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Photography by:

G. Admans, C. Argoud,
E. Boller, B. Denis (Art Photos).

APPOINTMENT OF A NEW DIRECTOR GENERAL

The ESRF Council has opened the selection for the appointment of a new Director General of the ESRF to come into office in January 2001. As a first step the eight delegations to the ESRF Council are invited to nominate candidates. People interested in contributing to this phase, for example by suggesting candidates, may contact one of the Heads of Delegations listed hereunder, by **30 April 1999**:

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ESRF USERS' MEETING

11 February 1999

The history books show that this was the ninth meeting of ESRF users, although the first few took place at times when there was little to use, but lots to talk about. Now there are so many results that a one day meeting can do little more than highlight a few areas and offer a market place for the vast majority to display their results on posters for all to see.

This year 474 people registered for the meeting which is a record, or near record. They were doubtless drawn to Grenoble by the associated workshop program which is described hereafter. Suffice it to say that the three workshops were all over-subscribed and the auditoria were full to their legal capacity. Of course we hoped that many would also be drawn by the opportunity to refine their beam time applications with just a fortnight to go before the submission deadline. We also suspected that several would be tempted to take to the hills at the earliest opportunity. Whatever the reason they all came and Mother Nature took a hand in deciding to confine us all to Grenoble by dumping an unreasonably large amount of snow on top of the meeting!

The meeting began with reports from the ESRF Directors covering the operation of the machine (good and getting better), the completion of beamlines (almost done), the competition for beam time (higher ever higher) and some examples of the scientific activity (where is that Nobel Prize?).

The first of the highlight talks was given by J. Laissue (Berne) on the micro-beam-therapy pre-clinical studies on ID17. Both W. Thomlinson, who introduced the talk and J. Laissue paid tribute to P. Spanne whose death in the Swissair crash was a tragic loss to the Medical Beamline. The very encouraging results for the «sparing» of benign tissue obtained with the use of a microslit/multislit collimator were described.

After coffee the focus moved to the work of the Scientific Advisory Committee (SAC) which advises the ESRF Council. R. Fourme, the SAC Chairman, discussed its work and described its guiding role in the facility's development. He ended with

some thoughtful points about the iniquities of short-term contracts for young scientists on whose unstinting efforts institutions like ESRF rely. We reported on the users' perception of ESRF as revealed by questionnaires, floor tours etc. and were happy to confirm that there are few complaints and plenty of compliments. W. Schulke (Dortmund) then described the selection process for the Young Scientist Award and announced the winner: Peter Cloetens who works on the topography beamline. Peter came to Grenoble in 1994 after graduating in engineering from the Vrije Universiteit Brussels. During experiments on BM5 he observed that objects with negligible absorption can be imaged in a monochromatic beam and over the following three years he explored this phenomenon both experimentally and theoretically and exploited it to study a number of problems in materials science as well as developing, with an Italian team, a wave guide to produce a submicron coherent divergent source and hence the first magnified phase contrast images. Peter received the award (5,000 French Francs - next year 762 Euros?) and gave an excellent account of his work.

The afternoon's highlights came from physics, biology and chemistry. Firstly L. Paolasini (ESRF) described the heroic resonant scattering experiments carried out at ID20 which provide the first direct evidence for orbital ordering in addition to the

more familiar magnetic ordering in $(V_xCr_{1-x})_2O_3$. He made light work of describing this truly complex piece of physics despite a power cut to the overhead projectors! The true extent of his work was revealed by an innocent question about getting «more data». L. Paolasini calmly explained just how much sweat and tears were involved in putting those vital few points on the curve!

E. Garcin (IBS, Grenoble) then described the characterization of metal sites in hydrogenases using anomalous dispersion methods on BM14 and BM2. These materials are the metalloenzymes that are involved in hydrogen biocatalysis: they are «vital» materials. The beautiful experiments she described were able to pinpoint all the metal sites and their ligands.

The final highlight talk was given by a physicist - E. Isaacs (Lucent Technologies New York) talking about chemistry: the covalency of the hydrogen bond in ice, which was first discussed by Pauling. The experiment that at last validated this concept was incoherent Compton scattering, rather than coherent diffraction. The study was carried out at ID15 and E. Isaacs showed how a simple analysis of the broadened Compton profile provided evidence - the first direct evidence - for substantial covalent character to the bond.

The session at Atria continued with a well-attended poster session that amply filled the space and time

*P. Cloetens
receiving the
Young
Scientist
Award from
W. Schulke.*





... ESRF USERS' MEETING

available. Indeed at the end of the afternoon it was difficult to persuade everyone to brave the snow and drift back to the ESRF. Over 300 managed this in time to partake in an excellent dinner. Those of us who had been involved in choosing the food and the wines made every attempt to ensure that all our choices were excellent and indeed they were!

On behalf of the Organizing Committee I would like to thank everyone for their help in making this such a successful meeting. Especial thanks are due to the speakers who clearly had made an effort to tailor their talks to the «SR family» audience and to the ESRF staff who helped to ensure that everything went smoothly. The User

Office staff, who bear the brunt of the organization were devastated by flu in the two previous weeks, nonetheless they worked so hard that you would have never known it. Thank you.

Now what do we do to make next year even better? It will be our 10th so it must be special. What ideas do you have? The date will be Thursday 10 February 2000, by which time you will have recovered from millennium parties and millennium bugs. Suggestions for workshops, prayers for a little less snow and inoculations against flu should start now.

M. Cooper,
on behalf of the ESRF
Users Organization



M. Cooper

MATERIALS SCIENCE AT THIRD GENERATION SYNCHROTRON RADIATION FACILITIES

12 February 1999

A workshop entitled "Materials Science at Third Generation Synchrotron Radiation Facilities" was organized by P. Withers, Univ. of Manchester and Å. Kvick, ESRF, on 12 February after the ESRF Users' Meeting. The Director General Y. Petroff opened the meeting, which featured 13 invited speakers and a poster session. Various aspects of stress and strain measurements were covered by P. J. Webster, A. Pyzalla, W. Jark, O. Castelnau, I. C. Noyan and U. Pietsch. H. Poulsen described a new 3-DXRD microscope implemented at ID11 for materials science characterization. *In situ* studies of nucleation and transformations in polyethylenes and metallic glasses were discussed by S. Rastogi and

A. Yavari. Time-resolved studies of self-propagating high-temperature synthesis and functional materials were presented by M. A. Rodriguez and P. Barnes. B. Salbu showed how radionuclides released by nuclear accidents could be traced by a combination of synchrotron radiation micro-beam techniques and electron microscopy. M. Drakopoulos explained how coherent illumination could be used to study micro-electronics structures. The workshop was concluded by a very active poster session featuring in excess of 30 posters. The workshop was very well received and the attendance was between 120 and 150 participants.

Å. Kvick

FRONTIERS IN SAXS AND SANS - 99

12/13 February 1999

Small-angle scattering is a well-established technique to characterize structures ranging from nanoscopic (1 nm) to microscopic (a few microns) scales. A combination of small-angle x-ray scattering (SAXS) and small-angle neutron scattering (SANS) provides complementary (contrast) structural information in a myriad of systems belonging to hard, soft as well as biological matter. On Friday 12 and Saturday 13 February, a common ESRF-ILL-CEA workshop was held at the ILL organized by T. Zemb (CEA-Saclay), B. Deme (ILL), O. Diat (CEA, Grenoble) and T. Narayanan (ESRF). The purpose of this workshop was to provide a comprehensive overview of the state-of-the-art instruments existing at the ESRF and ILL to the current and prospective users.

The workshop comprised seven oral sessions, one poster session, and visits to the beamlines/instruments. In the first session, the beamline/instrument scientists presented the current status of the respective stations/instruments. The following five sessions were primarily dedicated to discuss the present limits in spatial and time resolutions. These sessions covered many of the recent developments in optics, detectors, and sample environments, and stressed the need for further improvements. The closing session demonstrated the power of small-angle scattering as applied to two different situations involving, one protein solutions and the other solid polymers.

About 120 researchers (including the invited speakers) from France, Germany, UK, Italy, Spain, Netherlands, Sweden, Finland, and Austria participated in this workshop. The workshop further emphasized the usefulness of bringing both the x-ray and neutron communities together for joint endeavors.

T. Zemb



WORKSHOP ON X-RAY MAGNETIC CIRCULAR DICHOISM

12/13 February 1999



XMCD99 turned out to be a very lively gathering, attended by about 100 scientists, a good part of the world's small x-ray magneto-optical community. XMCD stands for X-ray Magnetic Circular Dichroism, the effect in which the x-ray «colour» (~ absorption coefficient) changes under inversion of the handedness of the circular polarization of the x-rays. It has a linearly polarized counterpart and, since the recent work at ESRF, also a «natural», or non-magnetic one. X-ray dichroism occurs also in derived spectroscopies, such as photoemission and x-ray scattering. In all cases it is especially strong at absorption resonances.

X-ray dichroic effects have been studied for the last 12 years, but XMCD99 illustrated that the field is still on the steep part of the learning curve, with an explosion of the use of the fundamental effect in many different directions. The organizers intended to focus the workshop on the so-called XMCD sum rules, a theoretical result that promises the separate measurement of the spin and the orbital parts of the magnetic moment. Since the orbital moment plays a key role in determining the magnetic anisotropy, which in turn defines the magnetic hardness, these rules are in principle extremely useful for magnetic research. However, there have been far more theory papers than experimental papers on

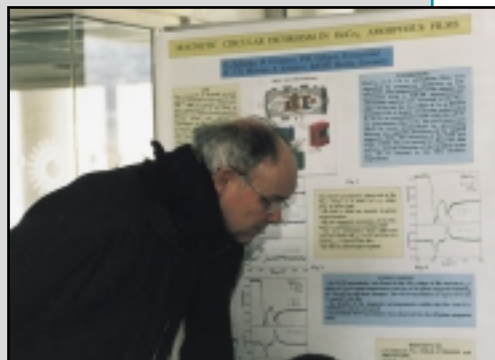
the subject, due to the difficulty of the experiment, which is very difficult without third-generation sources of polarized x-rays.

Indeed, also at XMCD99 new theoretical sum rules were presented, giving an even more precise direct link between linear dichroism and magnetic anisotropy, as well as sum rules for the newly discovered natural dichroism and for magnetic EXAFS. In addition several experiments gave beautiful illustrations of the use of sum rules in «real world» magnets such as $\text{Nd}_2\text{Fe}_{14}\text{B}$, magnetic multilayers and thin films, and Invar systems under high pressure. A new theme that could be picked from these talks is the intimate connection between the orbital moment, anisotropy and tetragonal distortions from octahedral symmetry.

The most fascinating aspect of the workshop was, however, that it showed the proliferation of the use of X-ray Magnetic Dichroism to obtain magnetic contrast. The talks on imaging and scattering showed convincingly how magnetic domain structures and magnetic roughness can be measured at scales of 50-1500 Å, not only in but also below the surfaces of magnetic thin films. The American input in this respect showed the power of these techniques to characterize magneto-electronical devices such as spin valves and the new non-volatile Magnetic Random

Access Memory (MRAM).

Another completely new direction is the use of the bunch structure of ESRF to study the magnetic relaxation of such thin film structures after a synchronous magnetic pulse excites them.



Together, all these developments show that the field is very much alive, and the general feeling was that it will be worthwhile to continue with XD2000, a broader name to do justice to the diversity of subjects. The organizers of the '99 version would not be afraid at all of doing the job again, thanks to the incredibly professional support that they obtained from the ESRF staff, the User Office, and in particular F. Mengoni (Theory Group), who made organizing it a great pleasure.

J. Goedkoop

For the program and abstracts, see <http://www.esrf.fr/conferences/XMCD99/>





BIOXAS WORKSHOP

15/16 February 1999

A workshop on X-ray Absorption Spectroscopy for Biology using a third generation source was held at the ESRF on 15 and 16 February 1999. Speakers and participants from Europe and the United States gave a statement of the current developments in the field. New possibilities, but also problems associated with the investigation of biological samples using X-ray Absorption Spectroscopy

(XAS) using the high flux of 3rd generation synchrotron sources, and the complementary use of different techniques were discussed during the workshop organized by the EXAFS Group (A. Solé, S. Pascarelli, M. Borowski and J. Goulon) and P. Lindley.

The interest of the scientific community is underlined by the November report of the European

Science Foundation (ESF) concerning the needs of the bio-science community with respect to synchrotron radiation sources. The participants decided to organize meetings on a regular basis (the next one taking place in Paris, probably in spring next year) to promote the application of XAS in the field of biology and to coordinate the efforts done on a European level.

M. Borowski

From 21 February to 1 April 1999, the ninth session of the HERCULES course was attended by 78 participants (out of 133 applicants). They were divided in two sessions:

- Session A: Neutron and synchrotron radiation for physics and chemistry of condensed matter .

- Session B: Neutron and synchrotron radiation for biomolecular structure and dynamics.

New lectures, devoted to the applications of neutron and synchrotron radiation techniques to the Physics of the Earth's interior and Environmental Sciences, have been introduced into the program of session A.

The program of session B was unchanged and corresponds to the contents of volume IV of the HERCULES series entitled «Structure and Dynamics of Biomolecules» (19 contributions) which should be published at the end of 1999 by Oxford University Press.

Next year, HERCULES 2000 will be the opportunity to celebrate the tenth anniversary of the course. It will be organized as usual with two parallel sessions A and B, from 27 February to 9 April 2000. A special program with a workshop devoted to recent developments and applications of neutron and synchrotron radiation will be organized at the end of the normal session for the past and present HERCULES participants. It is a significant measure of the impact of HERCULES that at the end of this 99 session about 650 scientists will have attended the course, out of about 1200 applicants since 1991.

REPORT FROM HERCULES 1999



HERCULES 2000

**HIGHER EUROPEAN RESEARCH COURSE
FOR USERS OF LARGE EXPERIMENTAL SYSTEMS**

Grenoble, 27 February – 9 April

Information:

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<http://www.polycnrs-gre.fr/hercules>

Workshop

«10 Years of HERCULES»

**for all HERCULES participants
devoted to recent developments and applications of
neutron and synchrotron radiation
Grenoble, 6 – 9 April 2000**

Deadline for application: 16 October 1999



EUROCONFERENCE AND NEA WORKSHOP ACTINIDE-XAS-98

During recent years the interest in applying synchrotron radiation techniques to the investigation of radionuclides and, in particular, actinides has grown rapidly. Important research topics, where a molecular-level understanding is mandatory, include the behavior of radionuclides in the environment, nuclear waste management, radiopharmaceutical chemistry, and general actinide chemistry and physics.

On 4-6 October 1998 the first Euroconference and NEA Workshop on Speciation, Techniques, and Facilities for Radioactive Materials at Synchrotron Light Sources, Actinide-XAS-98, took place at the ESRF/ILL site. Over 90 scientists came from 13 European countries, USA, and Japan. Among them were 22 young scientists with an average age of 26 who benefited from travel awards provided by the European Commission. The main objectives of Actinide-XAS-98 were:

- to introduce the type of information that can be obtained from synchrotron-based techniques to environmental and radionuclide scientists,
- to report the latest results on radionuclide/actinide work, and
- to inform on protocols which are in place for actinide research at several synchrotron storage rings throughout the world.

The first day had tutorial character and introduced several synchrotron radiation techniques. H. Nitsche described the sources of environmental contamination by radionuclides, the importance of understanding the chemical behavior of radionuclides under environmental conditions, and the role x-ray absorption fine-structure (XAFS) spectroscopy plays in these investigations. D. C. Koningsberger, J. Goulon, and A. Filipponi presented the physical principle of XAFS and related experimental and theoretical aspects. V. I. Nefedov gave an introduction to x-ray photoelectron spectroscopy (XPS). D. K. Shuh described the complementary application of XPS, near-edge x-ray absorption fine structure, and x-ray emission spectroscopy on actinide materials at energies below 2 keV. W. Matz and G. H. Lander gave tutorial



lectures on x-ray diffraction and the application of x-ray scattering to the magnetism of actinides, respectively. U. Wahlgren covered a different aspect related to XAFS studies, i.e. molecular modeling of actinide complexes in aqueous solutions.

Representatives of nearly all laboratories known world wide for using synchrotron radiation to study actinides reported on their latest results during the second day. Five invited and eleven contributed lectures and 22 poster presentations showed what sort of important structural, chemical, and physical information on technetium, uranium, neptunium, and plutonium samples can be obtained using synchrotron radiation. The majority of presentations were about XAFS studies on actinide complexes in solution, crystalline samples, and sorption of radionuclides on mineral surfaces. The discussion was focused both on basic and applied research, e.g., specially-resolved XAFS measurements of contaminated soil samples. Other speakers described investigations on actinides using XPS, x-ray magnetic circular dichroism, and x-ray tomography. Many of these results can be found in the proceedings of Actinide-XAS-98, which are being edited by N. M. Edelstein, T. Reich, and S. Sakurai and will appear as a Nuclear Energy Agency (NEA) publication in April 1999.

During the last day, participants heard short presentations about experimental stations available for actinide experiments at synchrotron light sources, their experimental

possibilities, and the procedures and regulations for safe handling of radioactive materials. These reports included the following synchrotron light sources: SSRL (P. G. Allen), ESRF (P. Berkvens), ROBL-CRG at ESRF (H. Funke), APS (L. Soderholm), Photon Factory and Spring-8 (S. Tachimori), LURE (C. Den Auwer), Daresbury Synchrotron Radiation Source (A. J. Dent), and ALS (D. K. Shuh). The conference concluded with a tour of several ESRF beamlines including ID20 (magnetic scattering), ID21 (x-ray microscopy), ID22 (x-ray fluorescence microprobe), and ID24 (dispersive EXAFS). Of special interest to many participants was the new Rossendorf Beamline (ROBL, BM20), which had just completed its first XAFS measurements of radioactive samples. The participants asked for detailed explanations of the radiochemistry safety system, the sample handling in the specially designed glove box, and the remote positioning of samples and detectors.

The conference organizers (N. M. Edelstein, C. Kunz, C. Madic, H. Nitsche, T. Reich, and S. Sakurai) thank the European Commission, OECD /NEA, ESRF, and FZR for financial support of the conference. Finally, I thank all those who contributed to making Actinide-XAS-98 a great event and an important step in the application of synchrotron radiation to radionuclide/actinide studies. It is not possible to name everyone here, but special thanks are due to M. Glückert for her invaluable help as conference secretary.

T. Reich



30TH COUNCIL MEETING

25 and 26 November 1998 in Grenoble

SCIENTIFIC MATTERS

The Council

- took note of the scientific program for the period 1999 to 2003 presented by the Management which, further to the enhancement of the radiation source and to technical developments on the chain "optics – sample handling – detectors – data handling", provides for some specific refurbishment measures such as the enhancement of materials sciences at ID11 by a further experimental station or the separation of beamlines ID12A and ID12B which presently share the same location. In addition the program addressed the development of a proper scientific life at the ESRF;
- noted the modifications of the CRG beamlines IF and FIP (construction of a second branch on FIP, dedicated to absorption spectroscopy in very dilute materials, in connection with environmental sciences and concentration of IF on surface science and interface studies) and of DUBBLE (replacement of the powder diffraction set-up by one to be used for protein crystallography) and authorized Management to implement the corresponding agreements with the CRGs involved;
- welcomed the continuation and development of the collaboration between the ESRF and the EMBL (European Molecular Biology Laboratory) and considered that the EMBL's wish for access to beam time (in recognition of its contribution)

might be dealt with in the framework of the block allocation of shifts for protein crystallography (see page 9). The Council was content that Management negotiate with the EMBL on this basis and that the results be submitted to the spring meetings of the Science Advisory Committee and the Council;

- agreed that a medium-term arrangement on the use of the ESRF be concluded with the Institute of Physics of the Czech Academy of Sciences;



- appointed a new Science Advisory Committee for the period 1999/2000 (see below).

FINANCIAL MATTERS

The Council

- approved the budget for 1999 as presented, i.e. providing for an expenditure of 428.5 million French francs and requiring Members' contribution of 400 MFF;
- took note of the Medium-Term Financial Estimates (1999-2003) presented by Management (which

however did not include any staffing or financial provision connected with the 35-hours legislation);

- noted 404 MFF (or about 61.2 million Euro) as the level of new contributions from Members to the budget for the year 2000.

INDUSTRIAL POLICY

The Council endorsed (with a minor amendment) the draft industrial policy presented by Management for further discussion by the Purchasing Committee and the Administrative and Finance Committee, and final approval by the Council. This policy describes the principal aims for links with industry and the means (sale of beam time, dedicated industrial beamlines, arrangements on transfer of know how and technology...). The Council agreed, on a temporary basis, that the income from the sale of beam time and other commercial activity be used along the lines incorporated in this draft policy.

DIRECTORATE

The Council adopted "Guidelines for selecting and appointing ESRF Directors" and noted a tentative schedule for selecting and appointing the Director General (from 2001 on), aiming at having the contract approved at the autumn 1999 meeting of the Council (see page 2).

K. Witte

NEW SCIENCE ADVISORY COMMITTEE

New members for the years 1999/2000

J. Bordas (Universitat Autònoma de Barcelona), **L. Braicovich** (Politecnico di Milano), **R. Fourme** (LURE), **H. Fuess** (Technische Hochschule Darmstadt), **P. Gillet** (ENS Lyon), **R. Hilgenfeld** (Institut für Molekulare Biotechnologie, Jena), **K. Hodgson** (SSRL, Stanford),

G. H. Lander (Institute for Transuranium Elements, Karlsruhe), **L. B. McCusker** (ETH Zürich), **S. Mobilio** (Laboratori Nazionali di Frascati), **H. Möhwald** (Max-Planck-Institut für Kolloid- und Grenzflächenforschung, Berlin), **T. Paakkari** (University of Helsinki), **D. Raoux** (CNRS, Grenoble), **T. Rayment** (Cambridge University),

G. C. Ruocco (Universita dell'Aquila), **B. Salbu** (Norges Landbrukshøgskole, Ås), **J. M. Sanz** (Universidad Autónoma de Madrid), **G. A. Sawatzky** (Rijksuniversiteit Groningen), **D. Stuart** (University of Oxford), **D. P. Woodruff** (University of Warwick), **G. Wortmann** (Universität GH Paderborn), **T. Zemb** (CEA Saclay).



LATEST BEAM TIME REQUESTS

A total of 644 applications were submitted for the September 1998 deadline for beam time between February and July 1999, for the 29 ESRF and 7 CRG beamlines that will be operating during this period. This is slightly lower than the number received in March 1998, the Block Allocation Group scheme (see below) accounting for a nominal drop by about 85 in the number of life sciences submissions.

Following the meetings of the Review Committees at the ESRF on 22 and 23 October 1998, 358 proposals were allocated beam time totalling 5153 shifts. Of these, two new long-term projects were accepted for a period of two years. Details of the applications and allocations, per committee, are summarized in Table 1. Considered overall, some 55.6% of proposals were successful this round, compared with an average of 48% over previous rounds.

Table 2 shows the number of shifts scheduled for user experiments compared with shifts requested, per scheduling period, since the beginning of user operation in September 1994. It should be noted that the second scheduling period each year to date has been slightly shorter than the first, so that there have been proportionately fewer shifts allocated and scheduled during the second half of each year.

Finally, interested readers are reminded that the next deadline for

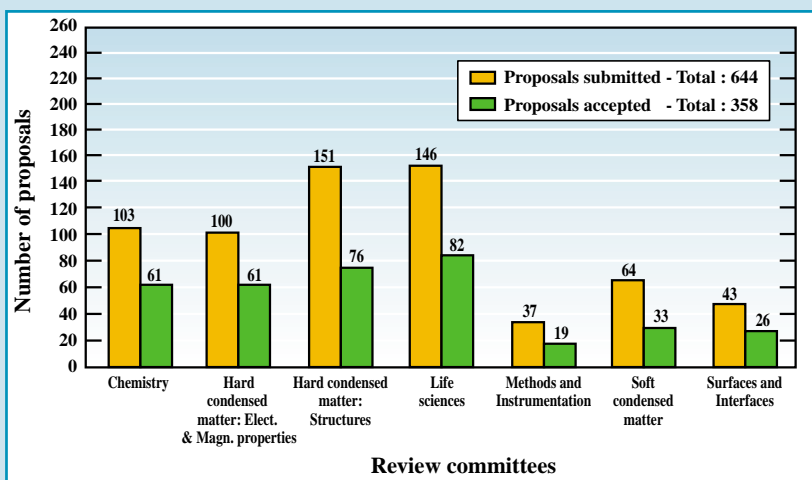


Table 1: Number of proposals and allocated beam time, per review committee, scheduling period 1999/I.

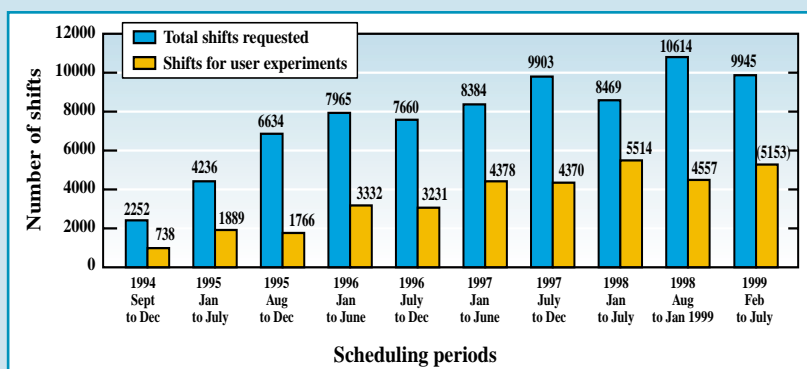


Table 2: Number of shifts of beam time requested and allocated, per scheduling period, 1994 to 1999/I.

proposals, for beam time between February and July 2000, is 1 September 1999. Further details can

be consulted on the Web at <http://www.esrf.fr>.

R. Mason

NEW MEASURES FOR THE LIFE SCIENCES USERS

In the area of life sciences, five beamlines will cater for macromolecular crystallography which constitutes the overwhelming majority of life sciences requests. These include four stations on the Quadriga beamline ID14, the MAD beamline BM14 to be transferred to ID29, ID2B where half the beam time is scheduled for macromolecular crystallography experiments and the new French CRG beamline BM30.

In parallel, measures have been taken to assist users in the area of macromolecular crystallography, and to streamline procedures. These have

been necessary in view of the dramatic increase in capacity, coupled with very rapid data collection times - frequently less than one shift - which are opening up opportunities for user groups, and at the same time placing unprecedented demands on the beamline and support staff. A possibility to test crystals prior to preparing a formal application for beam time was introduced recently. Such test experiments are fitted in between user experiments, or on buffer days, to ensure fast access. Beam time for each test is limited, normally to two hours at most. Further a Block Allocation scheme was introduced

during the second scheduling period in 1998 for macromolecular crystallography requests. A number of groups - Block Allocation Groups, or BAGs - throughout Europe, with a history of successful peer review were identified, and encouraged to group their requests for beam time. The scheduling of their beam time is also grouped, allowing these teams greater flexibility in the choice of projects and samples. At the same time, these BAGs are requested to nominate one to two persons who will be trained to provide additional help when these teams are taking beam time.