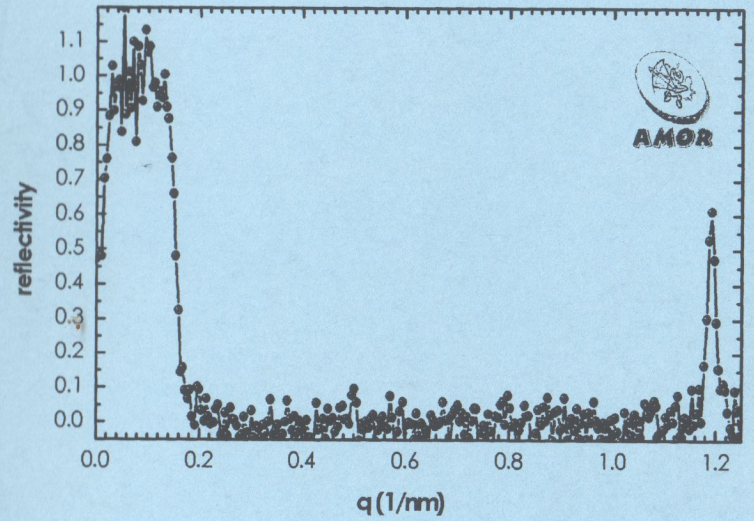
Number 18
December 2000

SWISS NEUTRON NEWS



Schweizerische Gesellschaft für Neutronenstreuung
Société Suisse pour la Diffusion des Neutrons
Swiss Neutron Scattering Society

Cover illustration:
One of the first results obtained on the new SINQ reflectometer 'AMOR' in its constant wavelength mode: total reflection and first Bragg order from a Ni/Ti multilayer monochromator.

Impressum:

Herausgeber: Schweizerische Gesellschaft für Neutronenstreuung

Vorstand für die Amtsperiode Januar 2001 - Januar 2004:

Präsident: Prof. Dr. P. Schurtenberger, schurtenberger@unifr.ch
Mitglieder: Prof. Dr. S. Decurtins, silvio.decurtins@iac.unibe.ch
Prof. Dr. G. Kostorz, kostorz@iap.phys.ethz.ch
Sekretär: Dr. S. Janssen, stefan.janssen@psi.ch

Ehrenmitglieder: Prof. Dr. W. Hälg, ETH Zürich
Prof. Dr. K.A. Müller, IBM Rüschlikon und Univ. Zürich

Rechnungsrevisoren: Dr. W. Fischer, Paul Scherrer Institut
Dr. P. Schobinger, ETH Zürich

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Postcheck-Konto: 50-70723-6

Druck: Paul Scherrer Institut, A. Brun

Erscheinungsweise: 2x pro Jahr

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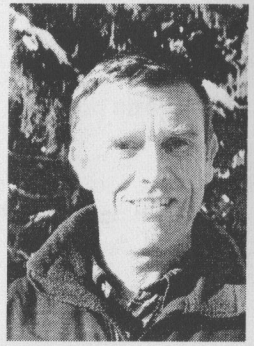
La page du président de la SGN/SSDN

Dear members,



You are certainly aware of the deep worldwide changes that are presently occurring in the field of neutron research. Very powerful third generation neutron sources are being built (spallation source SNS in the USA) or are being planned (European spallation source ESS, ISIS-III in UK, AUSTRON in A, JHF/NSP in Japan). Their neutron fluxes will surpass those currently obtained by an order of magnitude that will enable completely new experiments. In parallel to these developments, existing facilities are being upgraded as, for instance, at the Institute Laue-Langevin (ILL) of which Switzerland is a scientific member. As to our national source SINQ, it is now fully operational and many first-class instruments are available while new instruments are planned. Against this background, the question arises as to what extent Switzerland should participate in foreign developments while pursuing investments in its national source. This has prompted our Society to consider publishing a document on 'Status and Future of Neutron Research in Switzerland' (see minutes of the last General Assembly, p. 4, this issue). This document will assess the current status of research with neutrons in Switzerland and, in particular, estimate our future needs in the field of neutron scattering. This document will also outline a support strategy for neutron centers essential to our research. Furthermore, recommendations will be made to our scientific authorities for their future action concerning issues such as the renewal of the ILL contract, participation in ESS, and necessary investments into SINQ.

This document will cover various scientific disciplines for which the following 'Convenors' have agreed to take editorial responsibility (e-mail addresses in parentheses):

Structural and magnetic excitations (albert.furrer@psi.ch)
Crystallography (steurer@topaz.ethz.ch)
Magnetic structures (silvio.decurtins@iac.unibe.ch)
Biology (fritz.winkler@psi.ch)
Soft matter, glasses, liquids (peter.schurtenberger@unifr.ch)
Materials science (kostorz@iap.phys.ethz.ch)
Fundamental physics (N.N).

The 'Convenors' will contact neutron users shortly. Given the importance of this document to our future research, I urge all members of our Society to collaborate. Your inputs will be essential for the accurate assessment of our present use of neutrons both at home (SINQ) and abroad (ILL, ISIS, Riso, HMI etc.) and for a realistic estimate of our future needs. More specifically, you are invited to communicate your topics of research and think about appropriate ways to describe your scientific results, both quantitatively (number and type of experiments, rate of publications) and qualitatively (impact, scientific 'highlights'). You are also invited to identify scientific problems most likely to be tackled in the foreseeable future, to indicate the type and number of experiments to be carried out, to define technical boundary conditions such as the Q,ω-range and resolution, and to specify sample environment conditions. Finally, your opinion on what type of research is feasible, based on existing sources (SINQ, ILL) and what type of experiments need new sources (ESS) and/or instruments, will be highly appreciated. The final report will be drawn up by the President of the SGN/SSDN and the Convenors, and should be ready by spring 2001.

This is my last Editorial as a president of our Society. Let me take this opportunity to extend my hearty thanks to all who contributed in making my job enjoyable. In particular, I would like to mention our past secretary Peter Böni, our new secretary Stefan Janssen, our future president Peter Schurtenberger and all members of the SGN/SSDN Committee. With my best wishes to all Members of our Society.

Klaus Yvon

Protokoll der Generalversammlung der SGN/SSDN vom 5. 10.2000

Ort	:	PSI Villigen, Auditorium WHGA/001
Beginn	:	12:02
Ende	:	12:58
Teilnehmer	:	insgesamt 22 Mitglieder der Gesellschaft

1. Begrüssung

Der Präsident der SGN, Prof. Klaus Yvon begrüsst die Anwesenden, insbesondere das Ehrenmitglied Prof. W. Hälg zur Generalversammlung 2000 der Schweizerischen Gesellschaft für Neutronenstreuung.

2. Protokoll der Generalversammlung vom 2.12.99

Das Protokoll der GV vom 2.12.99, das in Swiss Neutron News Nr. 16 (Dez. 99) abgedruckt ist, wird ohne Beanstandungen genehmigt.

3. Jahresbericht des Präsidenten

Der Präsident berichtet den Mitgliedern über die Aktivitäten der Gesellschaft seit der letzten GV:

a) Die Anzahl der Mitglieder ist im Berichtszeitraum erstmals auf über 200 gestiegen. Der Jahresbeitrag ist mit SFr 10,- konstant geblieben.

b) Eine wichtige Aktivität war die Vorbereitung und Durchführung des gemeinsamen Meetings der SGN/SSDN mit der Schweizerischen Gesellschaft für Kristallographie. Darüberhinaus würdigt der Präsident die reichhaltigen wissenschaftlichen Aktivitäten der Gesellschaft, die insbesondere auf der '8. PSI Sommerschule über Neutronenstreuung' in Zuoz sowie beim letzten 'SINQ user-meeting' durch zahlreiche Beiträge der Mitglieder dokumentiert wurden. Die Sommerschule wurde traditionsgemäss von der Gesellschaft finanziell unterstützt.

c) Die Kontakte der Gesellschaft zur Direktion des PSI (Ausbau und Nutzung der Neutronenquelle 'SINQ'), zum wissenschaftlichen Rat des ILL (Millenium Programme), zur ENSA (Projekt ESS) und zum Bundesamt für Bildung und Wissenschaft (Nutzung des ILL durch Forscher in der Schweiz) wurden weiterhin gepflegt, und haben zur Qualität des Umfelds auf dem Gebiet der Neutronenstreuung in der Schweiz beigetragen.

4. Bericht des Kassiers (P. Böni)

Jahresrechnung 1999:

Vermögen der SGN/SSDN am 1.1.99 : **SFr 2510,60**

	Einnahmen [SFr]	Ausgaben [SFr]
Mitgliederbeiträge (Kasse)	310,-	
Spenden	20,-	
Mitgliederbeiträge (PC)	725,-	
Apero Sommerschule Zuoz		409,50
Arbeitsessen		118,40
Rückzahlung (Müller)		10,-
Zinnkanne (Geschenk)		586,40
Taxen für Postcheck		26,40
Nettozins	8,10	
Verrechnungssteuer		2,85
Gesamt	1063,10	1153,60
Einnahmen 1999		-90,50

Vermögen am 31.12.99 : **SFr 2420,10**

Bilanz 1999:

	Aktiva [SFr]	Passiva [SFr]
Postcheckkonto	2186,05	
Kasse	252,05	
Vermögen 31.12.99	**2420,10**	

5. Bericht der Revisoren

Die beiden Revisoren (W. Fischer und P. Schobinger) haben die Belege, die Abrechnungen sowie die Bilanz 1999 überprüft und Ihr Einverständnis erklärt. Die Annahme der Jahresrechnung 1999 wird vorgeschlagen und einstimmig akzeptiert. Die Entlastung des Vorstandes wird beschlossen.

6. Budget für das Jahr 2001

	Einnahmen [SFr]	Ausgaben [SFr]
Mitgliederbeiträge	1200,-	
Diverses		150,-
Taxen für Postcheck		30,-
Nettozins	10,-	
Gesamt	1210,-	180,-
Einnahmen 2001	**1030,-**	

W. Fischer weist darauf hin, dass das Budget 2001 durch die aller Voraussicht nach nicht stattfindende Sommerschule stark entlastet ist. Der Budgetvorschlag wird von den Mitgliedern einstimmig angenommen.

7.1 Bericht eines Mitgliedes über den Zustand der SINQ und der Instrumentierung (W. Fischer)

a) SINQ/Beschleuniger

Der bisherige Betrieb im Jahr 2000 war nicht völlig zufriedenstellend. Insbesondere in den Wochen 36/37 war die Verfügbarkeit der SINQ erheblich eingeschränkt. Ursache hierfür war nicht die SINQ selbst sondern aufgetretene Probleme an Hauptkomponenten des Protonenbeschleunigers. Diese mussten z.T. ausgetauscht werden. Seitdem ist der Betrieb wieder gewohnt stabil.

Insgesamt wurden bis zum Tag der GV 3805mAh Betrieb realisiert. Bis zum Jahresende werden 6000mAh angestrebt. Das aktuelle SINQ-Target wird im kommenden Shutdown nicht ausgetauscht.

b) Instrumentierung

Ausser den Instrumenten AMOR und POLDI sind sämtliche Instrumente während der gesamten Betriebsphase gelaufen. Es folgen kurze Anmerkungen zu einzelnen Instrumenten:

AMOR	:	z.Zt. Inbetriebnahme, noch kein user-Betrieb, dieser wird nach dem Shutdown 2001 angestrebt
POLDI	:	Instrument steht bis auf den Detektor, Inbetriebnahme 2001 ist geplant
SANS	:	z.Zt. ausser Betrieb, da die fehlerhafte ursprüngliche Detektorelektronik durch die neue PSI-Eigenentwicklung ersetzt wird. Anschliessend wird ein Gewinn der 'efficiency' um einen Faktor 2 erwartet
FOCUS	:	Inbetriebnahme der oberen und unteren Detektorbank ist für November 2000 vorgesehen
TRICS	:	Einbau der 2D-Detektoren ist für den Shutdown 2001 geplant

In einer anschliessenden kurzen Diskussion wird die Leiterverlängerung 'RNR15', die für den Shutdown 2001 vorgesehen ist, erwähnt. In diesem Zusammenhang wird auch über den Zeitplan für den Aufbau des 'MARS'-Spektrometers gesprochen (Aufbau 2001/02 je nach Fortgang der Leiterhallenverlängerung, Inbetriebnahme 2003). Die Erweiterung der Leiterhalle zur Unterbringung der Geräte zur Probenumgebung kann aus finanziellen Gründen erst im Jahre 2002 in Angriff genommen werden.

7.2 Bericht eines Mitgliedes des wissenschaftlichen Ausschusses SINQ (P. Schurtenberger)

Am 26.6.00 hat eine Sitzung des wissenschaftlichen Ausschusses der SINQ stattgefunden. Prof. P. Schurtenberger orientiert hieraus über folgende Punkte:

a) Der Ausschuss begrüsst sehr die erzielte Flusserhöhung um einen Faktor 2.2. Darüberhinaus befürwortet der Ausschuss jedoch klar eine weitere Erhöhung des Neutronenflusses.

b) Der Zustand der Instrumente wird als durchweg sehr gut beurteilt. Es wird allerdings auf den Engpass 'Elektronik-manpower' am PSI hingewiesen.

c) Es sind nun Statuten in Kraft getreten, die die Aufgaben des wissenschaftlichen Ausschusses eindeutig festlegen.

d) Hauptaufgabe des Ausschusses war die Begutachtung der eingereichten Proposals. Eckdaten hierzu:

Eingereichte Proposals	:	50
Davon abgewiesen	:	18
Beantragte Messtage	:	699
Hiervon vergeben	:	413
Anteil Schweizer Messtage	:	70%

7.3 Bericht des schweizerischen Repräsentanten am ILL (K. Yvon)

a) In der letzten Proposal-Runde ist der Anteil der von Schweizer Nutzern beantragten Messzeit auf 2.6% gesunken. Damit ist die Nachfrage deutlich geringer als dem finanziellen Beitrag der Schweiz am ILL entspricht (3.5%).
Als mögliche Ursachen sieht K. Yvon die verstärkte Verfügbarkeit der SINQ sowie die Emeritierung von Prof. Kern/Fribourg, dessen Anteil an der Schweizer ILL-Strahlzeit signifikant war.

b) Die Empfehlungen des wissenschaftlichen Rats des ILL zum zweiten Abschnitt des ILL-Millennium-Programms enthalten folgende Prioritäten:
- Rekonstruktion D7 mit Schwerpunkt Polarisationsanalyse
- Rekonstruktion D2B mit Schwerpunkt Erhöhung des gemessenen Neutronenflusses

7.4 Bericht des schweizerischen Vertreters im ENSA-Komitee (A. Furrer)

Prof. A. Furrer, der an der GV aus dringenden terminlichen Gründen nicht teilnehmen kann, teilt der Versammlung in einem Brief an den Präsidenten folgende Neuigkeiten aus dem ENSA-Komitee mit:

"Das Projekt ESS (Europäische Spallationsneutronenquelle) hat neue Impulse erhalten. Die Projektstruktur, insbesondere die Leitung, wurde neu organisiert. Die Projektarbeiten werden federführend vom FZ Jülich aus geleitet, im Verbund mit 12 Europäischen Forschungszentren (darunter auch das PSI). In Zukunft soll ein ESS-Newsletter alle Europäischen Neutronenstreuer periodisch über das Projekt orientieren. Als wichtiges Ereignis steht vom 2.-6. Mai 2001 ein Workshop in Wildhaus (Toggenburg) an, in welchem der Scientific Case und technische Randbedingungen der ESS (short pulse vs long pulse) festgelegt werden sollen."

8. Neuwahlen

Turnusgemäss stehen folgende Neuwahlen an:

- Präsident
- Vertreter der Schweiz im wissenschaftlichen Rat des ILL (bisher: K. Yvon)
- Vertreter der Schweiz in den ILL-Subkommitees
  - College 4 (Excitations), bisher: P. Allenspach
  - College 9 (Soft Condensed Matter), bisher: J. Ricka

Ausserdem möchte P. Böni auf eigenen Wunsch auf Grund seiner Berufung nach München aus dem Amt des Sekretärs ausscheiden, so dass dieses neu besetzt werden muss.

Die Versammlung beschliesst zunächst, dass nach dem Ausscheiden des derzeitigen Präsidenten K. Yvon zum Jahresende 2000 der neue Vorstand lediglich aus 4 Mitgliedern bestehen soll, nämlich dem neu zu wählenden Präsidenten, dem neu zu wählenden Sekretär sowie Prof. S. Decurtins und Prof. G. Kostorz, die im Vorstand verbleiben. Es wurden folgende Neuwahlen durchgeführt:

a) Sekretär
K. Yvon schlägt im Namen des Vorstandes Dr. S. Janssen (LNS, PSI&ETHZ) für dieses Amt vor. Es gibt keine weiteren Vorschläge. Die Versammlung wählt S. Janssen einstimmig zum Sekretär der SGN/SSDN.

b) Präsident
K. Yvon schlägt für das Amt des Präsidenten der SGN/SSDN den derzeitigen Vizepräsidenten Prof. P. Schurtenberger (Univ. Fribourg) vor. Es gibt keine weiteren Vorschläge. P. Schurtenberger verlässt kurz die Versammlung und K. Yvon berichtet über dessen Lebenslauf. Die Versammlung begrüsst den Vorschlag und wählt P. Schurtenberger einstimmig zum künftigen Präsidenten der SGN/SSDN. Dieser kehrt in den Saal zurück und wird von K. Yvon im Namen der Mitglieder herzlich beglückwünscht.

c) Vertreter der Schweiz in den ILL-Subcommittees
Turnusgemäss stehen die Neuwahlen für College 4 (Excitations, bisher P. Allenspach) sowie 9 (Soft Matter, bisher J. Ricka) an. Als einziger Vorschlag für College 4 steht Dr. J. Mesot (LNS, PSI&ETHZ) zur Verfügung. Seine Wahl erfolgt in Abwesenheit einstimmig. Ebenfalls einstimmig beschliesst die Versammlung auf Grund der geringen Schweizer Nachfrage die Vertretung in College 9 durch eine neue in College 5b (Magnetismus) zu ersetzen. Hier wird ebenfalls ohne Gegenvorschlag Dr. K. Krämer (Univ. Bern) einstimmig gewählt.

d) Vertreter der Schweiz im wissenschaftlichen Rat des ILL
Der Vorstand schlägt Prof. H-U. Güdel (Univ. Bern) vor. Dieser Vorschlag wird von der Versammlung gutgeheissen.

K. Yvon wird alle Vorschläge für die ILL-Gremien dem Bundesamt für Bildung und Wissenschaft (BBW) mitteilen. Er bedankt sich abschliessend herzlich bei den ausgeschiedenen Funktionsträgern.

9. Aktivitäten der SGN/SSDN im Jahr 2001

Als zentrale Aktivität für das Jahr 2001 stellt K. Yvon die Ausarbeitung eines Strategiepapiers 'Status und Zukunft der Neutronenforschung in der Schweiz: eine Analyse' vor. Das Papier hat die zentralen Aufgaben, die Sicht der in der Schweiz tätigen Neutronenstreuer insbesondere zu den Punkten

- Vetragsverlängerung mit dem ILL
- Unterstützung des ESS-Projektes

klarzustellen und den politischen Entscheidungsträgern zu vermitteln. Zu Beginn steht hier die Erstellung von Subkomitees zu den verschiedenen wissenschaftlichen Themenschwerpunkten sowie die Bestimmung der entsprechenden 'Convenors' an. Als Basis dient dafür folgender im Vorstand erarbeitete Vorschlag:

Thema	Convenor
Strukturelle und magnetische Anregungen	A. Furrer
Kristallographie	W. Steurer
Magnetismus - Strukturen	S. Decurtins
Biologie	F. Winkler
Weiche Materie, Gläser, Flüssigkeiten	P. Schurtenberger
Materialwissenschaften	G. Kostorz
Fundamentelle Physik	N.N.

Nach kurzer Diskussion wird beschlossen, keine eigene Gruppe 'sample environment' einzurichten, sondern den einzelnen Gruppen zu übertragen, auf ihre speziellen Bedürfnisse zur Probenumgebung einzugehen. Die Koordination des gesamten Projektes soll der neue Präsident der SGN/SSDN übernehmen. Als Termin für die Fertigstellung des Papiers wird Ende März 2001 angepeilt.

10. Varia

P. Schurtenberger dankt im Namen der Mitglieder K. Yvon herzlich für dessen vielfältige Tätigkeit für die Gesellschaft in den letzten Jahren. Anschliessend wird die Sitzung geschlossen.

S. Janssen, Protokollführer

Annual Meeting 2000 of the SGN/SSDN

Stefan Janssen, Villigen

The annual meeting of the 'Swiss Neuron Scattering Society, SGN' this year was held on October 5 and 6 at the Paul Scherrer Institute in Villigen. It was organized as a joint meeting together with the 'Swiss Crystallographic Society, SKG'. The meeting consisted of invited lectures and a poster session with some of the posters upgraded to short oral contributions.
The invited talks gave a broad overview about state of the art neutron and x-ray scattering:

Speaker	Title
H.J. Scheel, EPFL Lausanne	Growth of quasi-perfect crystals and epilayers
C.C. Wilson, ISIS, Oxford	Importance of crystal quality and size for neutron and x-ray diffraction studies
S. Cusack, EMBL, Grenoble	Exploiting third generation synchrotron sources for crystallographic studies of protein RNA complexes
C. Vettier, ILL, Grenoble	Neutrons and synchrotron x-rays for magnetism
G. Eckold, Göttingen	Inelastic neutron scattering
P. Radaelli, ISIS, Oxford	Neutron and x-ray synchrotron powder diffraction: the way ahead
G. Kostorz, ETH Zürich	Local order and decomposition in alloys - x-ray and neutron scattering studies

Besides the scientific program the two 'General Assemblies' of both the SGN and the SKG were held (see 'Protokoll der SGN GV', this issue). During guided tours of SINQ and SLS a lot of the participants took also the opportunity to have a look on recent progress on SINQ instrumentation and on the ongoing implemetation of accelerator and storage ring components at the SLS.
Finally, the PSI-OASE created a delicious menu during the conference dinner, where several old and new contacts between the neutron and the synchrotron communities could be established.

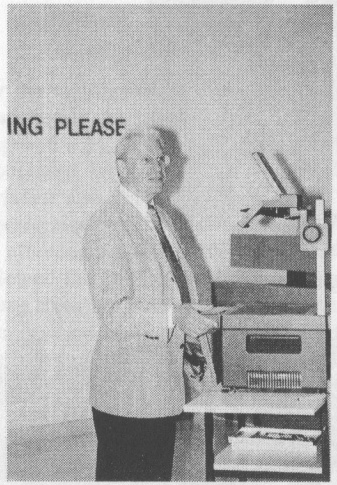
Poster contributions SGK/SGN meeting 2000

1*	**Inelastic neutron scattering studies on the single molecule magnets $[Mn_4O_3X(OAc)_3(dbm)_3]$ (X = F, Cl, Br, OAc)** H.P. Andres, R. Basler, H. U. Güdel, G. Aromi, G. Christou, H. Büttner, B. Rufflée
2*	**High pressure synthesis and crystal structure of the new ternary caesium magnesium hydrides $CsMgH_3$, $Cs_4Mg_3H_{10}$ and Cs_2MgH_4** B. Bertheville, P. Fischer, K. Yvon
3	**The surprising polymorph C of cimetidine: synchroton radiation to the rescue** H. Birkedal, A. Bauer-Brandl, P. Pattison
4*	**Magnetic solitons in CuB_2O_4** M. Böhm, B. Roessli, J. Schefer, U. Staub, G. Petrakovskii, A. Amato
5	**ADP's: additional sources of information** S.C. Capelli, H.B. Bürg, M.A. Spackman
6	**Powder pattern decomposition with the aid of preferred orientation - use of whole Debye-Scherrer ring** R. Cerny
7	**Structure solution of a high-order decagonal approximant $Al_{71}Co_{14.5}Ni_{14.5}$ by maximum entropy Patterson deconvolution** M.A. Estermann, K. Lemster, W. Steurer, B. Gruskho
8*	**Temperature dependences of chemical structure and thermal motion of the hexaborides RB_6 (R=Ce, Ho)** P. Fischer, T. Herrmannsdörfer, L. Keller, V. Pomjakushin, O. Zaharko, A. Schenck, A. Dönni, Y. Nemoto, T. Goto, S. Kunii
9*	**Magnetic ordering and crystalline electric field splitting in $Nd_3Pd_{20}Si_6$** T. Herrmansdörfer, P. Fischer, L. Keller, E. Clementyev, A. Furrer, A. Dönni, S.Mango, B. van den Brandt, H. Kitazawa
10*	**Pressure and temperature dependence of the ordered magnetic U moment of USe** T. Herrmansdörfer, P. Fischer, T. Strässle, K. Mattenberger, O. Vogt, I. Goncharenko
11	**Mercury halides under pressure, phase diagrams full of surprises** M. Hostettler, D. Schwarzenbach, M. Bonin, H.P. Weber
12*	**Structural and magnetic properties of RFe_4P_{12} (R=Pr,Nd) studied by neutron diffraction** L. Keller, P. Fischer, T. Herrmansdörfer, A. Dönni, H. Sugawara, Y. Aoki, H. Sato
13*	**Magnetic order in $Cs_3Er_2I_9$, a recent dilution experiment on DMC** K. Krämer, H.U. Güdel, B. van den Brandt, P.Fischer, L. Keller, V. Pomjakushin, T. Hauß, A. Dönni, N. Wada
14*	**New control software for the KM6 six-circle Kappa-Goniometer** M. Meyer, A. Kowalski, D. Kucharczyk, W.A. Paciorek, G. Chapuis
15*	**Long scale phase separation versus homogeneous magnetic state in $(La_{1-y}Pr_y)_{0.7}$ $Ca_{0.3}$ MnO_3: a neutron diffraction study** V. Pomjakushin, A. Balagurov, D.V. Sheptyakov, V.L. Aksenov, P. Fischer, L. Keller, O. Gorbenko, A. Kaul, N. Babushkina
16	**Structural study of metal-hydrogen interactions in cubic PrH2+x and rare-earth analogues** G. Renaudin, P. Fischer, K. Yvon
17	**The incommensurately modulated structure of Quininium R-Mandelate described in superspace** A. Schönleber, G. Chapuis
18	**Anharmonic thermal motion of a rigid mulecule** D. Schwarzenbach
19	**Texture as a tool for structure determination from powder diffraction data** T. Wessels, C. Bärlocher, L.B. McCusker
20	**LiB_x - An incommensurate composite structure at low temperatures** M. Wörle, R. Nesper, T. Chatterji

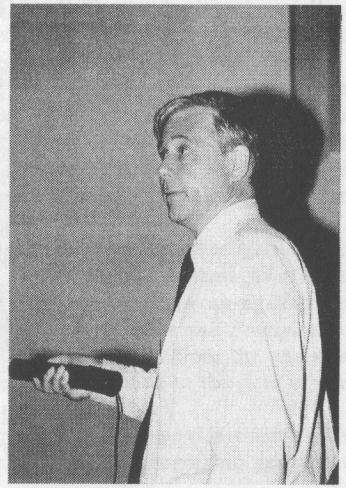
* - neutron scattering contributions

Please have a look at the full abstracts on the Web :
http://crystsun1.unige.ch/SSC_meeting/ssc_meeting_PSI00/PosterAbstracts.htm

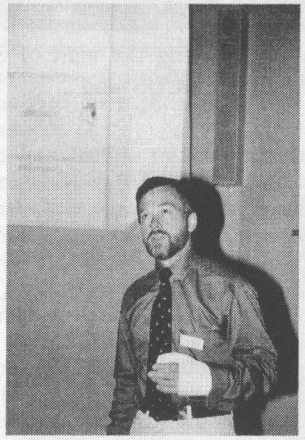
Photo Gallery



PSI director M.K. Eberle encouraged the audience with the good prospects of neutron scattering at SINQ



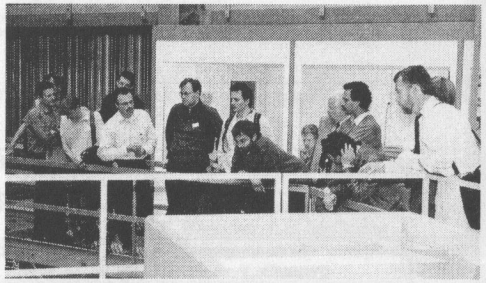
ILL's vice director C. Vettier during his talk on 'Neutrons and x-rays for Magnetism'



G. Eckold, Göttingen, talking about 'Inelastic Neutron Scattering'

The old and the new chairman (K. Yvon, P. Schurtenberger) discussing the future of the SGN during the coffe break...

'Exchange Interaction' during the visit of SINQ: Peter Fischer explaining 'FOCUS' and ...



... Stefan Janssen talking about 'HRPT' .

8th PSI Summer School in Zuoz

Felix Altorfer, Villigen

For the eighth time scientists from around the world interested in neutron scattering convened in the town of Zuoz in the Engadin to attend the PSI Summer School from August 5 – 11, 2000. *Neutron Scattering in Novel Materials* was the title of the meeting subdivided into sessions on materials science, biology and soft condensed matter, surfaces and interfaces, rare-earth compounds, magnetic excitations and finally superconductivity.

86 attendants from universities and national research institutes from 16 countries followed the talks closely and contributed to animated discussions. Once again, many young scientists participated at the summer school and the quality of their works could be seen during a lively poster session inside the venerable walls of the Lyceum Alpinum.

The scientific programme of the school started with a general introduction to neutron scattering given by J. Schefer (PSI). E. H. Lehmann (PSI) described the state of the art in neutron radiography and tried to extrapolate to future developments. The tour from neutron radiography to neutron tomography was covered by B. Schillinger (TU Munich) when he laid emphasis on the importance of neutron beam design for high quality neutron tomographic images.

The important contribution of neutron powder diffraction to the investigation of new materials was explained by A. W. Hewat (ILL, Grenoble). The advantages of neutron scattering for investigation of microstructural changes caused by aging, fatigue or corrosion was shown in M. Grosse's (PSI) talk on *Texture, Strain and Precipitates*. B. Schönfeld (ETH Zurich) made clear that a lot can be learned from the analysis of *Scattering between Bragg Peaks* when he gave an introduction to the field of elastic diffuse scattering experiments.

The interest shifted then to optically active materials when R. Rupp (University Vienna) described his experiments where neutron diffraction from holographic gratings was studied.

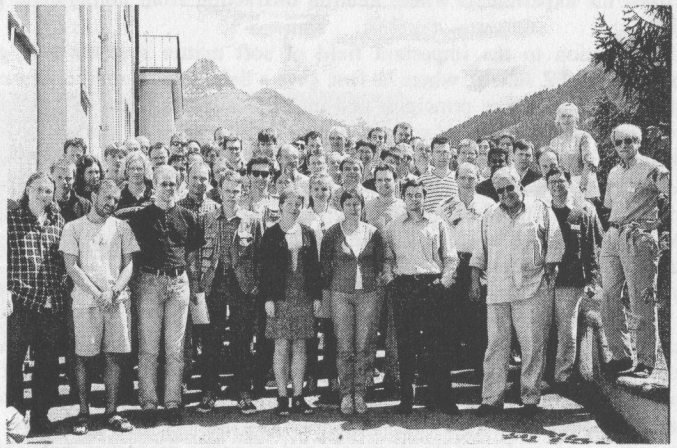
An introduction to the important field of soft matter systems was given by M. Monkenbusch (FZ Jülich), where he first gave a definition of soft condensed matter and went on to describe the principles and interaction that govern the soft matter world. Anyone interested in *SANS of polymer networks* gathered in the auditorium to listen to W. Pyckhout-Hintzen's talk on this topic. A. Arbe followed with a nice talk on *The dynamics of polymer systems* in which she described the intriguing dynamical complexity of glass forming systems. The wide range of neutron scattering was again demonstrated when H. D. Middendorf gave a well received talk on the *Biomolecular dynamics by neutron scattering* for non-specialists.

Although his mind was - at least partly - differently engaged (he became father for the first time during the school) D. Clemens (PSI) could focus his thoughts on physics and described the technique and applications of neutron reflectometry. The dynamic field of nanocrystalline materials was highlighted by W. Wagner (PSI) who demonstrated that properties of nanocrystalline materials can differ quite considerably from their coarse grained counterparts.

Rare earth compounds and its electronic and magnetic properties were then discussed, first introduced by R. J. Radwanski and then followed by L. Keller's (PSI) talk on

Magnetic ordering phenomena in rare earth compounds. A lot can be learned from the analysis of crystal field excitation levels, as A. Mirmelstein (IMP Ekaterinenburg) was able to demonstrate.
Magnetic excitations needed several talks to be satisfactorily covered: B. Roessli (PSI) gave an overview on magnetic excitations and neutron scattering and discussed the impact of longitudinal fluctuations as well as the importance of experiments using polarization analysis. If you wished to know what one could learn from *Triplet excitations in a family of S=1/2 unconventional antiferromagnets*, N. Cavadini (PSI) was most happy to oblige the audience when he talked on the properties of $KCuCl_3$ and $TlCuCl_3$ systems. The possible connection between magnetic and electronic excitations measured in the high-temperature superconductors was discussed by J. Mesot (PSI). He strayed off the neutron scattering path presenting also data measured by angle resolved photoemission.
P. Bourges (Saclay) described the Cu spin dynamics in cuprates and its relation to superconductivity and S. L. Lee (University St. Andrews) talked on the behavior of vortices in mixed state type II superconductors.
Last, but not least: *Superfluid ^{4}Helium – A very novel material* a contribution given by M. A. Adams closed this year's school. During his talk he commented on the importance of ^{4}He as a test-bed for weekly interacting Bose liquids and discussed the experimental problems carrying out neutron inelastic scattering studies.
A successful new topic was established by four different problem classes with exercises and examples. Here the participants could go even more deeply into the subjects that were covered during the school.

Universal praise earned the flawless organization, no wonder, since W. Fischer (PSI) and A. Furrer (ETH Zurich) took care of the scientific aspects and always optimistic conference secretary R. Bercher tackled all administrative problems successfully again.
We are all looking forward to the 9th PSI Summer School in Zuoz that will take place after a break in 2001 in August 2002.



The participants of the 2000 PSI summer school on neutron scattering in Zuoz.

Announcements

OSIRIS, RAL, Oxford, UK
The PSI supplied major components for the backscattering spectrometer OSIRIS at the spallation source ISIS. The PSI contribution will be recognised by usage of the OSIRIS beam time in proportion to the investment during the commissioning phase. The speciality of OSIRIS is - in contrast to its sister instrument IRIS - the full polarisation analysis option. OSIRIS will be ready for user operation in spring 2001. Interested scientists are encouraged to submit proposals for OSIRIS beamtime at the forthcoming calls up to the end of 2003 (when the agreement between PSI and RAL will expire). It should also be mentioned that IRIS has recently been upgraded (enlargement of the analyzer bank by a factor of 3) and is now an even more powerful instrument.
Experience on IRIS and OSIRIS will be essential to make full use of the backscattering spectrometer MARS which will be operational at SINQ in 2003.

A. Furrer, Villigen

New Members of the SGN/SSDN
Since the publication of the recent SNN issue 17 (June 00) we cordially welcome two new members of our society, namely

- Anna Stradner, University of Fribourg (CH)
- Christian Beck, University of Saarbrücken (D)

Presently the SGN/SSDN has 199 members.

Reminder

Next deadline for submission of SINQ proposals	:	**15.4.2001**
deadline for submission of ICNS 2001 abstracts	:	**30.3.2001**

A closer look at the sol-gel transition in colloidal suspensions - combining SANS and light scattering

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Aggregation and gelation in complex fluids has been a field of intense research for a long time, where both fundamental as well as applied questions are equally important. Applications of gels and sol-gel processing include such different areas as ceramics processing, cosmetics and consumer products, food technology, to name only a few. Starting from a solution of subunits (monomers), the system is then destabilized, which leads to aggregation, cluster formation and gelation. At the gel point a liquid-solid transition is observed which can be characterized by the appearance of a strongly increasing storage modulus in rheological measurements. Despite the randomness and the complexity of the sol-gel transition, it has always attracted fundamental researchers due to the unique features of gels and the strong similarities between very different gels. The sol-gel transition displays a very rich behavior of different physical properties that can be characterized by distinct scaling laws [1].

Most of the fundamental research has been carried out on the macroscopic properties of gels, e.g. their viscoelastic behavior. However, it is much more difficult to access information about the microstructural properties and furthermore link them to the macroscopic properties of the gel. In this respect colloidal gels are ideal model systems since their building blocks can be very well defined (monodisperse spheres), and they are of convenient size which allows the application of modern scattering techniques. Nevertheless it remains a challenge to link the microscopic systems properties, as determined by scattering techniques, to the macroscopic vsicoelastic properties as obtained from rheology. New developments both in light scattering techniques and in theory may for the first time now allow to bridge this gap even for very concentrated and turbid systems [2-6].

The coagulation of charge stabilized concentrated latex dispersions with volume fractions typically in the range of $0.1 \leq \Phi \leq 0.4$ is induced through an increase of the ionic strength or by a change of pH towards the so-called isoelectric point (IEP) of the particles where they become neutral (see figure 1) [7]. The onset of aggregation, the subsequent sol-gel transition and evolution of the gel is then followed in-situ by means of scattering

experiments. As we address particularly the high concentration regime where classical techniques such as static and dynamic (single) light scattering fail, we have to use other approaches. The combination of SANS with a modern multiple light scattering technique - Diffusing Wave Spectroscopy (DWS) - is of particular use in this high concentration regime. DWS is a powerful tool to obtain information about the local dynamical properties [2,3]. SANS on the other hand gives access to structural properties of dilute and concentrated systems on similar length scales.

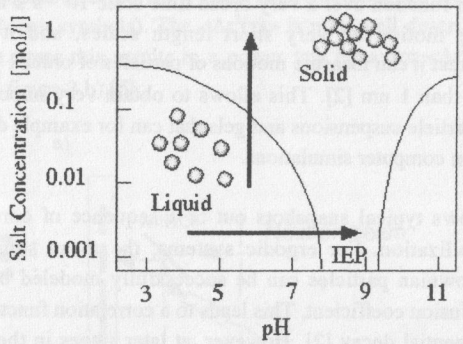

Figure 1: Schematic representation of the two different pathes in the destabilization of charge-stabilized amphoteric particles that lead to aggregation and gel formation.

a) b)

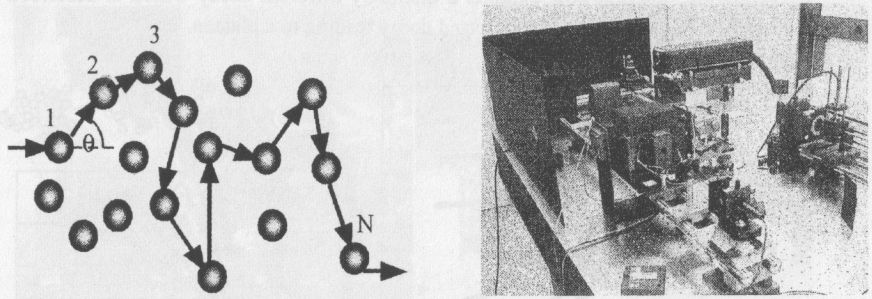

Figure 2: A schematic representation of a DWS experiment in transmission geometry (a) and an actual DWS spectrometer (b) are shown.

In DWS, coherent laser light impinges on one side of a very turbid sample, and the intensity fluctuations of the light transmitted through the sample are then analyzed (for a schematic view and a photograph of a spectrometer see fig. 2). DWS works in the limit of

very strong multiple scattering, where a diffusion model can be used in order to describe the propagation of the light across the sample [2]. Using such a diffusion approximation, one can then determine the distribution of scattering paths and calculate the temporal autocorrelation of the intensity fluctuations analogous to a classical photon correlation experiment. While DWS does not yield explicit information on the q-dependence of the so-called dynamic structure factor S(q,t), it is capable in providing unique information on particle motion. It is in fact possible to quantitatively determine the average mean-square displacement of the scattering particles $\langle \Delta r^2(t) \rangle$ from the measured intensity autocorrelation function over a very broad time scale 10^{-6} s ≤ t ≤ 10^4 s. DWS can thus probe particle motion on very short length scales, and it has for example been demonstrated that it can measure motions of particles of order 1 μm in diameter on length scales of less than 1 nm [2]. This allows to obtain very important information on the dynamics of particle suspensions and gels that can for example directly be compared with the results from computer simulations.

Figure 3a shows typical snapshots out of a sequence of correlation functions g(τ)-1 during destabilization. For ergodic systems, the mean square displacement of the correlated Brownian particles can be successfully modeled by means of an averaged short-time diffusion coefficient. This leads to a correlation function well approximated by a single exponential decay [2]. However, at later stages in the aggregation process the clusters fill the entire sample volume and gelation occurs. Because of the high volume fraction the network is very stiff, and as a consequence the trapped particles can only execute limited, very slow motions about their fixed averaged positions. After about 10 days the gel changes only very little and we take that time as the terminal state. The correlation function now exhibits a distinctly different decay which is described by a stretched exponential with an arrested decay leading to a plateau.

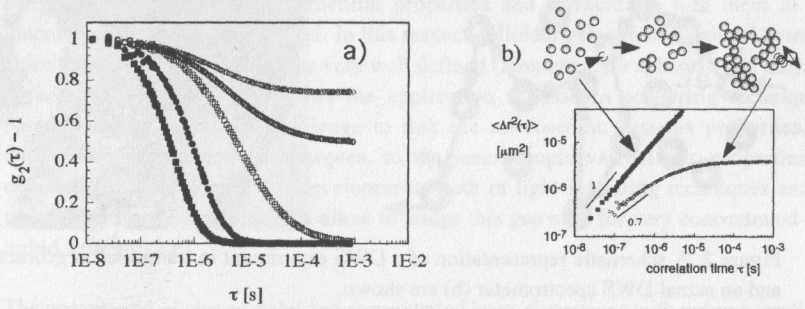

Figure 3: A series of intensity autocorrelation functions (solid symbols: suspensions; open symbols: gels) from a DWS experiment during a sol-gel transition (a) and two of the resulting mean square displacements in the sol and the gel phase, respectively (b).

This dramatic change in the local particle dynamics becomes even more clearly visible when looking at the time dependence of the corresponding mean square displacement $\langle \Delta r^2(t) \rangle$. The particle dynamics in the initial stable suspension as well as in the aggregating suspensions prior to the gel point (solid symbols) exhibit the typical characteristics of free particle diffusion due to Brownian motion. This is reflected by an almost exponential decay of the correlation functions and leads to a linear dependence of $\langle \Delta r^2(\tau) \rangle$ on time (figure 3 b). However, at the gel point a quite dramatic change in the particle dynamics occurs, and the short time behavior changes from Brownian to a subdiffusive motion (open symbols). The $\langle \Delta r^2(\tau) \rangle$ is now well described by a stretched exponential. At short times this results in a power law behavior $\langle \Delta r^2(\tau) \rangle \sim \tau^p$ with an exponent $p \approx 0.7$ (see figure 3 b) [5].

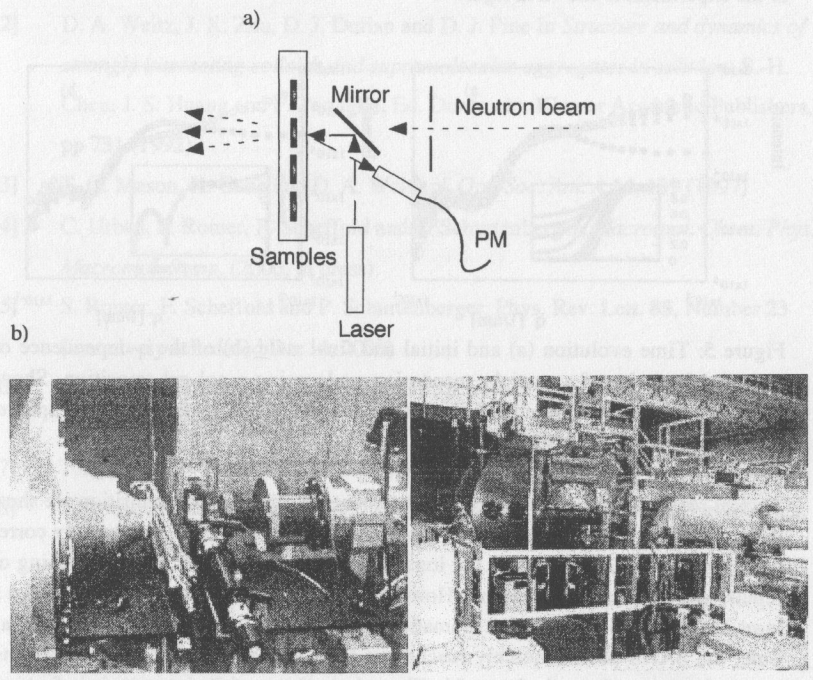

Figure 4: Schematic (a) and photographic (b) view of the combined SANS-DWS experiment at the PSI.

A comparison between time-resolved rheological measurements and the DWS experiments demonstrates that the qualitative change in microscopic particle dynamics

indeed coincides with a dramatic change in the macroscopic viscoelastic properties of the samples at the gel point. We observe a steep increase of G', indicating the transition from a sol to a gel, at the same time where the exponent p drops from 1 to about 0.7 [5,8].The combination of DWS and rheological measurements thus demonstrate that at the sol-gel transition a dramatic change of the local dynamic behavior of the particles occurs which is directly related to the build-up of solid-like elastic properties. However, both types of experiments do not provide any information on the corresponding changes in the microstructure that would be important in any attempt to better understand this important ergodic-nonergodic transition. Therefore we have designed a combined SANS-DWS experiment at the SANS instrument of the SINQ which allows us for the first time to simultaneously measure both the local dynamics as well as the microstructure as the aggregation and gelation proceeds. A schematic representation as well as a close-up view of the experiment is shown in figure 4.

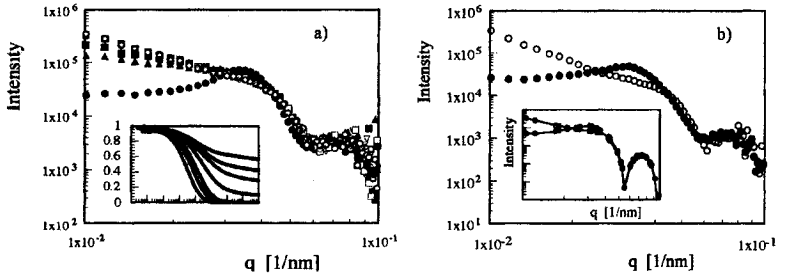

Figure 5: Time evolution (a) and initial and final state (b) of the q-dependence of the scattered intensity of a particle suspension undergoing a sol-gel transition. Shown as insets are the corresponding DWS results (a) and MC simulations of hard sphere and attractive particle suspensions (b).

Typical results from time resolved measurements during a sol-gel transition are shown in figure 5 a. We see that the structure factor peak which is typical for strongly correlated particles disappears as soon as the ionic strength increases due to the screening of the repulsive electrostatic interactions. However, while the DWS measurements shown as an inset in figure 5 a) indicate that dramatic changes in the local dynamics occur for a long time, the SANS pattern quickly reaches its final appearance. This corresponds to the terminal gel state shown in figure 5 b. The q-dependence of the intensity is in fact in quite good agreement with the structures found in Monte Carlo simulations of colloidal suspensions with attractive particles (see inset of figure 5 b). Our experiments thus indicate that a fluid-like structure is arrested in the course of the gel formation. There is in fact very recent theoretical work where a close analogy between glasses and gels formed by attractive particles was pointed out. This is a completely new approach to the

understanding of this very interesting class of nanostructured materials which we can now start to investigate using the experimental infrastructure at SINQ.

These preliminary experiments clearly demonstrate that this in-situ combination of methods, which is currently possible at the PSI only, provides us with unique information on the local dynamics and structure of the suspensions and gels. It shows that the Swiss neutron source offers unique opportunities for novel experiments.

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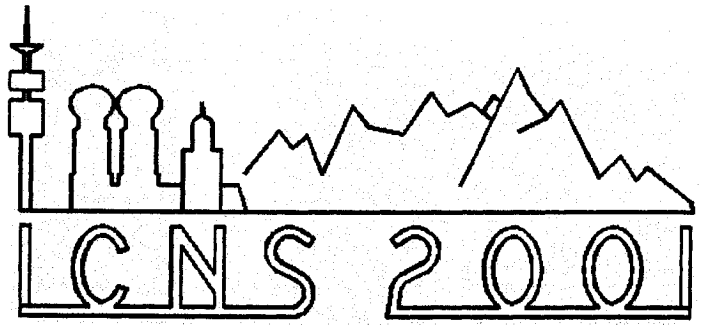
Conferences 2001

date	place	topic
07.01.-11.01.	San Antonio	8th Joint MMM-Intermag Conf. http://www.magnetism.org
25.01.-27.01.	Grenoble	Protons in Proteins, Biological Appl. of Neutron Diffraction http://193.193.43.3/Events/protons_contact.html
19.02.-21.02.	Jülich, Aachen	Dt. Neutronenstreutagung 2001 http://www.kfa-juelich.de/iff/termine /DN-J2001/
24.06.-29.06.	Aachen	Magnetic Multilayers (MML 2001) hartmut.zabel@ruhr-uni-bochum.de
24.06.-30.06.	Moscow, St. Petersburg	High-T_c Superconductors and Novel Inorganic Materials Roms@icr.chem.msu.ru
01.07.-04.07.	Lyon	Dynamical Processes in Excited States of Solids http://pcml.univ-lyon1.fr/DPC01/welcome.html
28.08.-01.09.	Grenoble	JEMS'01 (Joint European Magnetic Symposia) http://www.polycnrs-gre.fr/JEMS01/
09.09.-13.09.	Munic	ICNS 2001 http://www.icns2001.de
16.09.-20.09.	Kerkrade	Dynamical Properties of Solids DYPROSO XXVIII http://www.fz-juelich.de/oea/termine.html
September	Brazil	Rare Earth's - 2001 http://www.iq.usp.br/geral/congress.html
04.11.-09.11.	Hayama, Japan	Actinides-2001 http://act2001.tokai.jaeri.go.jp/



International Conference on Neutron Scattering

München, 9.-13. September 2001

Technische Universität München

Honorary Chairman

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EXPERIMENT REQUEST

Proposal number

[ ] **Short term proposal (next allocation period)** [ ] **Long term proposal (2 years)**

Proposer *(to whom correspondence will be addressed)*
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Fax:
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Co-proposer:
Name: Address: *(if different from above)* Phone/Fax/Email:

Sample description

Substance and formula:

Mass: Size:

[ ] Polycrystalline [ ] Single crystal [ ] Multilayer [ ] Liquid [ ] Gas

Sample Container: Space group: Unit cell: a= b= c=

Hazard

Is there any danger associated with the sample or sample environment?
[ ] No [ ] Yes [ ] Uncertain If yes or uncertain, please give details of the risks associated:

Experimental details

Instrument	**Days**	**Sample cond.:** Temp., Pressure, Magn. field	**Exp. cond.:** E, ΔE, λ, Δλ, Q, ΔQ

[ ] **New proposal** [ ] **Continuation of.....** [ ] **Resubmission of.....**

Requested dates:	**Unacceptable dates:**

Title of Experiment:

Research funded by:

Scientific background/Aim of experiment: *(Please restrict to the space given within this box!)*

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