Physics monitor

Neutrino sunshine

On 10 June 1992, at the Neutrino 92 meeting in Grenada, Spain, Till Kirsten of Heidelberg's Max Planck Institute reported that neutrinos from sunshine had been seen.

Most of the energy pumped out by the Sun comes from the fusion of protons into alpha particles, a process which also liberates neutrinos. While it takes about a million years for radiant energy formed in the deep interior of the Sun to fight its way to the surface, the highly penetrating neutrinos emerge almost immediately.

It was in 1970 that Ray Davis and his team began taking data with a tank containing 615 tons of perchloroethylene (dry cleaning fluid) 1500 metres underground in the Homestake gold mine, South Dakota.

The observed signal is consistently smaller than what is expected. This 'solar neutrino problem' was confirmed by the Kamioka mine experiment in Japan, looking at the Cherenkov light released by neutrino interactions in some 700 tons of water.

However these experiments are only sensitive to a tiny high energy tail of the solar neutrino spectrum, and to understand what is going on needs measurements of the primary neutrinos from proton fusion.

To get at these neutrinos, two large new detectors, using gallium and sensitive to these lower energy particles, have been built and commissioned in the past few years. The detectors are SAGE ('Soviet' American Gallium Experiment) in the Baksan Neutrino Observatory in the Caucasus, and Gallex, a team from France, Germany, Israel, Italy and the US in the Italian Gran Sasso underground Laboratory.

At Grenada, Kirsten reported unmistakeable signs of solar neutrinos of proton origin recorded in Gallex.

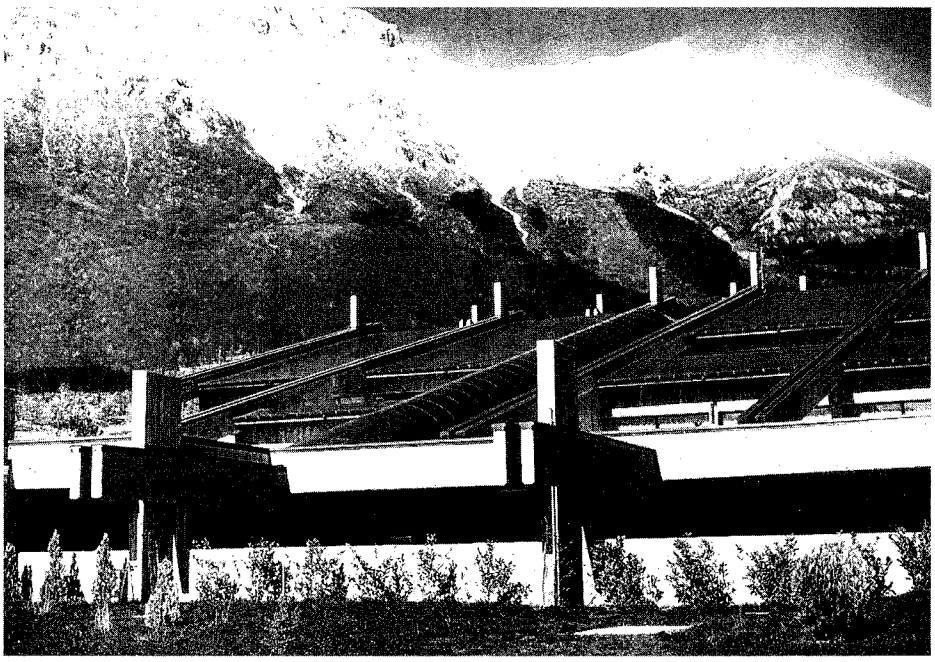
SAGE and Gallex do not yet have enough data to unambiguously fix the level of primary solar neutrinos reaching the Earth, and the interpretation of the interim results tends to be subjective.

However after 23 years of conditioning through watching the solar neutrinos' high energy tail, the prospect of a neutrino deficit is taken very seriously, and has led to ideas of neutrino oscillations, and oscillation resonances.

If the different neutrino varieties - electron, muon and tau - have a mass, then they can oscillate between themselves. A neutrino beam starting off as pure muon-type, for example, would change its composition as it went along. Setting limits on this behaviour is an important objective in neutrino experiments, with 'long baseline' studies - beams covering a long distance between source and detector, playing a vital role.

Lincoln Wolfenstein, one of the architects of the new neutrino oscillation scenarios, says 'it is still not clear whether neutrinos have masses or not'. Laboratory experiments try to measure these masses, but so far only upper limits have been established. These studies are beginning to reach the limit of their sensitivity and are unlikely to improve drastically. 'But there is indirect evidence,' says Wolfenstein, 'that neutrinos are much lighter.' 'The solar neutrino problem is really to solar neutrino opportunity,' he continues.

Future experiments with gallium and other new neutrino detection techniques, coupled with new high energy neutrino studies, will answer the question.



Exterior of the Italian Gran Sasso underground Laboratory, home of a range of ongoing experiments homing in on extraterrestrial neutrinos.

UNIVERSITY OF OXFORD

Department of Physics

Research Associateship on ZEUS

Research Support 1A - Salary £ 12,828 to £ 20,442

Applications are invited for a Research Associate position to work in the ZEUS group at the University of Oxford. The successful candidate would be expected to work on matters relating to the ZEUS Central Tracking Detector for which Oxford has major responsibilities. It would also be expected that the candidate becomes involved in physics analysis of ZEUS data, the broad range of interests within the group include deep inelastic scattering and exotic physics. The experiment is located at DESYand although the successful applicant would be based at Oxford, he/she should be prepared to spend signicant periods of time in Hamburg, The appointment, which is funded by the SERC, will becomes available from 1st October 1993 and would be for 2 years in the first instance.
Applicants should have obtained, or be about to obtain, a PhD in Experimental Particle Physics or a related topic. A knowledge of high-speed readout and data acquisition systems would be an advantage but certainly not essential. Letters of application supported by a full CV should be addressed to :

Mr. P F Dobbs
Deputy Administrator
Department of Physics
Nuclear Physics Laboratory
Keble Road
Oxford OX1 3RH

Applicatnts should also arrange for 2 references to be sent to the same address by the closing date which is 30 November 1993.

The University is an Equal Opportunity Employer

Postdoc Position

At the National Institute for Nuclear Physics and High Energy Physics (NIKHEF) the Pulse Stretcher/Storage Ring AmPS recently came into operation. This electron ring will operate in the energy range 250-900 MeV. The circumference of AmPS is -200 m. Its injector (MEA) is a 200 m. long electron linac.

AmPS was originally designed to increase the duty factor of the facility (Pulse Stretcher option) from 1% to 80%. The high-duty factor beam is used to perform nuclear physics coincidence scattering experiments.
An internal gas-jet target is installed in the machine as well; this setup will use the stored beam of AmPS (Storage Mode option).

Recently a proposal to investigate the possibility to implement a VUV FEL into the AmPS ring was approved by our funding agency F.O.M. To carry out this feasibility study we invite applicants with experience in the field of storage-ring FELs, optical klystrons and beam dynamics. The successful candidate will be appointed for a maximum period of 18 months.

Candidates with a Ph.D. who fulfil the above-mentioned requirements are invited to send their CV to: Mr. T. van Egdom, head of the Personnel Department, NIKHEF, PO Box 41882, 1009 DB Amsterdam, the Netherlands.
Information on this position can be obtained from dr. R. Maas, phone 31.20.5922087 (or 5922142), e-mail: robm@paramount.nikhefk.nikhef.nl.

NIKHEF

Faculty Opening in Physics
University of California at Berkeley

The Physics Department of the University of California at Berkeley, pending budgetary approval, intends to make one (or more) faculty appointment(s) effective July 1, 1994. Candidates from all fields of physics will be considered, but those in the fields of atomic physics, experimental particle physics and particle theory are especially encouraged to apply. Appointment(s) at the tenure-track assistant professor level are preferred, but tenure level appointments will also be considered.
Please send a curriculum vitæ, bibliography, statement of research interests, and a list of references to **Professor Herbert Steiner, Chairman, Department of Physics, University of California, Berkeley, CA 94720**, before December 10, 1993. Applications submitted after the deadline will not be considered. The University of California is an Equal Opportunity, Affirmative Action Employer.

DESY
DEUTSCHES ELEKTRONEN-SYNCHROTRON
has two openings for

POSTDOCTORAL FELLOWS
in central computing

The vacancies exist for computer scientists or physicists with PhD or equivalent, who are younger than 32, and who would like to work on the development, the implementation and operation of

the automation of central computing and networking by making use of OOP and expert systems,
high speed networking, mass storage environment, and data management.

Both topics will require experience with UNIX in addition to the techniques mentioned above. For the first topic experience with operating systems such as MVS and VMS will be needed as well.
The appointments will be for a three year period with a salary according to the principles of the German civil services (IIa MTV Ange stellte). Applications including a curriculum vitæ with special emphasis on computing, bibliography, and the names and addresses of three referees should be sent before November 30, 1993 to :

DESY Personalabteilung
Notkestrasse 85
D - 22603 HAMBURG
Tel. : 0049-40-8998 3628