



COMMON/CSCAL/IBM, NERR, NCH, NGAP, ISCAN, NBK, NGR, NSCAN, NRO
LIYSEL, IYSEU, IYMAX, NTRACK, NSCAN, NES, NFAIL, MAXTR, MAXNO, TA
ZNBEGIN, NTK, KTRY, NMISS, NSSR, NFID, MAXMIM, NFIRST, NEND,
COMMON/CFID/MFX(20,3), MFY(20,3), NFDX(10,3), NFX(3), N(3)
TAB(2,20,3), NX(100,4), NY(100,4), XN(2), YN(8), TB(100,3), ID
R IDY(100,2), JDX(4), JDY(4), IHS(4), IGV(2), I(2), I
S NCF(16), IFS, NFS, FX, FY, JK, PIC, KPIC, NCOUNT, NBTN, MAXOV, MAX
T MAXN, CTA(3, M, N), C, IO, J, JF, Y, Y
DIMENSION NCTR(144), NGIR(20), CTR(112), GTR(12), MODE(21)

bulletin 4

23 February - 8 March 1976

ABRC VISIT The Advisory Board for the Research Councils (ABRC), accompanied by Department of Education and Science personnel, Engineering Board members and a London Office representative, will visit the Laboratory on Friday, 27 February.

During the morning and afternoon, selected exhibits covering a wide range of the Laboratory's work will be shown to the visitors. The Advisory Board will also hold a meeting at the Laboratory.

The ABRC was established as recently as November 1972 and replaced the Council for Scientific Policy which had been in existence since 1964. Its membership includes the chairman of each of the five Research Councils; the chairman of the University Grants Committee; chief scientists from Government Departments with a major interest in the work of the Research Councils; a representative of the Chief Scientific Adviser to the Government and, independent members drawn from the universities, industry and the Royal Society of London.

The function of the ABRC is to advise the Secretary of State for Education and Science on such matters as policies, responsibilities and the allocation of the Department's Science Budget. Another very important function is to promote close liaison between Research Councils and the users of their research. The international aspects of the Board's work is an area which, with the entry of the UK into the EEC, has increased considerably.

AME BOARD VISIT Members of the Aeronautical and Mechanical Engineering Committee of the Engineering Board will visit the Laboratory on Tuesday 2 March. The visitors will be shown selected exhibits dealing mainly with engineering aspects of the Laboratory's work and interactive computing and networks.

MORE VISITORS The Energy Proposals Committee of the SRC will be meeting at the Laboratory on Wednesday 3 March.

COMPUMAG An International Conference on The Computation of Magnetic Fields will be held at St Catherine's College, Oxford from 31 March to 2 April 1976. Its aim will be the review of recent developments in magnetic field analysis for physicists and engineers engaged in the design of magnets and electromagnetic devices.

The principal objective is the practical application of numerical techniques to magnetic field problems, but emphasis will also be given to related topics such as the calculation of mechanical forces and the modelling of magnetic material properties. The Conference will be directed specifically to direct current and low frequency devices. It will not be concerned with waveguide applications in which displacement currents are significant, nor magnetohydrodynamics.

Attendance at this conference is by invitation only. Further information from the Conference Secretary on Ext. 6114.

RUTHERFORD LABORATORY LECTURE

Kettering Grammar School has become very well known since the early 60's for

its active interest in the space operations of the Russians and later, the Chinese.

The speaker in the next RL Lecture, on Thursday 26 February, is the man who founded the Kettering Group, the School's Senior Science Master, Mr G Perry, MBE.

Geoff Perry joined the school some 22 years ago and began optical tracking with Sputnik 2 in 1957 and radio tracking of Sputnik 4 in 1960. By 1962, pupils were very much involved and the Kettering Group was in business. Geoff was the first person to disclose that the Russians were using a new launch site and, to pin point its location.

In the 1973 New Years Honours List, he was awarded the MBE 'for founding and leading the Kettering Group.' The following year, the Royal Astronomical Society awarded him the Jackson-Gwilt Medal and Gift, an award made very infrequently.

During the recent Apollo-Soyuz mission Geoff Perry was a resident member of ITN's panel of experts. He has just contributed to a report for the US Senate on "The Soviet Space Programme, 1971-75" to be published later this year.

He has kindly supplied the following summary of his lecture to be given at 15.15 in the Lecture Theatre:-

KETTERING OBSERVATIONS OF CHINESE AND RUSSIAN SPACE MISSIONS.

The membership and equipment of the Kettering Group will be described. Steps leading to the announcement and subsequent pin-pointing of a new Russian launch site will be outlined. By regular study of radar data supplied by the Goddard Space Flight Centre, pupils at Kettering Grammar School are monitoring the operational status of various Russian applications satellite systems. A description of the different types of telemetry systems employed by the Chinese and Russians will be followed by results obtained from the decoding of these transmissions. VHF/FM voice transmissions from the Russian cosmonauts in orbit are automatically monitored on a routine basis.

LIBRARY STUDY ROOMS

The Library study rooms are being heavily used. In the past, papers could be left for some time between

visits as spare rooms were always available. We must now ask staff to clear the tables when they leave for more than a short break. Anyone unable to find an unoccupied study room is asked to inform the Library staff. Such information will help with future planning.

LASER CENTRE

Experiments to be carried out with the high power laser will require the use of oscilloscope of the highest available bandwidth. Several groups in the Rutherford Laboratory have in their possession Tektronix Type 519 oscilloscopes.

If any of these fast scopes are no longer required the laser project would be pleased to receive them.

Please contact MR BRYAN SKINNER (Ext 6676) should you be able to help.

INTERNAL EVENTS

NIMROD LECTURE SERIES

Monday 23 February

11.30

Lecture Theatre

Internal Density Waves in the Ocean

Dr S M Flatté/CERN

HEP SIMINAR

Wednesday 25 February

11.00

R61 Conference Room

Study of the Reaction $\pi^- p \rightarrow \omega n$ in the Omega Spectrometer

K Sumorok/RL

SAFETY FILM SHOW

Wednesday 25 February @ 12.30 &

13.15

Thursday 26 February @ 13.15

Lecture Theatre

(note times of showings on

Wednesday).

And Then There Were Two - a 22 minute colour film

Falls and falling objects account for more fatalities in industry than any other single cause. The film looks at a working day for three well trained, skilled people concerned with repairing a leak in an overhead pipe. A moment's lapse in concentration causes the death of one of the three. 'And Then There Were Two' is a suspenseful and effective film for all who work at heights or direct others to do so.

RUTHERFORD LABORATORY LECTURE

Thursday, 26 February

15.15

Lecture Theatre

Kettering Observations of Chinese and Russian Space Missions

G Perry MBE/Senior Science Master, Kettering Grammar School (see 'News' for details)

NIMROD LECTURE SERIES

Monday 1 March

11.30

Lecture Theatre

Dimun Epidemiology

Dr E Derman/Oxford

FILM SHOW

Thursday 4 March

12.40

Lecture Theatre

The Gardens of Japan - 20 minutes, colour

A look at Japanese landscape gardens

FILM SHOW

Friday 5 March

12.40

Lecture Theatre

Banraku - 25 minutes, colour

The Japanese classical puppet theatre

SEMINAR IN COMPUTING

Friday 5 March

11.00

R61 Conference Room

Graphics at Rutherford: ENPLOT and FASUMX

I J Bloodworth

A revitalised version of ENPLOT (FAPLOT) is available for users. The new facilities will be described eg format free input, MUGWUMP/FR80 output, etc. A simplified version of SUMX using ENPLOT facilities (FASUMX) will also be discussed.

NIMROD LECTURE SERIES

Monday 8 March

11.30

Lecture Theatre

Measurement of Associated Multiplicities in High p_{\perp} Interactions at the ISR

Dr P D Grannis/Stonybrook and UCL

SAD NEWS

As we go to press we have learnt of the death of Mr L W Couling on 13 February after a long illness. Larry, until he retired last August worked in Nimrod Vacuum Section since 1960. We extend our deepest sympathy to his wife and family.

EXTERNAL EVENTS

SEMINARS IN THEORETICAL HEP/NP DEPT. OX - 14.30 hrs

- 27 Feb: Dr A J Azcarraga/Salamanca & Oxf. - Group
Theoretical Approach to the Melosh Transformations.
5 Mar: Dr J Bell/CERN - Subject to be announced.

COLLOQUIA/CLARENDON LAB. OX. 1 16.15 hrs

- 27 Feb: Dr D ter Haar/Oxf. - Interstellar Molecules.
5 Mar: Dr J T Houghton/Oxf. - The Atmosphere around
Venus.

THEORETICAL PHYSICS SEMINARS/CLARENDON LAB. OX - 16.15 hrs

- 26 Feb: Dr C Jordan - The Structure & Heating of the
solar atmosphere.
4 Mar: Dr F Close/RL - The New Particles and their
Implications - a Review for Non-experts.

ELEMT. PART. PHYS. SEMINAR/NP DEPT. OX - 14.30 hrs

- 26 Feb: Dr A Clark/RL - Multiplicities Associated with
High Transverse Momentum Triggers at ISR.

LOW TEMP. & SOLID STATE PHYSICS SEMINAR/CLARENDON - 14.30hrs

- 4 Mar: Dr C Windsor/UKAEA - Life Times of Spin Waves.

THEOR. PHYS. SEMINARS/QMC - 16.15 hrs.

- 23 Feb: Dr A J Leggett/Sx - Recent Developments in
Superfluid He³.
1 Mar: Prof S Deser/Brandeis & Kings - Duality
Properties of Gauge Fields.

HEP SEMINARS/SILVER ST, CAMBRIDGE U. - 1500 hrs

- 26 Feb: Dr E F Corrigan/Durham - Monopoles in Gauge
Field Theories
4 Mar: Prof M J Moravcsik/Sx & Oregon - The Two
Nucleon Interaction

HIGH ENERGY SEMINAR/CAVENDISH LAB. CAMB. U. - 1500 hrs

- 25 Feb: Dr F W Bullock/UCL - Latest Results on Charm
& Other Topics for CERN Gargamelle Neutrino
Experiments.

PHYS. & GEO-PHYS. COLLOQUIA/ROYAL FORT, BRISTOL U - 1700 hrs.

- 23 Feb: Prof J A Jacobs/Camb. - The Earth's Deep Interior
1 Mar: Dr R N West/U. of East Anglia - Positron Annih-
ilations: A Multi Purpose Tool for Condensed
Matter Physics.

PHYSICS DEPT COLLOQUIA/READING U. - 1700 hrs

- 1 Mar: Dr C D Clark - Excitations in Hot Salts.

HEP SEMINARS/4th FL. SEMINAR RM. MANCHESTER U - 1600 hrs

- 4 Mar: N Jackson/Liverpool - Results on Correlations
at High τ from the ISR.

THEOR. PHYS. SEMINARS/MANCHESTER U. - 14.30 hrs.

- 25 Feb: Dr R Phillips/RL - Charm Production in Neutrino
Interactions
3 Mar: Dr W H Miller/Camb. - The Classical S-Matrix

THEOR & HEP SEMINARS/SOUTHAMPTON U. - 14.30 hrs

- 27 Feb: Dr Chan Hong-Mo/RL - New Particle Physics from
Dual Unitarisation.
5 Mar: Dr R K P Zia/Soton - Symmetries as a Consequence
of Renormalization Constraints.

THEORY SEMINAR/DARESBURY LABORATORY - 1400 hrs

- 1 Mar: C M Quinn/Birm. - Angle Resolved Photoelectron
Spectroscopy from Single Crystal Emitters.

LECTURE SERIES/DARESBURY LABORATORY - 1400 hrs.

- 24 Feb: L Lyons/Oxf. - The Reactions $K^+ \rightarrow$ hyperon +
vector meson in the 3 to 3.6 GeV/c region.
2 Mar: D H Perkins/Oxf - New Particle Production in
Neutrino Reactions.

NP DIV. COLLOQUIUM/CONF. RM. HANGAR 8, AERE - 1530 hrs.

- 26 Feb: Dr E A Lorch/Radiochemical Centre Ltd -
Recent Developments in Design & Applications of
Low Energy Photon Sources.

OVERSEAS VISITS

Dr G Manning, to CERN, 19-21
February for discussions and then
to Flaine, France to attend International Conference on
Storage Ring Physics.
Mr R W Morgan, to CERN, 24-27 February for discussions.
Drs. G E Kalmus, B Franek, G P Gopal, A C McPherson and
W Cameron, to CERN on 24 February, returning 8/3, 21/3,
15/4, 5/4 & 15/4 respectively to run low energy K^+
experiment in 2m bubble chamber.
Drs. P J Litchfield, R M Brown & D Sivers, to Flaine,
France, 29 February - 6 March, to attend XIth Rencontre
de Moriond; Dr Sivers will present a talk at the
conference.
Dr D P Jones, to Frascati, 29 February - 6 March to
attend ECFA discussions on future PETRA experiments.
Drs. C Comber & K Paler, to CERN, 1 - 2 March to attend
collaboration meeting.
Dr W G Williams, Dr B H Meardon & Mr F F Freeman, to ILL
Grenoble, 1 - 19 March, to carry out polarization
analysis measurements on the D5 instrument.
The Director, to Frascati, 5 - 7 March, to attend ECFA
meetings on use of PETRA.

SRC BULLETIN Copies of the January 1976 edition of
the SRC Bulletin can now be obtained
from the Library, R61.

FILM BADGE NOTICE

Period 3 commences Monday
23 February. Colour Strip - RED
for $\beta\gamma$ films and neutron packs. Please change your films
promptly and return all old ones.
Six monthly TLD change for people with surnames
commencing I, J, K and L.

BLUE MOVIE AT R56?

A parcel has been received at
Stores R56 addressed to the
Cashier, SRC, Rutherford Laboratory. It contains a film!
The title is - Vitamin D3!! The Cashier denies all
knowledge. Stores (R & D) R56, Ext. 412, would be most
grateful if the person who ordered this film would
contact them as all efforts to trace its destination have
failed.

RUTHERFORD LABORATORY BULLETIN

Published by the Scientific Administration Group

Editor: H F NORRIS

Deadline
for
Insertions

1000 hours Wednesday 3 March

Room 42 Building R20
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Abingdon 21900 Ext 484

TST SUCCESS AT ARGONNE

With one installation at Argonne now operational, another under way at CERN for BEBC and with moves afoot to

install units at the Fermilab and, it is rumoured, even at Serpukhov in the USSR, all the world's large cryogenic bubble chambers soon will be using the Track Sensitive Target (TST) particle detection technique developed by the Rutherford Laboratory. In this article, Wilbur Venus and Eddie Fitzharris look at the background behind the Argonne installation - the second in the world (after RL) to use the technique.

December 12th 1975 saw the first operation for physics of a track sensitive target (TST) in a very large, 60 litre bubble chamber. Thus the Argonne bubble chamber group, in collaboration with CERN and the Rutherford Laboratory, became the second bubble chamber group in the world (RL was first) to successfully produce physics using this technique. Film from this run is now being examined by bubble chamber physicists from the USA, Europe, Australia and Japan.

The TST technique aims to combine the principle advantages of hydrogen and heavy liquid bubble chambers by, in effect, simply embedding a "hydrogen chamber" (the TST) inside a heavy liquid chamber. The TST has flat transparent plastic walls so that the beam-particle interactions inside it can be scanned, measured and geometrically reconstructed in the usual way. The neutral secondaries escape undetected from the TST (as from a normal hydrogen chamber) but are then detected in the heavy liquid. The efficient detection of neutral as well as charged secondaries from interactions in pure hydrogen allows a wider range of reactions to be studied in detail.

The technique was pioneered by the Rutherford Laboratory 1.5 metre bubble chamber group, in collaboration with Heinrich Leutz and his colleagues at CERN, during the years 1970-73. Initially, six TST's were broken in depressingly rapid succession. But the constructional and operational problems were successively understood and overcome and the first successful physics pictures in the 1.5 metre chamber were eventually taken in December 1971, as a Bulletin issue of that month jubilantly reported. Thereafter, operation of the chamber + TST was as trouble-free as that of the chamber alone had been previously. 2.4 million physics pictures were taken for four different experiments using four different TST's.

It had been clear from the start that the long-term future of the technique lay with the new generation of very large bubble chambers, providing larger measurable track lengths in the hydrogen and much higher detection efficiencies for the neutral secondaries. The first of these chambers to become operational was the 12ft monster at Argonne. After the successful runs in the 1.5 metre chamber, Argonne became interested in providing their chamber with a TST facility and a technical

collaboration formed between Argonne, CERN and Rutherford Laboratory achieved this.

The TST being used is the first to be built of LEXAN, which is stronger at low temperatures than the plexiglass used in the 1.5 metre chamber and is approximately 220cm long x 30 cm wide x 10cm deep. The heavy liquid filling the rest of the chamber was a light neon-hydrogen mixture (38 mole percent neon). Good tracks were obtained in both the hydrogen and the heavy liquid, although dirt on the TST walls and the lack of the usual anti-static and anti-reflective coatings caused visibility inside the TST to be much worse on this occasion than normal. Nevertheless, during three weeks of running, 99000 pictures were taken in test and data runs for several different experiments:-

4.08 GeV/c antiprotons for the Argonne - Carnegie Mellon - Melbourne - Rutherford collaboration; 8 GeV/c pi-minus for Notre Dame; 12 GeV/c protons for Argonne and Illinois Institute of Technology; slow and stopping antiprotons for the Japanese; slow and stopping antiprotons for an Italian - CERN collaboration.

The chamber also kept running for much of the time while the various beams were being tuned, resulting in a total of 193000 expansions of chamber + TST. There was every indication that the TST was capable of sustaining a much larger run without breaking. This very considerable technical success inaugurated a new era in bubble chamber physics.

Work is now going ahead to install a jumbo size TST, (some 50 times larger than ever attempted before) adequate for neutrino physics as well as hadron physics, in BEBC at CERN. The first test TST (240 cm long x 140 cm wide x 80 cm deep) is being constructed, the additional Dewars and plumbing for the chamber are ready, and more than enough neon for a 38 mole percent neon-hydrogen mixture is already at CERN. Its first operational test in BEBC in May this year will be with hydrogen inside and outside the TST. Operation with a neon-hydrogen mixture outside will follow shortly afterwards. The aim is to have a fully tested TST facility usable for neutrino physics available by the time an SPS neutrino beam to BEBC is available.

There are also moves afoot to install a TST in the Fermilab 15 ft chamber. Paul Kenney of Notre Dame University has constructed one similar in size but different in constructional detail to that used at Argonne. He hopes to test it in the chamber as soon as the crowded physics program allows. Rumour has it that a TST for Mirabelle at Serpukhov in the USSR is also under discussion. Thus the indications are that all of the world's large cryogenic bubble chambers will soon be equipped with TST facilities.

The Rutherford Laboratory can be proud of the major role it has played in bringing about this revolution in bubble chamber technique.

RECORD CONCERTS

Tuesday, 24 February at 12.40 in the Lecture Theatre, Claudio Arrau plays Chopin. A selection of favourite piano pieces by this acknowledged master interpreter, including the Ballade in F minor, two Scherzi and the Fantasie Impromptu.

On the following Tuesday, 2 March, at 12.40 in the Lecture Theatre, Symphony No 6 in F, the 'Pastoral' by Beethoven. Wolfgang Sawallisch conducts the Amsterdam Concertgebouw Orchestra in a superb performance which successfully balances the classical and romantic elements of this great work.

CHRISTIAN FELLOWSHIP

On Friday 27 February, Derek Smaje of R18 will be leading a Bible Study concerning 'Grace and Truth'. This will be in connection with the letter of Paul to the Colossians and all are welcome to come along at 12.30 in the R12 Conference Room. All are welcome to attend our monthly prayer meeting led by Ben Kingdon of R20 on Friday, 5 March at 12.30 in the R12 Conference Room.

OBITUARY NOTICE

We regret to record the death on 11 February of Mr A C Windless, a craftsman in the Department of Engineering Science.