

# Bulletin

of the Rutherford Appleton Laboratory

1 Mar. 1982 No.4

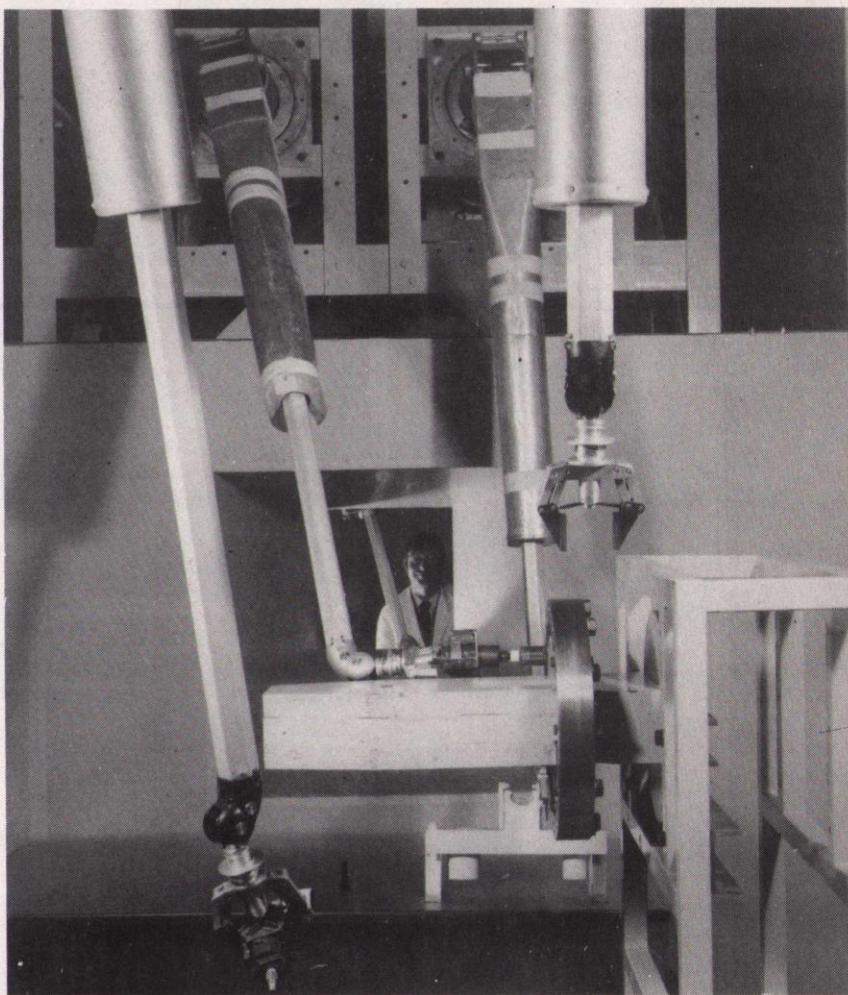
## SNS Target Remote Handling

Think of a sliced loaf when the slices of bread have been separated by gaps of 1.75 mm. Replace the bread by slices of depleted uranium clad in Zircaloy-2, put the whole lot in a pressure vessel and circulate heavy water through the gaps to keep the slices cool. You now have a rough picture of the SNS target. Note that the uranium is "depleted", that is uranium with the fissile U235 taken out, which is the reactor or bomb material, so that the uranium can never go 'critical'.

### Source of the SNS

If you bombard this target with an intense beam of high energy protons (say, 800 MeV and about  $1.2 \times 10^{15}$  protons/sec equal to about 200  $\mu$ A of beam) it will give off huge fluxes of fast neutrons to become the 'source' of the Spallation Neutron Source (the word Spallation describes the nuclear interaction and means, literally, "chipping-off"). These fast neutrons are slowed down to "thermal energies" by "moderators". The array of target and moderators is embedded in a "reflector" which reduces the escape of fast neutrons by scattering them back into the moderators and so improve the net efficiency of the system. The overall arrangement of target, moderators and reflector is called the Target Assembly. The thermal neutrons are the probes by which the properties of condensed matter are studied, which is the end product of all the hard work going into the SNS Project.

The target, after 6-12 months irradiation, is very radioactive and suffers from radiation damage. Its activity is about the same as an equivalent piece of fuel element in a research reactor. And just like a reactor fuel element, the target must be replaced. The problem is how to do it? In operation the target assembly lies at the centre of a 3.2m diameter vessel within a massive bulk shield with walls of iron and concrete 4.5 m thick. No human access is possible and using remote handling equipment very difficult. The way it will be done is to make part of the shielding into a door and mount the target assembly from it on a cantilever frame. When



Target being removed by John Hogston

access is needed, roll the door back on rails so that the target assembly is located in a remote handling cell adjacent to the bulk shield. All the services to the target assembly (water, etc) are fed through pipes in the shielding door and the services equipment is mounted on trolleys. The whole system of door and trolleys moves backwards and forwards on the rails to put the target assembly in its operating position or the remote handling cell. It's called the LMSR - Long Modules for Services Railway - though sadly it will not be driven by steam!

### The Remote Handling Cell

The remote handling cell (RHC) is designed like a conventional one used in the reactor business, so we can use all the experience available there. Using manipulators is a bit more tricky than hands so everything must be designed to make it easier. This requirement is known as the KISS rule (Keep it simple, stupid!). The operations must be certain because if it gets stuck you can't go in there to put it right. This is ensured by making sure beforehand that

(Cont'd p.3)



# INTERNAL Events

## RAL LECTURE

LECTURE THEATRE - 1515 hrs

- 18 Mar. Prof. E G S Paige/Oxford  
'Surface Acoustic Wave Devices'

## 'WHAT'S NEW'

LECTURE THEATRE - 1515 hrs

- 10 Mar. D A Gray/RAL  
Wednesday. 'SNS - Neutrons Galore'

## CONDENSED MATTER SCIENCE SEMINARS

R3 CONF. ROOM - 0930 hrs

- 9 Mar. R A Bond/Culham  
'Hydrogen in Palladium; An Ideal Lattice Gas'.  
15 Mar. S Doniach/Stanford  
'Superconductivity in Two Dimensions'

## ASTROPHYSICS SEMINARS

R61 CONF. ROOM - 1400 hrs

- 10 Mar. J Leonard Culhane/UCL  
'X-ray Spectroscopy of Active Galaxies'  
17 Mar. Gordon E Bromage/RAL  
'Adolescent Violence in the Galactic Community'

## REMOTE SOUNDING GROUP

R61 CONF. RM - 1530 hrs

- 9 Mar. Dr D Rees/UCL  
'Remote Sensing of Atmospheric Winds from Satellites'.  
23 Mar. Dr P H Moffat/RAL  
'Results from the LIMS Experiment of NIMBUS-7'

## PROGRESS ON DATA PROCESSING STANDARDS FOR PARTICLE PHYSICS

- 9 Mar. Three 'colloquia have been arranged on this subject:-  
1100 hrs-Atlas Colloquium R27  
1330 hrs-Lecture Theatre  
1600 hrs- " "

For details please contact  
James Hutton Ext: 6324

# EXTERNAL Events

## PHYSICS COLLOQUIA

CLARENDON LAB - OXFORD - 1615 hrs

- 5 Mar. Dr J Ellis/CERN  
'Grand Unification and Cosmology'  
12 Mar. Dr Hideo Aoki/Tokyo  
'Fine-structure Constant and the Quantised Hall Conductivity in Two Dimensions'

## ASTROPHYSICS COLLOQUIA

DEPT OF ASTROPHYSICS - OXFORD-16.30hrs

- 2 Mar. Dr P M Gondhalekar/RAL  
'The Ultra-violet radiation in the Intergalactic Medium and the consequential Ionisation Balance'  
9 Mar. Dr J P Emerson/QMC  
'What Does IR (1 $\mu$ m - 4 $\mu$ m) line emission in Galactic Regions Tell Us? Recombination or Stellar Winds?

## ELEM PART PHYS SEMINARS

N.P.L - OXFORD - 1430 hrs

- 4 Mar. Dr N G Bowler/Oxford  
'Strings and Things.'

## SHEP SEMINARS

SOUTHAMPTON - 1430 hrs

- 5 Mar. E Corrigan/Durham  
'Multi-monopole Solutions in Spontaneously Broken SU (2) Gauge Theories'  
12 Mar. J Stirling/DAMTP  
'Testing QCD in  $e^+e^-$  Annihilation'.  
19 Mar. D Broadhurst/Open Univ.  
'Can QCD Sum Rules Fix the Properties of a Single Resonance?'

## NPD COLLOQUIUM

CONF. ROOM H8 - HARWELL - 1530 hrs.

- 2 Mar. Dr R Ellis/Durham  
Galactic Observations and the Fate of the Universe'  
25 Mar. Dr C Isenberg/Kent  
'The Physics of Soap Bubbles and Soap Films'

## PART PHYS DISC GP MEETINGS

BIRMINGHAM - 1615 hrs.

- 5 Mar. Dr G Ringland/RAL  
'Technicolour and its Experimental Consequences.  
12 Mar. Dr J Strong/Westfield  
'A Measurement of the Pion Form Factor'  
19 Mar. Dr J Bowcock/Birmingham  
Testing QCD in  $e^+e^-$  Annihilation'

## THEO. PHYSICS SEMINARS.

QMC - 1615 hrs

- 8 Mar. Prof. J Essam/Westfield  
'Percolation in Directs Systems'  
15 Mar. Prof. E B Davies/King's  
'A New Approach to Metastability'

## THEO. PHYS. SEMINARS

MANCHESTER - 1430 hrs.

- 3 Mar. Dr K Ledingham/Glasgow  
'Measuring the Electron Neutrino Mass'  
10 Mar. Dr K Moriarty/Royal Holloway  
'Recent Developments in Lattice Gauge Theories'  
17 Mar. Prof. A Donnachie/Manchester  
'Glueballs: Fact or Fiction'



## RAL Lectures

The next lecture in this series will take place in the Lecture Theatre on Thursday 18 March at 3.15 pm.

### SURFACE ACOUSTIC WAVES FOR PROCESSING ELECTRONIC SIGNALS

by

Prof E G S Paige  
University of Oxford

During the past decade, surface acoustic waves travelling on the surface of a solid have progressed from academic curiosity to the forefront of technology.

What are surface acoustic waves, how are they launched and detected? In answering these questions, we shall see how surface waves can be used in devices to process electrical signals. Examples of their use will be drawn from TV receivers and radar systems.

## Film Badge Notice

Period 3 commenced Monday 1 March. Colour Strip GREEN. Please check that you are wearing the correct badge and all old ones are returned.

Next Film Change - Mon. 29 March.

## Remote Handling

(Cont'd from p.1)

you can do it, by modifying, by training and more training.

To this end we have built a full scale mock-up remote handling cell in R52 (the old Nimrod active handling workshop). The walls (made of hard board) are 1.6m thick with zinc bromide windows and conventional Type 9 Master-slave-manipulators are used to assemble and disassemble components of the target assembly. As a golden rule, no component will be installed for operation until it has been proven in this mock-up RHC.

The mock-up cell has been built by the SNS Target and Utilisation Group's own gang-of-four; Bernard Poulten, John Hogston, Ken Moye and Charlie Greenhalgh. So far a model target has been made together with its special lifting and turning frames. Special fasteners have been developed for the flanges between target and services pipes and two types are possible; wedges and toggle bolts. The operation of removing a target, turning it and placing it ready for storage takes about 1½ hours.

(We are indebted to Dr Alan Carne for this light-hearted and informative look at an exacting project).

## WHAT'S NEW?

### NEUTRONS GALORE

by

D A Gray

Lecture Theatre - 3.15 pm  
Wednesday 10 March

The SNS will be the most powerful pulsed source of neutrons anywhere in the world. New components are now being installed and commissioning of earlier items has started. A description of the function of the different parts of the facility will be given together with news of progress on them.

## Missing

Dr I F Corbett is trying to locate a Tektronix Curve Tracer Type 575, Serial No 100690, last seen in RMS Control Room. The item bears a green RAL Label No R05308. Would anyone knowing of its whereabouts please contact Gill Brett Ext 570.

Will the person who borrowed the Hewlett Packard HP35 Calculator No. 1143S 10770 from the Atlas Centre Admin. Office, please get in touch with E B Fossey on Ext.6618.

## Art & Crafts Exhibition

The Committee has decided after careful consideration, that it will not hold an exhibition this year. In future, it is hoped to have one every other year.

The reasons for this decision are, that as many of the exhibits are long term projects, it would be more appropriate to have a bigger interval between exhibitions to ensure the high standard of exhibit is maintained; also it was thought that peoples' interest and enthusiasm would not be lost with the new arrangement.

The Committee sincerely hopes that anyone who is preparing to exhibit this year will not be too disappointed, but will instead look forward to working towards making next years exhibition a great success.

Thank you all very much for your support in the past - Jenny Coates.

## Lunchtime Films

### LECTURE THEATRE

Thurs 11 March  
12.30 - 1.00pm  
"National Scientific Balloon Facility"

In Bulletin of 6 Jan 1982 you were promised a second chance to see this film, first shown at the Staff Tour of the Stabilised Balloon Platform which some people missed because of inclement weather. The film shows the Facility, which is situated at Palestine, Texas, at work. There are some quite spectacular sequences showing the unfurling and release of the immense balloons which lift the experimental platforms.

## Penlee Fund

The recent collection for this fund raised a total of £90.77. Thank you for your generous contributions and a special thanks to the messengers who organised the collection.

## Library Notice

The Limitations of Computing, by J A Campbell (copy no 013182) was loaned to Appleton Laboratory in May 1981 and has not yet been returned. If anyone has this book, will they contact the Computing Library R27, Ext 6226 please.

The book entitled 8080/8085 Assembly Language Programming, by J N Fernandez has also been lost from 'display'. Please put it back!

Also missing from the Library

Healey & Hebditch, "The Minicomputer in On-line Systems"

Astrophysics Journal (Letters) 248 No. 2 pt 2 1981. We would appreciate the return of this. Single issues are not obtainable and we do not wish to replace a whole volume. It is a WASTE OF MONEY!

The Library has received several copies of the "Picked up for You This Week" cumulative volume for 1981. They are available free!

## Trade Exhibition

An exhibition of metal bellows and bellow assemblies will be held by William Hughes Ltd on 31 March in Conference Room 5, R20 from 1000-1600hrs.



## Maurice Dean Retires



Those who know Maurice, know he doesn't make up his mind without very careful consideration. So, when he decided that getting up on Monday mornings had become an overrated pastime, there was little his friends and colleagues could do, but gather in force, to thank him for his help and companionship over the years, and wish him well.

Naturally they wished to present him with a memento of the times, and on 29 Jan in R12 Conference Room, Martin Wilson found himself presiding at the farewell ceremony that had been arranged.

Maurice arrived at RAL (like many other good colleagues) via Harwell and Malvern, in August 1961. He had had a long and honourable career in experimental science, said Martin, working on power valves and klystrons in the BLA days, on superconducting

magnets, especially the Plessey magnet, the Southampton Rotor, and in porous metal development. In addition he was always willing to help with all our experiments. "It is therefore a great pleasure to me to be asked to present you with this genuine "Ray Roberts" card and these gifts on behalf of all your friends. We shall miss you and wish you well in your life of leisure"

"Thank you all," Maurice replied. "The card says it all, doesn't it? Working with a grand bunch of people, I have enjoyed it all. Thanks again for the tools (a Black & Decker Jobber, a blow torch and a  $\frac{1}{2}$ " hammer drill) I can certainly put them to good use. My bungalow is, what is described in House Agents Ads, as eminently suitable for modernisation! It has been a treat working with you I'm very grateful - thank you".

## Indoor Sportsday

The SERC Indoor Sports Day this year is to be held at Aston Villa Leisure and Sports Centre on 2 April.

Would all those wishing to go to watch, please send their names to A Forster, R6 Electrical Workshops, Ext 6300. Those who wish to stay for the Disco should let A Forster know. The early bus will leave the Centre at about 1930 hrs; the late bus at about 0300 hrs! Disco tickets are £2 including supper. Please apply for your tickets before 10 March, by which date all competitors names should also be with the controllers.

## Darts

If there is sufficient interest shown, it is hoped to run a dinner-time darts league. Teams are expected to have their own boards, and each team of six players will be asked to pay a £3 entry fee. For a league a minimum of 8 teams is required.

If interested please contact A Forster.

## Interested in Photography?

Then the formation of a Camera Club will be of interest to you.

There will be an inaugural general meeting on Tuesday 23 March at 1300 hrs in Conference Room 5, R20.

All enquiries to B Maddison Ext: 427

## Music for Pleasure

The last in the present series of concerts take place on Friday 30 April and Wednesday 5 May. The programme will be the same on both evenings. The Concerts take place at the Royal Albert Hall at 7.45 pm, and the London Philharmonic will be performing pieces by Haydn, Beethoven, Mozart, Suppe, Lehar, Strauss, Waldteufel and Offenbach.

For details please contact Nigal Angold Ext: 6508.

## Coffee at Cosener's

All RAL wives are invited to a coffee morning at the Cosener's House, Abingdon on Tuesday 16 March from 10.30. until noon.

Do come along, and bring the children.

Information about these get-togethers can be obtained from -

Mary Rousseau Tel. Wantage 3676  
Ann Corbett " Abingdon 20434

## Sister's Plaintive Air

Quite often I'm at S.E.R.C.

The medicals to do,  
Its rather quiet in my small room  
and sometimes lonely too.  
For though they're sent appointments  
and asked to please attend,  
They just don't come or aren't on  
site and forget to tell a friend.  
If you could phone the office  
when you cannot make the time,  
There'd be no need for me to  
sit down and write this rhyme!

# Bulletin

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