

## Neutrino search

# New plan causes a stir

Washington

CONSTRUCTION of the prototype for a massive neutrino detector is to begin soon on the Pacific Ocean floor off the coast of Hawaii. Unlike existing neutrino detectors, "Dumand" (for "deep underwater muon and neutrino detection") will search for very high energy neutrinos thought to be produced by astronomical sources such as supernovae, and will take the unconventional approach of using an enormous mass of ocean water as the primary detector.

The Department of Energy (DoE), which has funded preliminary studies of the concept for several years, has approved construction of a small prototype to be completed in late 1984. Ultimately, a series of 500-metre-long strings of photo-detectors will be deployed that will pick up the Cerenkov light produced by muons passing through the water above, the muons having been generated in turn from the high-energy neutrinos as they undergo interactions in the water. The completed device will contain a total of 756 detectors, enabling the direction of the neutrino source to be determined.

In addition to the University of Hawaii, which is serving as the centre for the project, six other American universities are participating along with institutions in Japan, West Germany, and Switzerland. Total construction costs are estimated to be \$12 million, about half of which is expected

to come from DoE.

DoE's support of Dumand is causing a certain consternation among some neutrino physicists in light of DoE's refusal to support a solar neutrino detector that Brookhaven National Laboratory has proposed to build. This detector, which was strongly endorsed by the Field commission study on priorities in nuclear physics, would contain 45 tons of gallium that could pick up very low-energy solar neutrinos, and thus answer the riddle of why the neutrino flux measured by Brookhaven's existing detector (which uses chlorine) is only one-quarter that predicted by current solar models. The gallium detector, which could pick up the basic neutrinos produced in the fundamental solar reaction of  $p + p \rightarrow D$ , could determine whether the solar models are wrong or whether the neutrinos travelling from the Sun are somehow altered en route.

DoE, while agreeing to support the operating costs for the experiment, has refused to spend anything on acquiring the gallium, which costs some \$600,000 per ton — about \$25 million in all. The Max Planck Institute has offered to supply twenty five per cent of the gallium; Brookhaven officials are reportedly preparing a proposal to the National Science Foundation for support to purchase the remaining seventy five per cent.

Stephen Budiansky

## Failed Soviet collaboration

THE Dumand project was originally conceived as a joint US-Soviet venture. In September 1979, three months before events in Afghanistan cast a cloud over such collaborations, Academician Moisei Markov, head of the Soviet side of the project, spoke warmly of the "joint theoretical elaboration and practical implementation" which would put into practice an idea mooted by the Soviet side at the end of the 1950s, the detection of high energy neutrinos under water of ocean depths.

The Soviet intervention in Afghanistan spelt the end of all formal Soviet participation in Dumand, although individual American participants admit that they have received valuable theoretical help and stimulus from formal discussions with Soviet colleagues encountered at international conferences.

The American side now has no access to the Soviet Union's unique deep-water facility — lake Baikal, which has a maximum depth of 1,620 metres and in many places descends to below 1km within a few hundred metres of the shore. Baikal has the further advantage that the currents and bed structure have already been studied by Soviet limnologists. In March 1982, it was announced that a special station for the recording of muons and neutrinos would

be established at Maritui, on the southwest shore of Baikal. Initially, there will be a detector lattice of up to one million  $m^3$ , which, will "probably" be increased to 1,000 million  $m^3$  at a later date.

Meanwhile other neutrino projects are going ahead, using, *inter alia*, a 300-metre deep salt-mine in the Donbass and a four-storey observatory inside Mount Andyrchi in the Caucasus. At the Dubna Joint Nuclear Research Institute, and the Serpukhov High Energy Physics Institute, moreover, theoreticians continue to investigate the possibility of "heavy" neutrinos, with a small, but non-zero rest mass.

Another joint Soviet-US neutrino experiment, announced in spring 1981, has failed to materialize but apparently for scientific, rather than political reasons. Code named Batiss, the experiment involved the generation of a stream of neutrinos from the Batavia research centre in the United States, and their detection beneath lake Issyk Kul in the Tien Shan mountains. In accordance with the officially utilitarian basis of Soviet science, this experiment was announced as a means of checking the hypothesis of tectonic plate movements and the early forecasting of earthquakes.

Vera Rich

## Medical education

# Obstacles for private school

READERS with a charitable disposition and money to spare to help buy a medical school are invited to write to Dr Paul MacLoughlin at 146 Harley Street, London W1. Dr MacLoughlin's ambitious scheme to establish a new independent medical school in central London is being held up by lack of funds, and plans to open the school in October have had to be abandoned.

Dr MacLoughlin had hoped to buy the building recently vacated by his old medical school, the Royal Free Hospital Medical School in Hunter Street. But fund-raising has been difficult and the building remains unsold. The latest of several feasibility studies, all paid for by Dr MacLoughlin, will be completed shortly and may enable him to secure a bank loan to cover the purchase price.

Dr MacLoughlin is at pains to emphasize that the projected school, to be called the Hunter School of Medicine, would not be a profit-making venture. The school has the status of a registered charity and this is proving to be one of the main stumbling blocks for finding sources of finance. Dr MacLoughlin feels, however, that only an independent school will allow him to develop his unconventional ideas on training and student selection. He says that many potentially good doctors are lost to the profession because they do not have the high school-leaving examination grades in science subjects that state medical schools are able to demand. The Hunter School would take into account in its selection process other personal qualities such as motivation, willingness to take responsibility and even moral and philosophical outlook.



Desirable medical school for sale — the old Royal Free buildings. Reproduced by kind permission of British Medical Journal.



Once the building has been bought, Dr MacLoughlin thinks that further funds will be more readily forthcoming. He is already over-subscribed with potential students and has offers of money from overseas governments. His plan is to take about 40 British and 20-30 overseas students a year, each paying about £6,500 per annum.

Critics of the scheme draw attention to the high cost of providing clinical experience in such medical specialties as neurosurgery and cardiothoracic surgery. But Dr MacLoughlin claims to have many offers from doctors in National Health Service (NHS) hospitals who would be willing to provide teaching facilities. Students would be rotated around different hospitals in the area, returning to Hunter Street for verbal instruction. Dr MacLoughlin is also confident that physicians working outside the NHS would make teaching facilities available, and is not concerned by fears expressed in some quarters that private patients would be unwilling to be guinea pigs for medical students.

Money apart, one major hurdle will be recognition of the school's qualification by the Education Committee of the General Medical Council (GMC), which has statutory powers to monitor and advise on approving medical teaching and examinations. A further snag is the European Community directive that medical education must be supervised by a university. The would-be Hunter School is looking towards the privately-run University of Buckingham, although no formal approach has yet been made.

The university itself has been considering offering pre-medical courses and may later consider collaboration with the Hunter School on pre-clinical teaching. As GMC would have to monitor an entire generation of students before it could approve the Hunter School's course (and the council has no precedent for validating an independent school) approaches have now been made to the ancient Society of Apothecaries, which still has the power to approve names for the medical register.

Despite Dr MacLoughlin's enthusiasm, several independent authorities have doubts about the scheme's financial viability and the need for more qualified physicians. The Association of University Teachers has condemned the plans on the grounds that while school-leaving qualifications "have their limitations, the cheque book is not a suitable alternative".

Despite general pessimism about the project's chances of success, the association says it is not taking any chances in the current political climate. Dr Bill Stephenson, of the association's London branch, pointed out that 12 years ago people had thought the idea of an independent university inconceivable. But the University of Buckingham is now chartered to award its own degrees and has the Lord Chancellor, Lord Hailsham, as its first chancellor.

**Tim Beardsley**

**French patents**

**Fanning fires of invention**

THE French minister of industry and research, M. Laurent Fabius, believes that French genius is not protecting itself sufficiently with patents. So earlier this month, he proposed a 20-point programme to the council of ministers designed to encourage French men and women to embarrass the French patent office — the Institut National de la Propriété Industrielle (INPI) with inventions.

As things are the French balance of payments in royalties is markedly negative. France pays out FF3,500 million (£286 million) each year in royalties on foreign inventions licensed in France. But it receives only FF2,100 million (£171 million) in royalties on French inventions licensed abroad. The net loss of £115 million a year indicates, in Fabius's view, both excessive technological dependence on foreign invention and insufficient French protection.

Analysis of numbers of patents (see figure) speaks equally loudly. In 1980 France granted 10,000 patents to its citizens, and 35,000 — more than three times as many — to foreigners. In Japan, by contrast, 160,000 patents were granted in 1980 to Japanese inventors but only 30,000 to foreign inventors.

The patenting process in these two countries is roughly comparable. There is essentially no assessment or weeding out of applications in either country — anyone who applies (and pays) receives. By contrast West Germany's system is much more rigorous, so that the 50,000 patents to German nationals and 18,000 to foreigners probably represent a real national advantage. Britain's system falls in rigour between the French and the German and produced 19,000 patents for Britons and

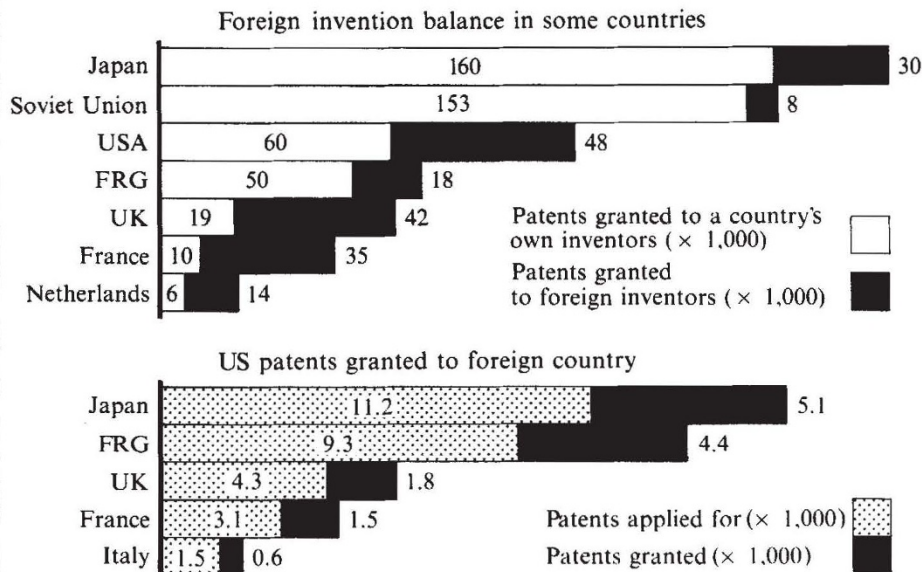
42,000 for foreigners in 1980.

A more objective test involves comparison of the number of US patents granted to certain foreign countries in 1979 (see figure). A study by Sally Wyatt and Luke Soete of the Science Policy Research Unit (SPRU) at the University of Sussex appears to show the underlying strength of West Germany in patenting — it follows close behind Japan on these figures — and the relative weakness of other countries in Europe. However, the US patents system is somewhat like the British — an application is examined and judged only if challenged. Thus the apparent patenting strength of a country is the product of a number of factors, high among which is the sheer volume of applications. "The Japanese will patent absolutely anything", Sally Wyatt claims.

But however difficult it is to interpret the data, the SPRU authors argue that they are useful among a clutch of indicators — including, say, research expenditure — which must be taken together to indicate the technological strength of a country. And M. Fabius seems determined to get this particular indicator up.

His 20 proposed measures include: support to small and medium industries to reduce the cost of patenting, now estimated to be FF 150,000 (£12,000) for world rights; free legal advice; research organizations to pay increased grants to groups which deposit patents; new courses on patenting at leading engineering schools (the *grandes écoles*); and a publicity campaign to encourage patenting, to be launched in the autumn. However, he has not been able to propose a reform of French patent law, which is little changed since the revolution.

**Robert Walgate**



Sources: Top, World Intellectual Property Organization. Bottom, S. Wyatt & L. Soete, *Scientometrics*, Vol. 5, 31-54 (1983).