30th. Anniversary at ILL, Grenoble

Interview with the Director, Reinhard Scherm

Neither fanfare, nor party-balloons heralded the 30th. anniversary of ILL this January 1997. As with all *decadent* birthdays, marking off another decade passed precipitates both pangs of chagrin at the passage of time and justified pride at the coming of a certain age and, after a very successful face-lift, still going strong. So there were no flourishes, floral speeches and suchlike (which would have been out of character anyway), but a cool appraisal of past, present and future ambitions during the interview granted by ILL Director, Reinhard Scherm.

On the 19th. January 1967 the two countries France and Germany, represented by their respective ministers of research, signed the founding contract that established the Institut Max von Laue - Paul Langevin. The Franco-German ambition to create an intense source of neutrons began to take shape. The project had received the enthusiastic support of Professors Louis Néel (Nobel laureate) and Heinz Maier-Leibnitz, the latter becoming ILL's first Director. The Institut was officially launched in 1971 with the commissioning of the High Flux Reactor, followed within a year by the first experiments. In 1973, the United Kingdom joined the two founding members. Later, new partners reinforced the multinational character of the Institut: Spain arrived in 1987, followed by Switzerland in 1988, Austria in 1990, Russia in 1996 and Italy in 1997.

In 1991 a crack in a grid for smoothing the flow of water in the reactor caused shutdown; subsequent repair and renewal took four years. At this time the UK terminated its contract, negotiating for a new subscription rate lower than that paid by France and Germany. Previously each of the three partners had been equal in status and paid equal amounts (1/3 of the budget), but now UK was down to a quarter. In turn, France and Germany replied with small cuts in subscriptions and so the budget, from 1994 on, was smaller. Notwithstanding, the reactor was refurbished *without* any extra budgetary increase. The overall repair costs were 170 MFF, with the same amount again for personnel expenditure during this time. For scientific work the budget is ~300 MFF. But to keep abreast of the reduction in budget, within two years there was a reduction in personnel from 480 to 400.

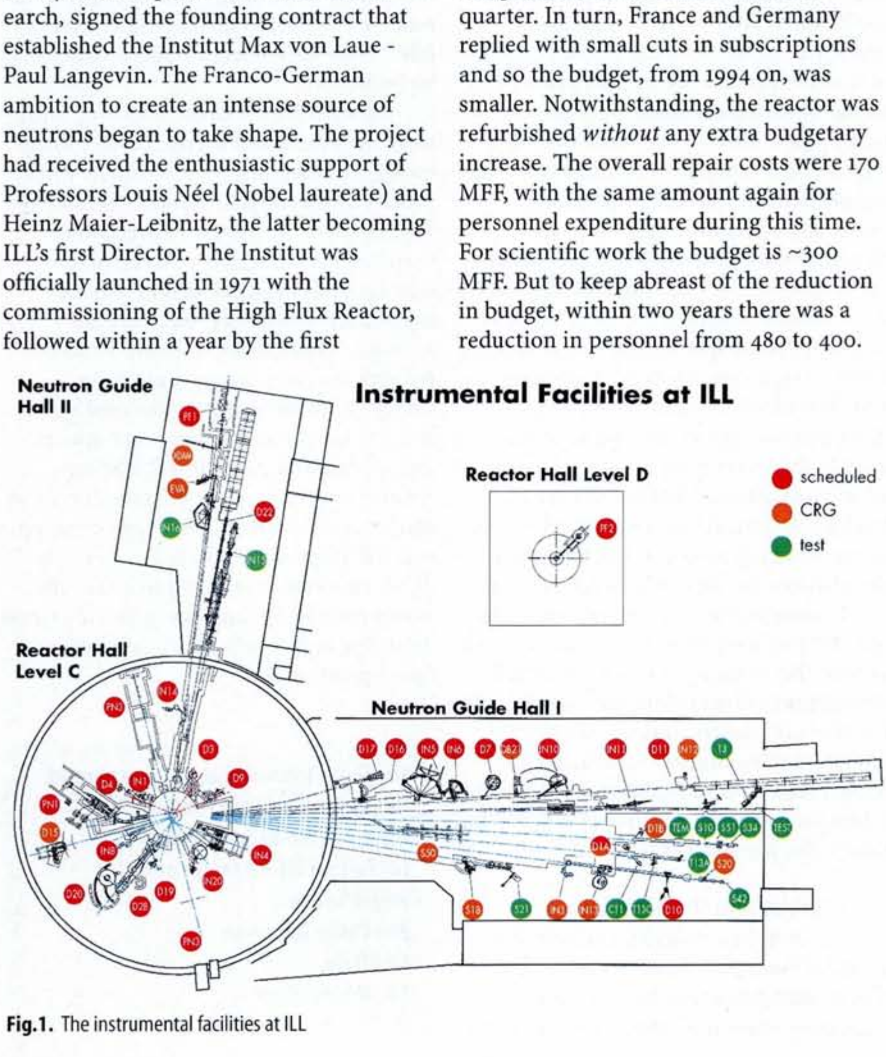

Fig.1. The instrumental facilities at ILL

In 1995 the "new" reactor (heavy water cooled and moderated) was once more in operation. On 3rd. January 1995 authorization to restart had been received, three days later the reactor went critical and by 7th. January it had reached full power. Users once again thronged to the scene, the beehive began to hum, experiments were happily underway and results were being discussed - a familiar picture, business as usual. In the interest of their own existence, personnel had been ready to sacrifice their private time by working extra shifts to cut up the old reactor and remove the waste, all within the 170 MFF budget limit.

The reactor now operates 4.5 cycles of 50 consecutive days a year. At the end of each cycle the spent fuel element is changed during a two-week shutdown. There is another, longer, annual shutdown to carry out maintenance work on the instruments and the reactor. Upon removal, the fuel element is stored for two years, after which time it is sent to La Hague. The end result is depositable waste, and non-proliferable uranium with only 1% enrichment.

ILL plays a leading rôle in the field of neutron research owing to the facilities it has built up around the reactor (Fig. 1). Some 35 instruments stimulate a cornucopia of research topics: the fields chemistry, biology, solid state physics, magnetism, nuclear and elementary particle physics, materials science, engineering are all represented. Neutrons, as electrically neutral particles, are able to pass through the outer electron shell of atoms and penetrate to the nucleus. Their magnetic moment enables them to detect the elementary magnets within magnetic material (Fig. 2). Further structural information is gained from polarized neutrons which can change orientation when probing matter. Of course, the wave-particle duality principle applies, and since the wavelengths of neutrons vary with the temperature of the moderator, a further very useful property can be utilized: that of adapting the probe to the sample. With the neutron spectrum moderated by liquid D_2, ILL possesses two cold neutron sources. For instance, hot neutrons (short wavelength) are used to investigate short distances, whilst cold neutrons (long wavelength) are used to study large molecules and atom clusters. Naturally ILL neutron experimentalists are on good terms with their synchrotron neighbours (ESRF), the complementary use of Xrays being of great advantage to

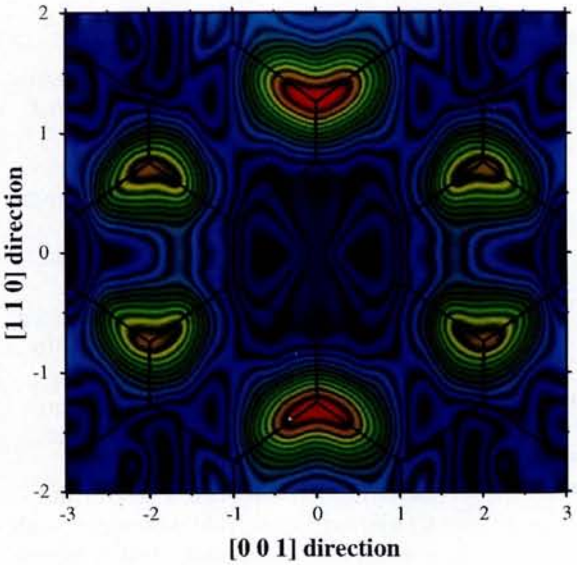

Fig.2. Diffuse scattering from spin fluctuations in the scale of $4 \cdot 10^{-13}$s in the "frustrated" magnet $[YSc]Mn_2$. The violet areas indicate low intensity and the red areas high intensity

the analyses. Finally, the process of inelastic scattering is used to examine the forces in the interplay between atoms in condensed matter.

It was Mössbauer, ILL's second director, who developed the principle of a "user service" institute. This "democratization" of neutrons means that university institutes and others are approached and invited to do experiments. Today the scientific staff of 54 welcomes about 1400 external scientific visitors conducting some 600 experiments annually. Thus we are looking at small tabletop science performed on a big source. In total, neutron scientists in Europe number about 3550, compared with just 700 in the US (Table 1). Indeed, the concept of an open user facility has been pushed more strongly in Europe, with ILL being neutron work's top dog.

Today, the budget for ILL has suffered a further cut of 6 MFF/a. This compares with a budget for instrument upgrades of 7 MFF/a. The consequence will be a further delay in the upgrade programme, another cutback of personnel and a reduction in experimental usage.

The three major countries form the Steering Committee on which the other member countries have observer status. They receive beam time related to the level of their subscriptions.

According to the initial contract between France, Germany and the UK, the directorate of ILL is a triumvirate. Directors can be proposed by the original three members. By tradition, the Director does not usually come from France and while the UK pays less than a third of the budget, that member does not nominate the Director and now has less veto rights. However, UK scientists still submit a large number of proposals. "It would of course be a dream come true if the UK were to resume its place as a full partner", mused the Director.

Table 1. ILL overview. Report year: 1997

ILL	**Member countries** F+D+UK; and CH, E, A, RU, I	n-scientists in Western Europe	3550
Staff and Budget	400; ~300 MFF	UK	1200
Reactor	58 MW, high flux for n-beams	D	800
Instruments	25 specialised for various applications + 11 collaborating research groups	F	600
		CH	300
International	meeting place		
		E	150
Interdisciplinary	fundamental & nuclear physics; solid state; materials; chemistry; biology	I	130
Scientists	54 at ILL ←→ 1400 external	A	20
800 experiments	500 publications	cf. US	700

Outlook

In order to accommodate new instruments, it will be necessary to close down some of the existing instruments. Currently ILL operates 25 instruments, with 10 more from self-financed French, German, Swiss and Austrian groups. The experimental facilities at ILL are oversubscribed by more than a factor of two. Although 35 instruments is a good number, this is far from full capacity. To achieve this, one might offer other countries membership, but this is not easy: peaceful coexistence depends on the financial commitment of members and proportional beamtime allocation. Shopkeeper mentalities spoil the fun! Of course, unofficial entry through the back door is possible, for example as participants in various groups, but what about a Nordic consortium, or a Benelux-type arrangement? ILL cannot and does not wish to be the only neutron source. The UK operates the world's most powerful pulsed neutron source ISIS. In Germany, the state of Bavaria is building a new research reactor near Munich. This is a strong hope for the future, provided it is fully instrumented and operated at full capacity. In France a very good reactor is being jointly exploited by CRS and CEA; for the health of the community, it is to be hoped that this arrangement will continue.

A recent ESF Workshop on the future of neutron research revealed a fascinating spectrum of opportunities currently in the making or still embryonic. ILL, with its high neutron flux reactor, its versatile range of experimental installations, the reliable equipment ever ready for modification or novel design for a special application, has a fulfilling future ahead. In partnership with other European nations, the Institut has shown diplomacy and flexibility, as well as a pragmatic style which is always a firm base for necessary negotiations. In science today it is truer than ever before that "united we stand"!

A fitting tribute to his five-year directorship of ILL, and the many more years of successful work in the helium field, is the award to Reinhard Scherm of the 1997 Gentner Kastler prize, by the German Physical Society and the Societé Française de Physique. Typically, there was no divulging of this piece of news during the interview. We congratulate him warmly on this achievement.

C.C.J. Schneider