layers.

A powerful and versatile experimental tool for the analysis of the structural and physical properties of magnetic layer systems is polarized neuron reflectometry (PNR) [2]. PNR allows to measure independently the non-spin-flip (NSF) reflectivities R^{++}, R^{--} and the spin-flip (SF) reflectivities R^{+-}, R^{-+}. From these reflectivities, the nuclear and magnetic potential profile along the sample normal can be retrieved. Layer-resolved magnetization profiles at various states of magnetization can be obtained by PNR. Off-specular PNR allows for exploring magnetic roughness and samples with a periodic lateral structure [3].

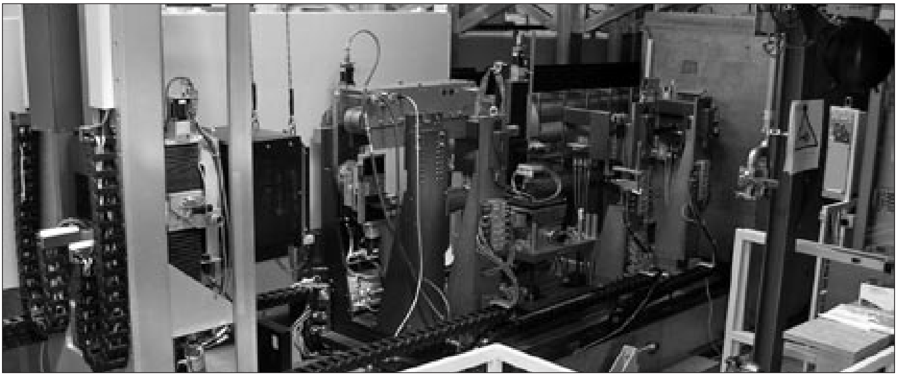
To enable complete polarization analysis of all SF and NSF reflectivities adequate neutron polarizing and analyzing devices are required. Magnetically remanent neutron supermirrors using the material combinations Fe/Si and FeCo/Si have been developed as versatile devices with high neutron polarization for usage in PNR [4]. In particular the polarizing remanent supermirrors show very good performance in monochromatic as well as in polychromatic mode, used in broad wavelength band time-of-flight reflectometers.

The time-of-flight neutron reflectometer AMOR at SINQ/PSI [5] has been equipped with a set of remanent supermirrors as polarizer and analyzer. In the following the current set-up of AMOR and the performance of the polarizing remanent supermirrors used will be explained with respect to full polarization analysis of specular and off-specular signals. Examples of measurements with PNR at AMOR are given to illustrate current instrument performance.

AMOR

The principal setup of AMOR allows measurements with polarized or unpolarized neutrons in white beam time-of-flight mode (1.3 Å < λ < 13 Å). The scattering plane of the sample is oriented vertically in order to allow measurements at open liquid surfaces, too. The inclination angle and thereby the accessible *q*-range is adjusted by tilting a deflection mirror and/or the sample. A flexible software control of the $\theta - 2\theta$-movement around axes that are not mechanically coupled has been implemented, which enables an extremely simple operation for measurements. The standard mode of the instrument is time-of-flight, which has been opened for user operation in October 2002. An area detector or two single detector tubes can be operated alternatively with new fast detector read-out electronics.

Most optical components are riding on an 8 m optical bench so that the chopper-detector distance can be varied in order to give an optimum sample illumination and resolution (Fig. 1).



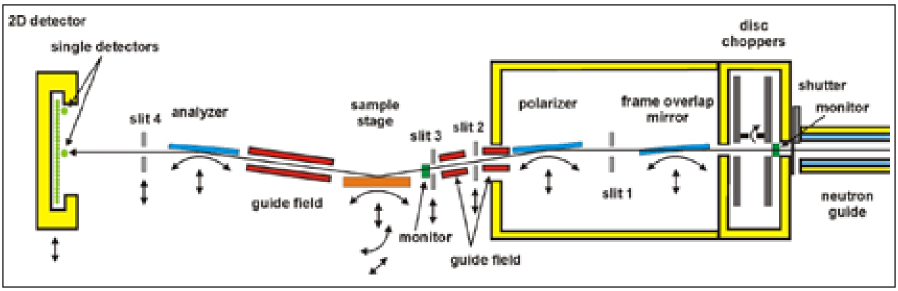


Fig. 1: View of time-of-flight reflectometer AMOR and schematic layout of the instrument.

REMANENT SUPERMIRRORS

To polarize the incoming neutron beam at AMOR a switchable remanent supermirror has been implemented in the beam path of the instrument [3]. The supermirror is a FeCoV/Ti:N multilayer on float glass with dimension of

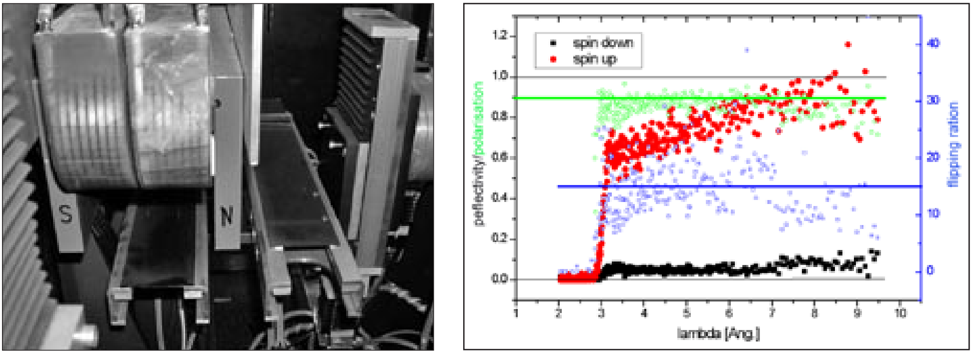


Fig. 2: FeCoV/Ti:N supermirror in polarizing unit (left). Polarization performance of supermirror at 1.0° (right).

70 x 500 mm². This mirror is placed on a rotation and translation stage below an electromagnet to change the magnetisation direction of the multilayer and thus to switch between spin-up and spin-down polarized neutrons. A view of the polarizing unit is shown in Fig. 2. The unit is placed within the shielding of the optical units of the reflectometer after the chopper housing. The polarization performance is shown for the wavelength band of 2 Å < λ < 12 Å at an angle of 1.0° of the supermirror towards the incoming beam.

The current set-up of the polarizing unit produces an average polarization of about 90% of all accepted wavelengths.

Full polarization analysis of the SF as well as NSF channels for specular reflectivities can be done using the analyzer unit in the beam path, equipped with an identical supermirror. Without the analyzer unit off-specular PNR can be measured for spin up and spin down polarized neutrons. An analyzer to cover the opening for the 2D-detector system for off-specular PNR is under development.

MAGNETIC SAMPLE ENVIRONMENT

To study magnetic materials and magnetism at AMOR the instrument can be equipped with dedicated sample environment to allow for low temperatures and magnetic fields at the sample position. The most convenient set-up consists of a closed cycle refrigerator with various sample holders to be placed within a Helmholtz coil for measurements up to 0.1 T or underneath a large electromagnet for measurements up to 1 T (Fig. 3). The CCR allows for cooling samples down to 10 K within applied horizontal field. The maximum sample size is 30 x 30 mm².

For lower temperature and higher magnetic fields a cryomagnet can be placed on

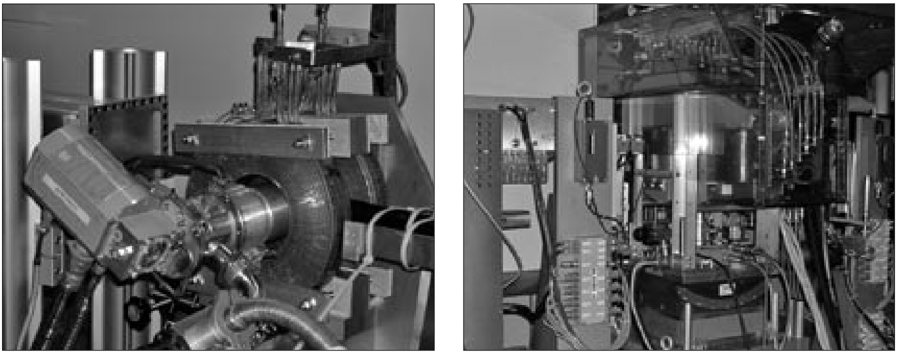


Fig. 3: CCR with Helmholtz coil at AMOR (left). CCR with 1 T electromagnet (right).

the sample stage of AMOR to allow for temperatures down to 1.5 K and horizontal fields up to 2 T. The maximum sample size is then 15 x 15 mm^2.

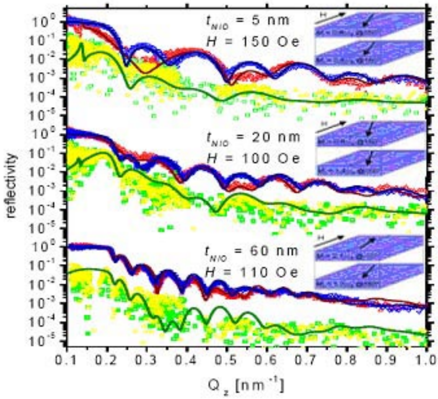


Fig. 4: PNR of selected Ti(5 nm)/FeCoV (20 nm) / NiO (t nm)/ FeCoV (20 nm)/Ti(5 nm) [t = 0.9 - 100 nm] samples during the magnetization reversal. Each sample was saturated at -5000 Oe prior to the experiment. The experimental data are represented by the symbols (Δ R^{++} (red uptriangle), ∇ R^{--} (blue downtriangle), □ R^{+-} (green square), □ R^{-+} (yellow circle)) and computed reflectivities by the lines, respectively.

EXAMPLES

Since availability of polarized neutrons at the reflectometer AMOR various kinds of experiments have been performed successfully [6–9]. Among others the interlayer exchange coupling in FM/AM/FM (FM = ferromagnet, AF = antiferromagnet) trilayers was probed. FM/AF/FM trilayers exhibit intriguing spin configurations in the AF depending on its thickness. Possible interlayer exchange mediated by the AF was investigated by PNR. From the obtained layer resolved magnetization profile the authors concluded that partial domain wall formation in the AF is responsible for the observed magnetization behavior of the trilayers [6].

The exchange bias in the AF/FM multilayer of [Co/CoO/Au]16 when the system is cooled below the blocking temperature at very low field strengths (HFC) was studied at various external fields (Fig. 5). The SF intensities in the specular geometry along the fields of the decreasing branch indicated rotational reversal of the unpinned half of moments (increased SF) while the pinned half shows domain wall nucleation and propagation (lack of SF) during the reversal [8].

Giant proximity effect in high-temperature superconductors between ferromagnetic and superconducting layers was studied [9]. In the superconducting state the magnetic field is expelled from the superconducting volume of the sample. Thus, in addition to nuclear scattering, magnetic scattering occurs that cause the difference in scattering length density (SLD) profiles for spin-up and spin-down neutrons. Comparison of PNR data with curves calculated for certain models presented in Figs. 6 lead to the conclusion that most probably the superconducting YBCO layers are coupled through the antiferromagnetic PBCO layer. This was also confirmed by low-energy μ-SR measurements.

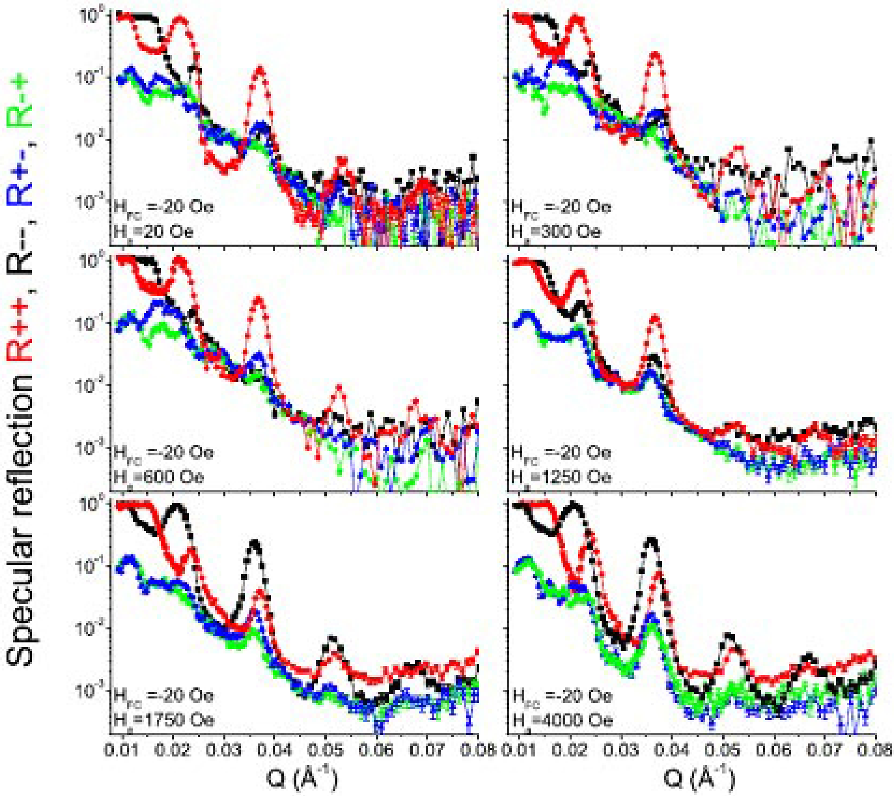
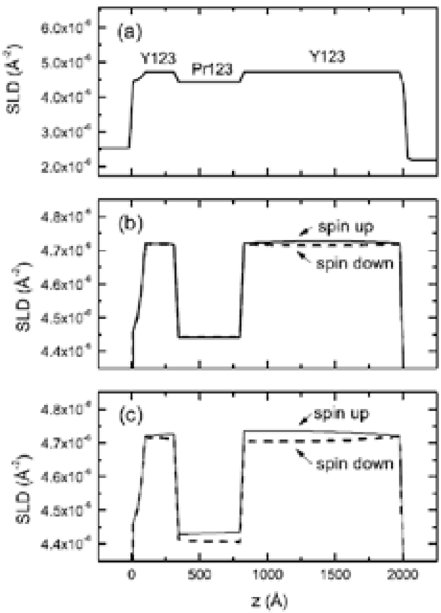


Fig. 5: Specular reflectivity patterns NSF: [R^{++} (red circle) and R^{--} (black square)] and SF: [R^{+-} (green triangle) and R^{-+} (blue downtriangle)] for the ML: SiO2/[Co(9.0 nm)/CoO(7.0 nm)/Au(25.0 nm)]16 ML with negative field cooling strength of -20 Oe.



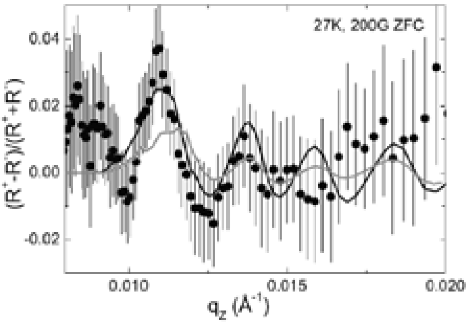


Fig. 6: SLD profiles in YBCO/PBCO/YBCO trilayer sample in normal state (a) and in superconducting state (b) and (c). The solid and dashed lines in (b) and (c) denote the SLD profiles for spin-up and spin-down neutrons, respectively (left). $(R^+ - R^-)/(R^+ + R^-)$ vs. q_z (T = 27 K, H = 200 G, zero-field cooled). The grey and black lines are calculated for models (b) and (c) presented on the left, respectively (right).

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Introducing the Inverted Time-Of-Flight Backscattering Instrument, MARS at SINQ

(Manuscript originally submitted to: Journal of Neutron Research, March 8, 2007)

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The design and performance of the new inverted time-of-flight backscattering instrument, MARS (Mica Analyzer high Resolution inverted time-of-flight backscattering Spectrometer) located at SINQ, at the Paul Scherrer Institut, is described. The spectrometer boasts high resolution over a large neutron energy transfer range, reaching 1µeV at the elastic line. The foremost distinguishing feature is the moveable analyser banks, allowing resolution matching between the primary and secondary instrument, thus achieving optimal intensity. A wide Q-range is obtained by selecting different mica analyser reflections; rendering MARS a highly versatile spectrometer with applications foreseen across many branches of the physical and biological sciences.

THE SCIENTIFIC CASE

Current topics engaging the attention of the scientific community place an ever increasing demand on accessing information on the microwave and far-infra energy regions of the electromagnetic spectrum. This is manifested not only in the heavy demand for neutron spectrometers but in the multitude of high-field EPR facilities springing up across Europe and elsewhere. Conventional neutron backscattering instruments such as IN10 at the ILL and HFBS at NIST proffer sub-μeV resolution but only for energy transfers < *ca.* 30 μeV. Transitions in the inelastic regime may be readily observed with time-of-flight or triple-axis instruments but with a resolution that often cannot compete with optical or magnetic resonance techniques, the inherent advantages of the neutron scattering technique notwithstanding. The MARS spectrometer was conceived primarily to fulfill the need of rendering a spectrum with μeV resolution deep within the inelastic regime, coupled with a large Q-range and high-intensity. This precept dictates the principal instrument design, which shall be described in the next section. Then the performance of the instrument is described. An instrument of the versatility and, it should be said, complexity of MARS requires adept software to run the instrument and analyse the data. A comprehensive program package has already been written for the instrument and this is outlined in the 4th section. The first results from MARS and forthcoming upgrades are then described in the two last sections.

PRINCIPAL DESIGN CHARACTERISTICS

The spectrometer is described with reference to the schematic of the instrument, shown in Fig. 1, the distance vs. time diagram shown in Fig. 2, and schematics of integral components of the primary and secondary instruments exhibited in Figs. 3 and 4 and 5, accompanied by detailed descriptions in the figure captions.

A quasi-white beam of neutrons is formed by five choppers (Figs. 1–3) housed in three bunkers integrated into a guide system (Fig. 4) consisting exclusively of Nickel-Titanium supermirrors. Neutrons with varying velocities are well-separated in time when incident upon the sample. The neutrons with suitable energies are scattered into detectors placed at 30°, 60°, 90° and 150° in the scattering plane (Fig. 1) by way of analyser crystals (Fig. 5) defining the flight time in the secondary instrument. Measurement of the total time-of-flight affords the calculation of the energy transfer between the neutrons and sample.

The distinguishing feature of MARS is the moveable analyser banks, a schematic for one of which is shown in Fig. 5. The secondary instrument consists of ten such analyser-detector units, uniformly distributed in the scattering plane, as indicated in Fig. 1. Unlike other inverted time-of-flight spectrometers such as IRIS[1], where the secondary instrument is fixed at near-backscattering geometry, the scattering angle, θ, defined by (180-α)/2, where α is the sample-analyser-detector angle, may be varied between ~50° and ~87°, courtesy of these analyser-detector units, affectionately referred to as "The Triffids" due to their appearance; the closer to backscattering geometry (θ = 90°), the better the resolution but the lower the intensity. Optimal intensity is achieved by matching the resolution of the secondary instrument to that of the primary. This is particularly important for obtaining good quality data at high energy transfers. As a conseqeunce of being off backscattering, the detectors may be shielded very effectively against neutrons emanating directly from the sample, furthermore the scattered neutrons do not pass back through the sample.

The inelastic analysers banks are intersected by ^{3}He time-of-flight detectors. Knowing the distance and scattering angle, the diffraction pattern may then be constructed.

The Multi-Detector Interface collects the data, generates time information for time-of-flight measurements and transmits them via a fiber optic link to the histogram memory, which sums the single neutron events into multidimensional arrays of bins. The generated histograms are then read out by the SINQ Instrument Control System (SICS) running on the instrument server. Further details on the data acquisition system are provided in ref. [2].

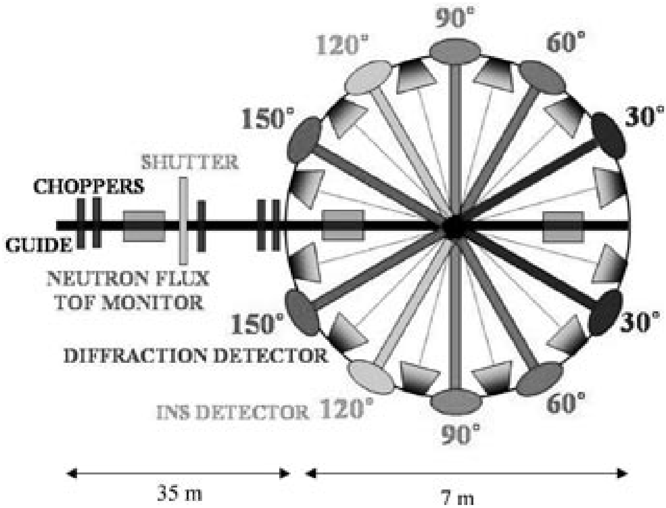


Fig. 1: Schematic of the MARS spectrometer. A quasi-white beam of neutrons is formed by five choppers, intersecting the guide. All have magnetic bearings and operate at 50 Hz with the exception of the master, pulse-producing chopper, which operates at frequencies of n * 50 Hz, where n takes integer values from 1 to 7. The master chopper is located 38.470 metres from the sample and is straddled by "snail" and "rabbit" choppers, positioned 0.308 and 15.909 metres on either side. As the names suggest, the function of these choppers is to prevent unduly slow and fast neutrons from reaching the sample (see the d-t diagram in Fig. 2). Finally, the desired time window is selected by a chopper pair at 34.439 and 34.494 metres downstream from the master chopper, ~4 metres upstream from the sample. A characteristic of the choppers is the geometry of the windows, described in Fig 3. In order to maintain stability at the high rotation speeds demanded of the master chopper, the aluminium disc is of uniform thickness for a radial vector of any given length; the window being defined by a gap in the gadolinium oxide coating. For the remaining four choppers the apertures are cut out of the aluminum discs, coated with boron carbide. The reason for the snail chopper preceding the master chopper is to diminish the severe gamma-radiation inherent to the neutron-gadolinium interaction.

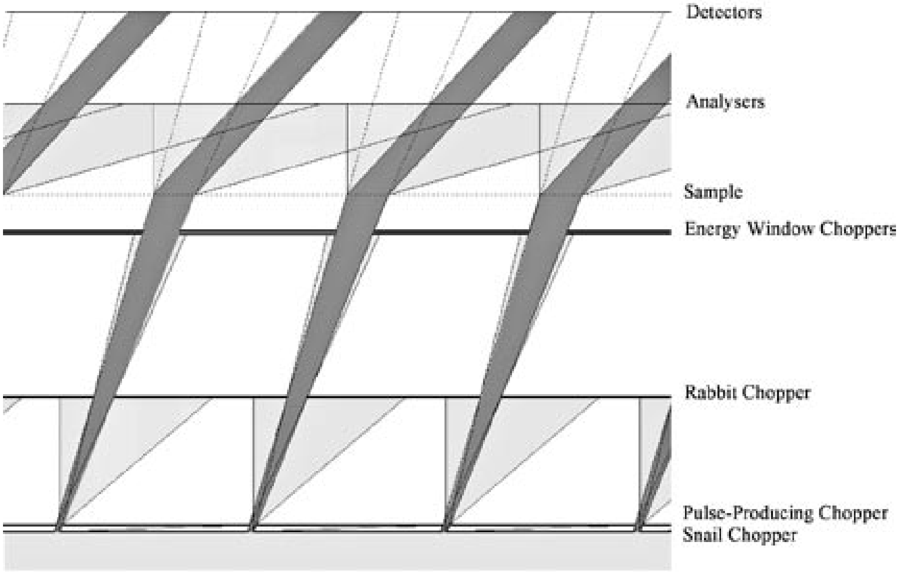
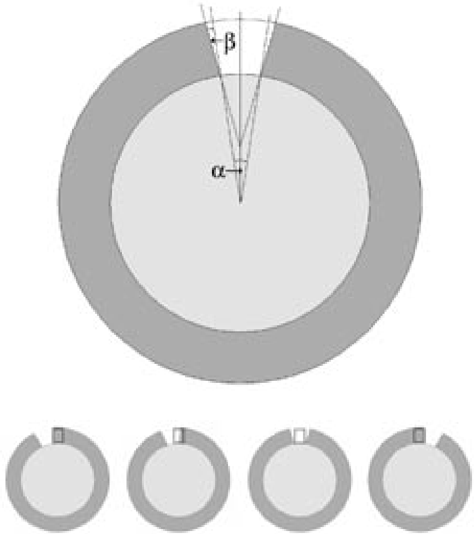


Fig. 2: Distance – Time diagram of the MARS spectrometer. Neutrons marked in blue progress through the spectrometer whilst those marked in yellow are eliminated. The velocities indicated correspond to a neutron energy-loss process. The energy resolution of the primary instrument is governed by the ratio of the pulse duration to the time of flight from the master chopper to the sample.

Fig. 3: Schematic of a given MARS chopper, emphasising the non-radial windows. The outer edges of the windows define vectors that converge to a point non-coincident with the centre of the disc. The rationality of this design is that the window edges are flush with the walls of the guide when the transmission of neutrons begins and ends, resulting in an abrupt rise and fall of the transmitted neutron intensity. The angles α and β, defined in the upper part of the figure have the following values, snail: α = 4.05°, β = 1.523°; master: α = 3.053° β = 1.523°; rabbit: α = 54.27°, β = 3.840°; Energy window chopper pair: α = 121.02°, β = 2.046°. The lower part of the figure displays the rotation of the chopper, shown in grey, relative to that of the guide, shown as an unshaded rectangle.



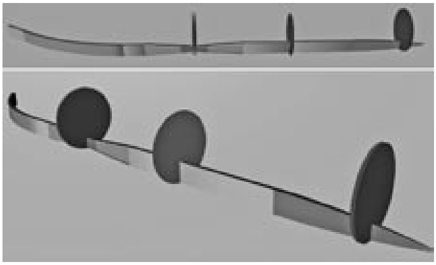


Fig. 4: Colour-coded schematics of the guide system from two different perspectives. The description follows the guide from left to right. The cold neutron guide, '15', begins 1.5 metres from the moderator face with an inner cross section of 30 mm x 120 mm. A 4.7 metre straight guide (m=2) leads the neutrons through the source shielding, marked in yellow. Immediately behind the shielding, a 20 metre long curved (R=2408 m) guide with a constant cross section of 30 x 120 and m=2 follows within the guide bunker (green). A 3.5 metre long straight guide (m=2) passes through the bunker back wall (yellow). The next guide section consists of a symmetric arrangement of tapered pieces to compress the beam to half of its size, in order to allow for a very short chopper pulse, and expand it again to its original size afterwards. The components are as follows: Light-blue guide section: 6 metre vertically converging (m=3.6) from 120 to 75 mm and fixed width (30mm, m=2); pink guide section: a vertically and horizontally converging guide (30x75 down to 15x60, m=3.6) of 2 metre length; dark blue and red-brown disks: the snail and pulse producing choppers separated by 30.8 cm of 15 mm x 60 mm, m=2 guide; pink guide section: a vertically and horizontally diverging guide (15x60 up to 30x75, m=3.6) of 2 metre length; light blue guide section: 6 metre of vertically diverging guide (m=3.6) from 75 to 120 mm and fixed width (30mm, m=2). An 18.4 metre long straight (30x120, m=2) guide follows, with a slit for the rabbit chopper at 7.6 metre (yellow). Finally, a doubly parabolic guide of 12 metre length converges the beam down to 11 mm x 33 mm (variable coating from m=2 up to m=3.6) to just 23 cm before the sample position shown in orange. The chopper pair that selects the range of neutron energies is located 4 metres upstream from the sample position, separated by 5.5 cm.

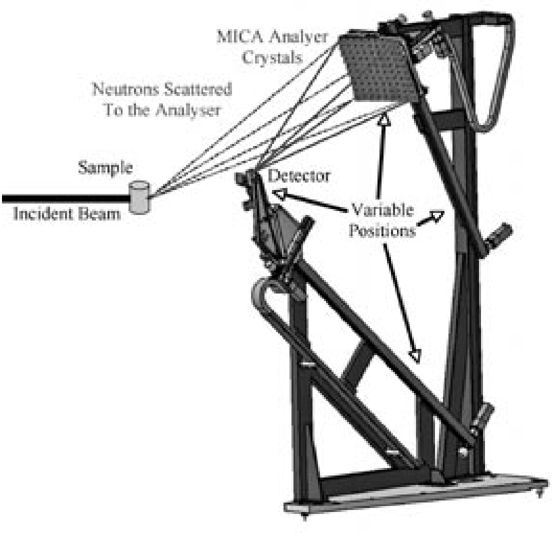


Fig. 5: The MARS moveable analyser-detector system, enabling data collection with scattering angles ranging from ~50 to ~87°. At each position, the distance from sample to detector is maintained at 2.995 metres with optimal intensity. This is achieved by six motorised cog wheels, four of which govern the position of the analyser and detector in a plane defined by sample-analyser-detector; with the other two defining the tilt of the detector within this plane and the horizontal focusing curvature of the analyser bank, the vertical curvature being constant. The MICA crystals of one analyser are distributed over an area of *ca.* 0.6 x 0.4 m^2. The solid angle of collection ranges from 0.45 to 1.09 sr, having the greatest value at the position close to backscattering geometry as depicted in the figure.

PERFORMANCE

The measured neutron flux curve, shown in Fig. 6 below, mirrors that reported for the IRIS instrument, except that it is *ca.* a factor of three lower. However, both sides of MARS are equipped with mica as opposed to just one for IRIS (the other being pyrolytic graphite cooled to *ca.* 25 K). In addition, the MARS analyser banks are *ca.* 3 times larger. Hence, MARS should be a competitive instrument.

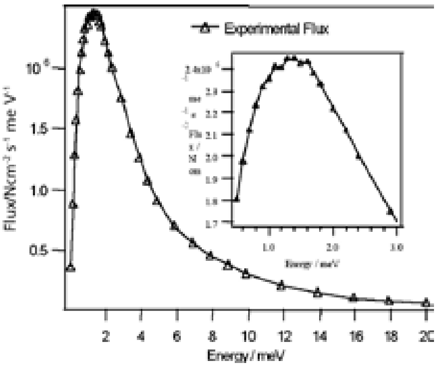


Fig. 6: The flux for MARS as a function of the incident energy, measured by the ^{3}He monitor placed 0.23 metres upstream from the sample. The scattering function is obtained by normalising the raw data to the monitor spectrum according to the prescription of Dorner[3].

The dimensions of the neutron beam at the sample position are given by the measured intensity vs. distance plots in Figure 7, with full width at half heights of 11.6 mm and 32.4 mm in the horizontal and vertical directions respectively. If the sample dimensions exceed these values, the gain in intensity will not be signifcant but an adverse effect on the resolution could result.

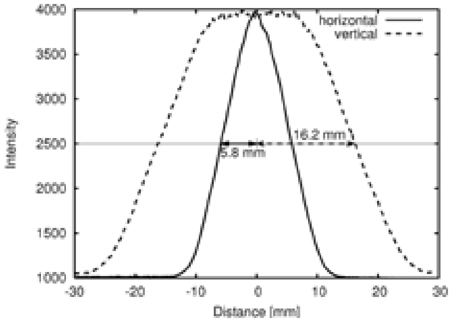


Fig. 7: Profile of the neutron beam at the sample position, as measured by a Delcam neutron camera.

The resolution of the primary instrument is dictated by the ratio of the pulse width to the time it takes for a neutron to travel the distance from the pulse-producing chopper to the sample. High resolution therefore implies long travel times, long wavelengths and hence, correspondingly, a large d-spacing for the analyser reflection. The 002 phlogopite reflection affords high-intensity with a d-spacing of ~10 Å, corresponding to an energy of 0.2 meV. The inherent advantage of inverted versus direct geometry time-of-flight spectrometers is the accessible range of S(Q,ω), which lends itself to the study of neutron-energy-loss processes. The low energy of the phlogopite 002 reflection means cold inelastic processes can be observed at energy transfers up to 20 meV, with a reasonable incident flux. High resolution may be maintained by running the pulse-producing chopper at frequencies up to seven times the nominal frequency of 50 Hz. A plot of resolution versus energy transfer is shown in Fig. 8 below. At 10 meV energy transfer a resolution approaching 20 μeV may be achieved, which is unprecedented for inelastic neutron scattering.

MARS is a big beast with the tank encompassing the secondary instrument spanning some seven metres (Fig. 1). This is a result of the detectors being placed as far as possible from the sample before frame overlap occurs. Inelastic overlap between peaks originating from different mica reflections may then be avoided by reducing the range of energies of neutrons incident upon the sample. The cost of avoiding inelastic overlap is a relatively narrow energy window, as indicated in Fig. 8.

Neutrons that are elastically scattered by the sample may subsequently be scattered incoherently by the analysers, giving rise to spurious peaks and a higher background. An important consequence of the spacious secondary instrument is that, in general, these unwanted neutrons do not reach the detector in the time window of interest. This may be appreciated by inspection of figure 2, where the path of the elastically scattered neutrons from the analyser to the sample is emphasised by the broken lines.

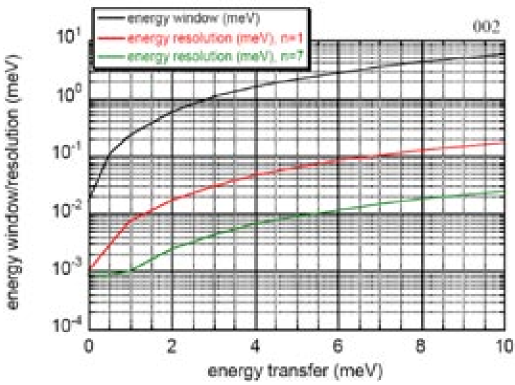


Fig. 8: Energy resolution and Energy Window of the MARS spectrometer, with the master chopper running at n*50 Hz.

Another implication of the long wavelength of the 002 mica reflection is that for a given measurement k_i is typically much larger than k_f. For a given energy transfer, therefore, the momentum transfer is dictated by k_i and the dependence of the momentum transfer on scattering angle is slight. Measurements at larger Q values can be accessed by resolving higher order reflections, but at the cost of resolution. The accessible Q range for energy transfers reaching 10 meV is shown in Fig. 9.

The diffraction detectors are positioned at angles of 15°, 45°, 75°, 105°, 135° and 165° in the scattering plane, as indicated in Fig. 1. Though, under normal operation, the time window and hence the d-spacing range, is relatively narrow, MARS should be considered as a versatile high-resolution spectrometer as

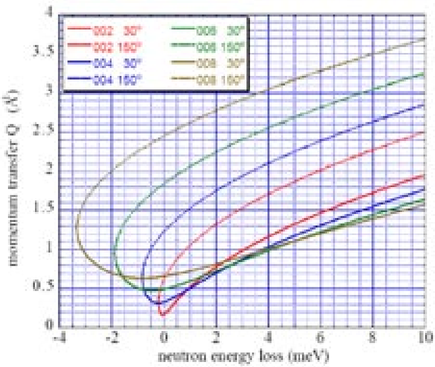


Fig. 9: Moduli of the scattering vector as a function of energy transfer, analyser reflection, and analyzer angle. The accessible values for a given reflection lie between the solid and the dashed line of the corresponding colour. The analysers diffract neutrons from a broad Q range. The angular coverage of one analyser varies beteeen 15.2° and 20.6°, depending on its position in the scattering plane.

the energy of the incident pulse may be tailored such that the d-spacing of interest falls within the range observable with the high-angle detectors. By running the master chopper at 7 times the nominal frequency the resolution obtained is excellent, as shown in Fig. 10 below.

The primary disadvantage of inverted time-of-flight spectrometers is the high neutron flux present within the secondary instrument. It is important that the end of the guide is positioned as close as possible to the sample to aviod scattering and absorption of the direct beam. The background is maintained at acceptable levels by placing the secondary instrument under an atmosphere of Argon and extensive use of boron carbide, aluminum impregnated with boron and gadolinium oxide – coated materials. The secondary instrument of MARS is shielded from the surroundings by a series of tanks containing a saturated solution of borax ($Na_2B_4O_7{\cdot}10H_2O$).

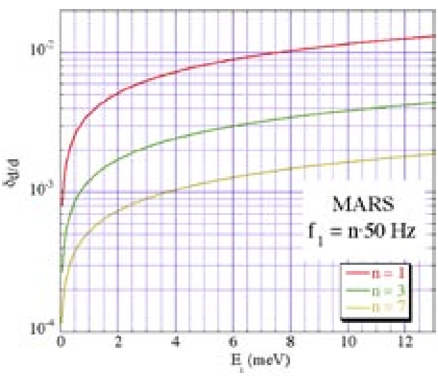


Fig. 10: Resolution corresponding to the highest angle MARS diffraction detectors as a function of the incident energy, for master-chopper frequencies of 50, 150 and 350 Hz.

MARS SOFTWARE

The time is approaching midnight and for the past half an hour the user has been grappling to decide upon the best course of action. The experiment will not run. No matter how many obscure server-specific commands he enters, the experiment will not run. In fact, he is making matters worse. The sample temperature is increasing, the choppers are de-phased and the histogram memory has been inadvertently, and inappropriately, re-configured. Once again he consults his notes taken that very morning during the routine forty minute tutorial. It would seem that every functionality requires a different program running on a different platform. For the calculation of the chopper phases, no software exists at all. Instead, he has been presented with an algorithm with a complexity second only to the way in which the price of meals at the ESRF canteen are calculated. This is where the problems began. A potentially interesting result was obtained and the user desperately wanted to change the settings after the local contact had departed. Finally, he plucks up the courage to ask for help. The local contact answers the phone. His voice is not somnolent but has a sense of purpose, like that of his partner in close proximity. The next day the user appeases the local contact with a six-pack and a bunch of flowers. The ILL living expenses, being what they are, meant slim pickings of victuals for the remainder of the experiment.

This early experience of the present instrument responsible for MARS was influential in the conception of the following three golden commandments that a good software package for neutron scattering experiments should adhere to.

1. Thy purpose shall be to allow *the user* to run the experiment and reduce the data.
2. Thou shalt be written by someone with a knowledge of the instrument.
3. Thy code shall be freely available.

All the MARS programs are available as part of the DAVE (Data Analysis and Visualisation Environment) application suite, developed and maintained by instrument scientists at the National Institute of Standards, Washington D.C.[4] DAVE is essentially a collection of modules pertaining to all aspects of conducting a neutron scattering experiment, woven into one main widget application. Many modules are instrument-specific, like those for the time-of-flight instruments at the PSI; the common thread being that the reduced data sets share a common output file format. This means that after a given data set has been reduced, the user may employ any one of the powerful data analysis and visualisation programs available within the DAVE suite. The programming language is IDL (interactive data language) and the staff at NIST offer free introductory and intermediate courses in IDL, tailored towards people wanting to write neutron-scattering applications. There are numerous sections of code that one can pinch and adapt when writing an application, and the staff at NIST are more than willing to provide help and support for would-be programmers. The DAVE application can run under UNIX, MAC or WINDOWS operating systems and both the application and the source code can be freely downloaded from the DAVE website. A brief description of the programs pertaining to MARS shall now be given.

The *MARS Experiment Planner* informs the user of the capabilities of the instrument. Potential users will be encouraged to access the program before applying for beam time, and certainly before conducting an experiment. The main GUI is shown in Fig. 11 right.

For a given setting, the user may view the incoming flux, analyser efficiency, resolution, available energy window, and the Q range. To realise a given setting, the choppers phases, analyser scattering angle and histogram memory must be configured. The information can be sent directly to the instrument or stored in a planner file, which may be read and interpreted by the MARS batch program.

A typical setting configured with the experiment planner will yield a high resolution spectrum over a limited range of neutron energy transfer. It is unlikely that one setting will suffice for a given experiment. The *MARS Batch Program* affords the execution of batch commands relating to the measurement time, sample environment and also the instrumental settings. User-friendly commands are translated into the language of the server and sent to the instrument. Before the batch file is executed, each command is tested for viability and the bath file re-ordered for efficiency. A record of the executed time for each command is maintained along with the run number for a given measurement command.

The current status of the instrument is accessed via the *MARS Status Program*, with a GUI that resembles the layout of the instrument. Raw and reduced TOF spectra, hard-

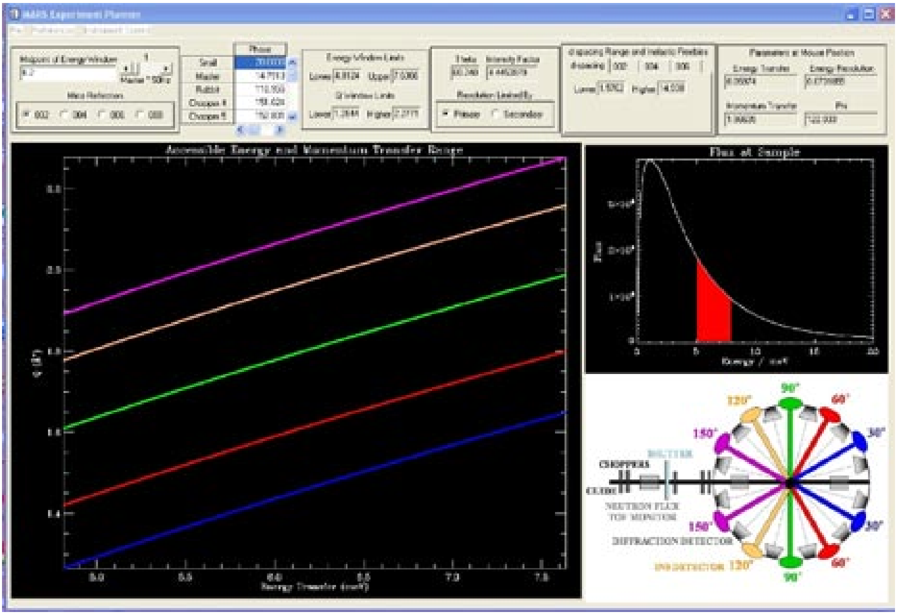


Fig. 11: The Main Graphical User Interface for the MARS Experiment Planner.

ware parameters, and sample environment characteristics may all be accessed by the user with little explanation required from the local contact. Furthermore the user may view a record of any anomalies encountered during the acquisition of data.

After the experiment has been completed, the data are reduced with the *MARS Data Reduction Program*, broadly based upon the *FOCUS Reduction Program* reported earlier[5], which is itself derived from the *HFBS Reduction Program*, written by Rob Dimeo. Any neutron scattering experiment will be of short duration compared to the time needed to analyse the data. This is why the reduction program is the most important module of all. A novice user may reduce his data with a couple of mouse clicks using the default program settings. The more experienced user may wish to exploit the advanced options to perform operations such as detector masking and energy binning.

Programs have also been written to facilitate the calibration of the instrument. A semi-automated approach to this task essential, given the complexity of MARS, and the hardware upgrades planned.

The writing of the programs described above constitutes one year's work for the instrument scientist. The dividend will be that the user will be able to exploit the full capability of the instrument, and act independently.

FIRST RESULTS

The first results from MARS are presented in Figs. 12 and 13 below. Given that the data were obtained with the secondary instrument still under an atmosphere of air rather than argon, these initial results are very encouraging. In Fig. 12 are presented INS data of $[(C(ND_2)_3][V(OD_2)_6][(SO_4)_2]$ (GuVSD), EPR[6] and electronic Raman[7] data for which have been presented previously. The spectra exhibit peaks attributable to transitions between the low lying spinor levels of the vanadium(III) hexaaqua cation. The spectrum labelled 'MARS 006' was obtained under near backscattering conditions from the 006 reflection of MICA. The full width at half maximum is clearly less than that for the spectrum obtained from the direct TOF spectrometer, FOCUS, included for comparison. The spectrum labelled 'MARS 002' was again obtained under near backscattering conditions but from the MICA 002 reflection with energy binning. At the higher resolution setting, splittings due to differing site symmetries of the vanadium(III) hexa aqua cation become resolved.

In Fig. 12 is shown the high-resolution diffractogram of $Na_2Ca_3Al_2F_{14}$. This material affords well-defined diffraction peaks over a large d-spacing range, and therefore serves as a suitable standard against which the MARS diffraction detectors are calibrated. The diffraction pattern displayed emanates from one of the two diffraction detectors positioned at an angle of ~165° in the scattering plane. The versatility of MARS as a high-resolution diffractometer lies in the ability to adjust the primary flight time such that the d-spacing range of interest falls within that observable with the $2\theta \sim 165°$ detectors, where the resolution is greatest.

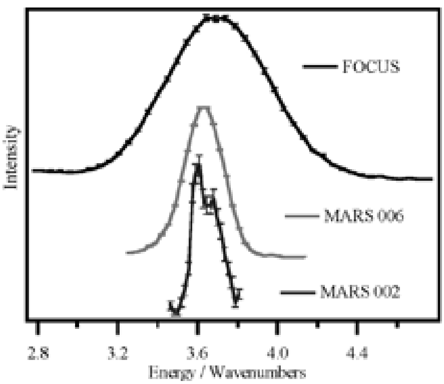


Fig. 12: Inelastic neutron scattering spectra of $[(C(ND_2)_3][V(OD_2)_6][SO_4]$ collected at ~1.5 K on the direct geometry TOF instrument, FOCUS, and the indirect geometry TOF instrument, MARS (analyser reflection indicated) at the PSI.

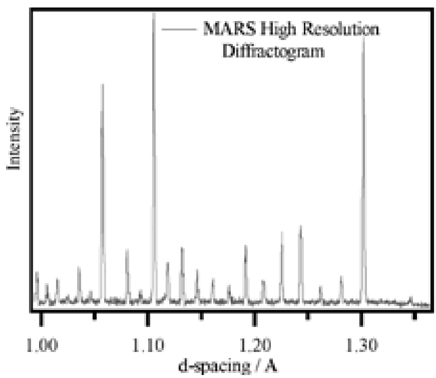


Fig. 13: High-resolution neutron-diffraction pattern of $Na_2Ca_3Al_2F_{14}$, collected at 295 K.

UPGRADE OF THE SECONDARY INSTRUMENT

The analyser banks of the MARS spectrometer are currently equipped with the natural mica mineral phlogopite, affording well-defined, high-intensity Bragg peaks for the 002 and 006 reflections. The primary disadvantage of the material is the incoherent scattering from the tightly bound hydroxyl groups. Another drawback is the variation of d-spacing across the samples, which is the factor governing the best resolution that can be achieved. These problems can be alleviated by employing synthetic mica in which the hydroxyl groups are replaced by fluorine groups. Test measurements suggest a higher degree of homogeneity. To this end, we have begun to replace the natural mica with synthetic fluorinated, a process which is expected to take up to three years.

ACKNOWLEDGEMENT

We would like to extend our gratitude to the superb body of technical staff here at the Paul Scherrer Institut, who actually built the instrument.

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Jeffrey Penfold wins the 2007 ENSA Walter Hälg Prize

Jeffrey Penfold (left) during the award ceremony together with ENSA chairman Peter Allenspach.

Every two years the **European Neutron Scattering Association, ENSA**, awards the prestigious **Walter Hälg Prize** to European scientists for an outstanding programme of research in neutron scattering with a long term impact on scientific and/or technical neutron scattering applications. The Prize of 10'000 Swiss Francs is donated by Professor Walter Hälg, the founder of neutron scattering science in Switzerland. In 2007 the Hälg Prize is to be presented at a special session of the International Conference on Neutron Scattering, to be held in Lund, Sweden, between June 25 and 29.

The nominations received for the 2007 Hälg Prize were examined by an international selection committee consisting of authorities representing the major scientific disciplines, both within and beyond the field of neutron scattering.

The selection committee is delighted to announce that the **2007 Hälg Prize will be awarded to Professor Jeffrey Penfold** (Rutherford Appleton Laboratory, Didcot, UK) in recognition of his ground breaking work on neutron reflection which he developed as an invaluable tool in colloid and interface science. His work has involved both instrument and technique development as well as a large volume of highly cited original research. In particular, he has played a **pioneering role** in the development of **neutron reflection** and has exploited this technique, combined with small-angle neutron scattering in order to provide a complete picture, for studies of surface chemistry, which led to the **Hayter-Penfold theory** to describe the scattering from colloidal dispersions. The quantitative aspects of this theory were ahead of their time and have led to a greatly deepened understanding of the interactions giving rise to colloidal properties. His more recent work with R.K. Thomas, Oxford, has extended all of this to the interactions between biological molecules as well as between biological molecules and surfactants, again revealing unexpected phenomena of both fundamental and practical interest. All these developments have stimulated a huge non-neutron community, notably industrial companies, to start taking a strong interest in the potential of neutron scattering experiments.

Jeffrey Penfold studied at Brunel University, UK, where he obtained the degree of Bachelor in Technology in 1971 and the Ph. D. degree in 1981 with a thesis entitled "New applications of neutron scattering to problems in surface chemistry". In 1971 he was appointed Scientific Officer in the Neutron Beam Research Unit at the Rutherford Laboratory. From 1977 to 1979 he was seconded to the Institut Laue-Langevin, Grenoble. From 1980 to 2003 he was Group Leader for Large Scale Structures at ISIS, Rutherford Appleton Laboratory, and since 1981 Group Leader for non-crystalline diffraction at the same institute. Since 2001 he is engaged as Project Scientist for the target station 2 at ISIS. In 2000 he was appointed Visiting Professor at University of Bristol, UK, and since 2002 he has been Visiting Professor in Physical and Theoretical Chemistry at Oxford University, UK.

Henrik M. Rønnow wins Lewy-Bertaut Prize

The prize committee set up by the **European Crystallographic Association and the European Neutron Scattering Association** has decided unanimously to award the **first Lewy-Bertaut prize to Professor Henrik M. Rønnow.**

Henrik M. Rønnow has a brilliant track record that illustrates the truly successful career of a young European scientist. His work has concentrated on **experimental and theoretical aspects of quantum magnetism** (spin dynamics in the two-dimensional magnet CFTD, in copper germanate as well as high Tc cuprates). He has also been involved in development of **neutron instrumentation** as well as **simulation and data analysis software**. Despite his still early career, he has contributed significantly to neutron scattering science and he has become a renowned expert in polarized neutron scattering techniques.

Henrik Ronnow (right) received the first Lewy-Bertaut Prize from Hannu Mutka (ILL), who initiated the prize during his time as ENSA chairman together with Hartmut Fuess (European Crystallographic Association).

Dominik Schaniel: Max-von-Laue-Prize 2007

Jürg Schefer
Laboratory for Neutron Scattering, ETH Zurich & Paul Scherrer Institut,
5232 Villigen PSI, Switzerland

Dr. Dominik Schaniel from the University at Cologne, a former thesis student at LNS and a long-term member of our society, received the **Max-von-Laue-Prize 2007** from the German Society for Crystallography (DGK).

The prize was given to him for the work on **photocrystallography**, especially for the advancement of the method and its successful application to excited iron-nitrosyl complexes. The central part of this work was performed at Paul Scherrer Institute using the single crystal instrument TriCS. The work was highly stimulated by Density Functional Theory calculations performed at PSI. Dominik received the price at the annual meeting 2007 in Bremen. He will give the honory lecture on the next meeting 2008 in Erlangen.

Dr. Schaniel received his PhD in 2002 from ETH Zurich for his work on high knowledge-content materials. He continued to work in this new field now well known as photocrystallography: The investigation of structural changes under the illumination of light by diffraction methods. He established the existence of the light-induced NO-inversion in the complex $Na_2[Fe(CN)_5NO]*2H_2O$ using neutron single crystal diffraction. This 180° rotation of the NO-ligands (Fe-N-O $\rightarrow$ Fe-O-N) was proposed by P. Coppens based on suggestions from density functional calculations (DFT) of B. Delley et al. The neutron data could clearly provide evidence for this inversion, compared to previous X-ray data which only delivered indications for it. This results from the higher contrast between nitrogen and oxygen atoms for neutron diffraction, but also the higher stability of the metastable states under neutron radiation. A second big step forward was the monitoring of the density of the metastable states. This was reached by measuring the transmission of the sample in-situ during the experiment with the illuminating light: The absorption established previously using optical methods is compared with the transmitted light during the illumination process. This eliminates the density of the metastable states from the free parameter list, which turned out to be crucial as this parameter is highly correlated to parameters such as anisotropic displacement factors difficult to investigate in mixed state systems. Together with Dr. V Petricek, Dr. Schaniel introduced also a simulation procedure in the JANA2000 computer package, which allows the prediction of expected photo difference maps as a function of illumination in order to plan future measurements on other light sensitive systems.

Together with his supervisors, Dr. D. Schaniel built a photocrystallographic setup at the Swiss neutron spallation source SINQ, which is available for the scientific community on request (http://trics.web.psi.ch/trics-photocrystallographic-setup.htm) and allows for measuring light-induced structural changes at temperatures down to 20K and up to 1200 K. Also the new features in JANA2000 are now a general part in all new versions. His work is also a big success for the DFT calculations, as this theoretical method pushed the experimental measurements to its success by directing the experimental physicists. On the other hand, the experimental results inspired afterwards the theoreticians to extend DFT codes for time-dependent calculations.

Nowadays, NO inversion is only one example of light-active ligands. There are many other light induced structural changes of ligands such as of N_2, NO_2, SO_2 or $(CH_3)_2SO$, e.g.

Technologically, such systems are interesting for data storage, optical computing (change in the absorption) or in cancer treatment (the local release of the highly active ligands can be triggered by light).

We congratulate Dominik Schaniel for his success.

Related Publications:

Density Function Theory Calculations:

B. Delley, J. Schefer and Th. Woike,
Giant Lifetimes of Optically Excited States and the Elusive Structure of Sodiumnitroprusside
J. Chem. Phys. **107**, 23 (1997) 10067-10074

Optical Measurements needed for the Interpretation:

D. Schaniel, J. Schefer, B. Delley, M. Imlau and Th. Woike,
Light-Induced Absorption Changes by Excitation of Metastable States in $Na_2[Fe(CN)_5NO]_2H_2O$ Single Crystals,
Phys. Rev. B **66**, 085103-1-10 (2002)

Neutron Measurements TriCS/SINQ:

D. Schaniel, J. Schefer, M. Imlau and T. Woike
Light-induced structural changes by excitation of metastable states MSII in $Na_2[Fe(CN)_5NO]\cdot 2H_2O$ single crystals
Phys. Rev. B **71**, 174112, 1–7 (2005)

D. Schaniel, Th. Woike, J.Schefer, V. Petříček, K. W. Krämer, 5 and H. U. Güdel
Light-induced structural changes by excitation of metastable states MSI in $Na_2[Fe(CN)_5NO]\cdot 2H_2O$ single crystals
Physical Review B **73**, 174108,1–5 (2006)

Review Article:

D. Schaniel, M. Imlau, Th. Weisemoeller, Th. Woike, K. W. Krämer, and H.-U. Güdel
Photoinduced Nitrosyl linkage isomers uncover a variety
of unconventional photorefractive media,
Advanced Matererials **19**, 723–726 (2007)

9^{th} SINQ Users' Meeting Lund University, Sweden, June 26, 2007

Stefan Janssen
NUM department, Paul Scherrer Institut, Villigen

SINQ goes Lund: On June 26 the annual SINQ users' meeting was organized during the European Conference on Neutron Scattering (ECNS) in Lund, Sweden.

Every four years the series of ECNS conferences brings together a large number of European neutron scatterers. The 2007 conference was already the 4th of its kind after the previous conferences in Interlaken (1996), Budapest (1999) and Montpellier (2003). Again the approximate number of participants was 700.

Since the SINQ users' meeting was about to be organized in May/June and a large number of SINQ users would travel to Lund anyway, the idea was realized to organize the 9th SINQ users' meeting as a dedicated session during the ECNS conference. Finally the meeting was settled as one parallel session on the afternoon of June 26.

Approximately 70 participants joined the session and used the opportunity to receive an overview about recent experiments and scientific highlights from a broad variety of different scientific topics.

Ted Forgan from Birmingham University started the series of presentations with a talk on his latest SINQ SANS results of 'flux lattices in conventional and unconventional superconductors' before Peter Böni (TU Munich) presented recent triple-axis results of their experiments on 'spin waves in helical MnSi'. Next speaker was Marc Janoschek (both LNS and TU Munich). He showed results of the 'magnetic structure of $NdFe_3(Bo_3)_4$' that has been studied using the MuPad device for spherical neutron polarimetry at SINQ. A second talk on vortex studies was then presented by Morten Eskildsen (Notre Dame, US). He focused on 'superconducting $CeCoIn_5$' before Andreas Dönni (Tsukuba, Japan) presented a detailed analysis of classical neutron powder diffraction on $TbPd_{0.9}Ni_{0.1}Al$.

After those entirely scientific talks the session turned to instrumentation: The new MARS backscattering spectrometer was introduced by the instrument scientist Philip Tregenna-Pigott (LNS, PSI & ETH Zürich). Philip not only discussed the instrument parameters and first results but also gave an online demonstration, how MARS can be remotely controlled and be optimized for the users' needs.

The two final presentations were on applied science: Ludovic Thilly from Poitiers University showed POLDI results on nanofilamentary Cu/Nb wires, which were exposed to in-situ tensile tests during the experiment. The last presentation was then given by Pierre Boillat (PSI) and covered the technique of neutron imaging: Pierre talked about his high-resolution radiography results in the diagnostics of fuel-cells.

The full programme of the users' meeting is still on the web: http://sinq.web.psi.ch/sinq/usmeet_9/programme.html

The next meeting (already the 10th users' meeting) will again be organized at PSI and is foreseen for spring 2008: http://user.web.psi.ch/user/mtgs.html

The main building of Lund University, where the European Conference on Neutron Scattering 2007 was organized.

Pioneer of Neutron Scattering in Switzerland: Prof Walter Hälg celebrates his 90th birthday

Stefan Janssen
NUM department, Paul Scherrer Institut, Villigen

On the occasion of the 90 birthday of Prof. Walter Hälg a solemn colloquy was organized at PSI on April 28, 2007. Walter Hälg is one of the pioneers of neutron scattering in Switzerland and honorary member of the Swiss Neutron Scattering Society.

Approximately 150 guests attended the symposium in the afternoon of April 28 at PSI. Several former colleagues, students and friends from Walter Hälg showed up. One of them was the former Swiss Bundesrat Kaspar Villiger, who performed his diploma thesis at ETH Zurich under the supervision of Walter Hälg.

After the opening and welcome by the PSI director Prof. Ralph Eichler, two former colleagues – Dr. Paul Schmid and Prof. Wolfgang Gläser – reported on early contacts with Walter Hälg mainly in connection with Swiss and German nuclear reactor projects. Thereafter Prof. Albert Furrer – the successor of Walter Hälg – attracted the audience with a humorous review on Hälg's life time achievement. Electronic greetings per DVD video message were sent by Dr Olver Eriksen who reminded Walter Hälg and the audience on the pioneering area of building research reactors in Europe.

During the second part of the event former students from Walter Hälg like Dr. Andreas Pritzker and Prof. Richard Bührer addressed the audience. Andreas Pritzker reminded on two quite untypical scientific projects that he worked on together with Hälg. Richard Bührer, who settled in informatics, talked about the rapid and tremendous changes of computing over the recent three decades.

FORMER SWISS BUNDESRAT KASPAR VILLIGER WAS STUDENT OF WALTER HÄLG

One highlight of the celebration was definitely the presence and the speech of "Altbundesrat" Kaspar Villiger, also a former ETH student from Walter Hälg. Villiger pointed out how important the scientific education at ETH Zurich was for him even after leaving science

Walter Hälg together with 'Altbundesrat' Kaspar Villiger…

and engineering for a political career. In addition he used the opportunity to share his thoughts about the growing importance of the elder generation in today's modern societies.

The festive atmosphere of the event was also created by the outstanding performance of the 'Minder string quartet', which opened and closed the two afternoon sessions. After that many participants used the opportunity to visit the Swiss spallation neutron source SINQ and its instruments. Doing so they could make an impressive time jump from the early sixties and the beginning of neutron scattering to the state-of-the-art instrumentation of the 21st century.

The event closed with a delicious dinner at the PSI restaurant 'OASE' and the afterdinner talk of Prof. Hugo Tschirky.

ETH-PROFESSOR FOR NUCLEAR REACTOR TECHNOLOGY

Professor Walter Hälg was born in 1917 in Basel, Switzerland. 1943 he received his PhD from the Basel University. After some years at the Physical Institute in Basel he moved to the

AG Brown Boveri Co. in Baden (BBC), the predecessor of the current ABB. During his time at BBC, he worked on the development of the Swiss heavy water reactor DIORIT at Würenlingen, which went critical on 26 August 1960.

Afterwards Hälg moved to ETH Zurich and became full professor for Nuclear Reactor Technology. For many years he was member and head of the research commission of ETH Zurich. He is honorary member of the Swiss Neutron Scattering Society and of the distinguished Physical Society of Zurich. He retired in 1984.

Apart from science Walter Hälg's passion belongs to viniculture. He is still very active in maintaining his vineyard in Villigen together with his wife Madeleine and pressing his own wine.

…and former colleagues.

Announcements

SGN/SSDN MEMBERS

The Swiss Neutron Scattering Society welcomes the following new members:

- Vivek K. Malik, University of Fribourg, Switzerland
- Alastair McEwen, University Louis Pasteur Strasbourg, France

Presently the SGN has 202 members. Online registration for new members of our society is available from the SGN website: http://sgn.web.psi.ch

UNEXPECTED SHUTDOWN OF SINQ

On June 29, 2007 SINQ was taken out of operation due to a leak in one of the heat exchangers of the moderator system. Presently it is expected that SINQ will be operational again in September 2007. Please check also the SINQ website for actual news: http://sinq.web.psi.ch/sinq/news.html
The allocated experiments of July and August will be postponed towards a later period this year. The instrument responsibles will contact the affected users as soon as a new schedule can be made.

10TH ANNIVERSARY OF SINQ

In summer 1997 the first user experiments were performed at SINQ. Ten years and approximately 2000 experiments later the Swiss neutron source has become a real success. The 10th anniversary of SINQ will be celebrated in a special occasion at PSI on **September 21, 2007**, see also page 38.

OPEN POSITIONS AT SINQ

There are various job openings related to SINQ at the moment. Please have a look at: http://sinq.web.psi.ch/sinq/open_jobs.html.

OPEN POSITIONS AT ILL

To check the open positions at ILL please have a look at the ILL-homepage: http://www.ill.fr following the link ‘Job Offers’.

PAUL SCHERRER INSTITUT PSI

SINQ: the first 10 years

The Spallation Neutron Source

September 21, 2007, Paul Scherrer Institut, Villigen

SINQ – 10 years celebration

Program:

14.00 – 16.10	**Part I: The neutron source**	
14.00 – 14.10	Welcome	*K. Clausen*
14.10 – 14.40	SINQ: from idea to realization	*W. Fischer*
14.40 – 15.10	First instrument generation – the early years	*A. Furrer*
15.10 – 15.40	PSI – Shifting focus to Solid State Physics	*H.R. Ott*
15.40 – 16.10	**Coffee Break**	
16.10 – 18.10	**Part II: The use of SINQ**	
16.10 – 16.40	Highlights from 'hard' experiments at PSI – the perspective of an external user	*E.M. Forgan*
16.40 – 17.10	Highlights from 'soft' experiments at PSI – the perspective of an external user	*K. Mortensen*
17.10 – 17.40	The SINQ target development – Recent achievements and future perspectives	*W. Wagner*
17.40 – 18.10	SINQ: Quo vadis?	*J. Mesot*
18.15 – 19.15	**Tour of SINQ**	

Conferences and Workshops 2007/2008

(an updated list with online links can be found here: http://sinq.web.psi.ch/sinq/links.html)

AUGUST 2007

ICRE 2007: 5th International Conference on Rare Earth Development and Application
August 7–11, 2007, Baotou, China

National School on Neutron and X-ray Scattering
August 12–25, 2007, Argonne National Laboratory, USA

9th International Conference on Biology and Synchrotron Radiation
August 13–17, 2007, Manchester, UK

6th PSI Summer School on Condensed Matter Research
August 18–25, 2007, Zuoz, Switzerland

ECM24: 24th European Crystallographic Meeting
August 22–27, 2007, Marrakech, Morocco

Diffusion Fundamentals II
August 26–29, 2007, L'Aquila, Italy

Third Seeheim Conference on Magnetism
August 26–30, 2007, Frankfurt, Germany

SEPTEMBER 2007

10th Oxford School on Neutron Scattering
September 4–14, 2007, Oxford, United Kingdom

International Workshop on Small Scale Plasticity
September 5–8, 2007, Braunwald, Switzerland

Gordon Research Conference on Superconductivity
September 9–14, 2007, Les Diablerets, Switzerland

3rd High-Power Targetry Workshop
September 10–14, 2007, Bad Zurzach, Switzerland

8th SLS Users' Meeting
September 11–12, 2007, PSI Villigen, Switzerland

Annual Meeting of the Swiss Society for Crystallography
September 12–13, 2007, PSI Villigen, Switzerland

PNAM Autumn School about Application of Neutrons and Synchrotron Radiation in Engineering Materials Science
September 17–21, 2007, Ammersbek, Germany

SINQ: The first 10 years
September 21, 2007, PSI Villigen, Switzerland

DyProSo XXXI: 31st International Symposium on Dynamic Properties of Solids
September 25–29, 2007, Porto, Portugal

MSM07: 5th International Conference on Magnetic and Superconducting Materials
September 25–30, 2007, Khiva, Uzbekistan

SKIN 2007: Studying Kinetics with Neutrons
September 27–28, 2007, Göttingen, Germany

Swiss Workshop MaNEP 2007: Materials with Novel Electronic Properties
September 28–30, 2007, Les Diablerets, Switzerland

OCTOBER 2007

Size – Strain V
October 7–9, 2007, Garmisch-Partenkirchen, Germany

HSC5: Synchrotron Radiation and Neutrons for Cultural Heritage Studies
October 7–13, 2007, Grenoble, France

5th General NMI3 Meeting
October 8–11, 2007, Bilbao, Spain

Working meeting on prospects of levitation techniques for high-temperature neutron scattering experiments
October 10, 2007, Bilbao, Spain

Orbital 2007: 6th Workshop on Orbital Physics and Novel Phenomena in Transition Metal Oxides
October 10–11, 2007, Stuttgart, Germany

International School on Scattering for Biologists
October 23–26, 2007, Paul Scherrer Institut, Villigen, Switzerland

CanSAS V: Collective Action for Nomadic Small Angle Scatterers
October 28–31, 2007, Gaithersburg, MD, USA

XIVth International Workshop on Quantum Atomic and Molecular Tunneling in Solids and other Condensed Phases
October 28 – November 1, 2007, Houston, Texas, USA

CCMX Annual Course 2007: Particles and Thin Films
October 29 – November 2, 2007, Luzern, Switzerland

NOVEMBER 2007

2007 MRS Fall Meeting
November 26–30, 2007, Boston, MA, USA
January 2008

APNFM2008 – International Conference Advanced Processing of Novel Functional Materials
January 23–25, 2008, Dresden, Germany

MARCH 2008

TMS 2008: Linking Science and Technology for Global Solutions
March 9–13, 2008, New Orleans, Louisiana, USA

APRIL 2008

Summer School on Mathematical and Theoretical Crystallography
April 27 – May 3, 2008, Gargnano, Garda Lake, Italy

MAY 2008

Surfaces and Interfaces in Soft Matter and Biology: the impact and future of neutron reflectivity – A Symposium in Honor of Robert K. Thomas
May 21–23, 2008, ILL, Grenoble, France

2007 Annual Meeting of the American Crystallographic Society
May 31 – June 5, 2008, Knoxville, USA
June 2008

ICQ10: 10th International Conference on Quasicrystals
June 9–14, 2008, Zurich, Switzerland

5th International Conference on New Developments in Photodetection
June 15–20, 2008, Aix-les-Bains, France

AUGUST 2008

IUCr 2008: XXI Congress of the International Union of Crystallography
August 23–31, 2008, Osaka, Japan

SEPTEMBER 2008

ISBB 2008: 16th International Symposium on Boron, Borides and Related Materials
September 7–12, 2008, Matsue, Shimane, Japan

NOVEMBER 2008

ICTF 14: 14th International Conference on Thin Films
November 17–20, 2008, Ghent, Belgium

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