RUTHERFORD Bulletin 20

31 October - 14 November 1977

Congratulations Culham

On Tuesday 25 October the EEC Research Ministers announced that the Joint European Torus (JET) project will be sited at the Culham Laboratory. After two years of negotiations, Europe will now begin a large scale thermonuclear research project, similar to those already underway in the USSR and the USA. The JET aims to duplicate conditions in the Sun and so fuse together hydrogen atoms at temperatures approaching 100 million degrees centigrade, producing a plasma. At Culham, a giant experimental apparatus will be built over the next 5 years at an estimated cost of £120 million which will be used to develop the techniques for thermonuclear fusion. It is hoped that this venture will lead towards the eventual building of commercial plants producing electricity in the 21st Century. The advent of this international project will make Culham the most advanced fusion research centre in Europe.

We heartily congratulate our colleagues at Culham and wish them every success in this vital research activity.

Laser Facility Detects its First Neutrons

It is only eighteen months since the Laser Division moved into Lab 5 of Building R1. In that time the Neodymium-Glass laser has been assembled and brought into operation, a variety of diagnostic tools have been commissioned and the research programme has developed into collaborations involving more than a dozen outside User Groups.

The most recent success has been to take a tiny glass balloon containing a gas mixture of deuterium and tritium, and to heat it with the tremendous power of two laser beams. This produced a *plasma state* inside the balloon which was confirmed beyond doubt by detecting *neutrons* given off by nuclear reactions inside the plasma.

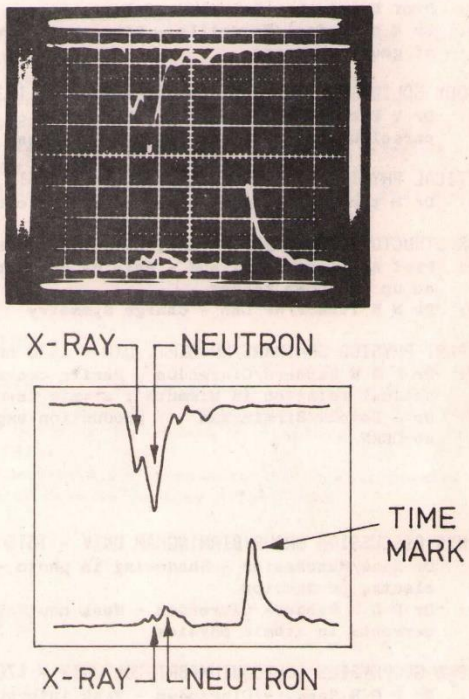
When the twin output beams of the laser are focussed onto opposite sides of an 0.1 mm diameter spherical target, the glass surface becomes so hot so quickly that it explodes. Half of the surface layer flies outwards, the other half goes inwards compressing and heating the interior. For a brief instant of time, the conditions in the compression region resemble those inside stars, in which the nuclei of light atoms can collide with enough violence to induce nuclear reactions.

The reaction which is most easily produced, and detected, is the fusion of deuterium and tritium to give helium and neutrons. Its rate is a sensitive function of the temperature and density reached and is thus an excellent diagnostic of the behaviour of the core of the implosion. These results complement those from x-ray measurements, such as were reported in the April Bulletin. The nuclear reaction yield depends on the temperature of the nuclear ions whereas the x-rays are more sensitive to the behaviour of the electrons, which can be quite different.

Early in September preparations were made at the Laser Facility to attempt the Laboratory's first fusion of deuterium and tritium. A scintillation counter to detect neutrons (courtesy of the Physics Apparatus Group) was positioned 70 cm from the deuterium-tritium target at the focus of the two laser beams.

The oscilloscope trace shown in the figure is the output of the detector during an implosion. The first peak in the upper trace is due to x-rays, the second peak is 14 MeV neutrons - travelling at about one-sixth of the speed of light. The test had been a success, and the yield of 10^5 neutrons from the shot agreed with the prediction of a semi-empirical model. When the test was repeated without tritium in the target only x-rays were seen. This provided a double check and confirmed that the neutrons had come from the deuterium-tritium interactions.

The measurement of neutron yields will provide a useful diagnostic of the behaviour of laser-produced plasmas in future experiments at the Facility.



An oscilloscope trace confirms the presence of neutrons emitted from a deuterium-tritium plasma.

A large part of the research programme at the Laser Facility is directed towards the study of how laser beams interact with matter and what happens inside highly ionised "plasmas". The world-wide interest in this field arises partly from the possibility that fusion power may one day be produced by laser compression, and it is therefore essential that the extremely complex physics of very hot and dense matter be thoroughly understood.

The Central Laser Facility is one of a mere handful of laboratories around the world where this basic research can be undertaken.

INTERNAL EVENTS

HEP SEMINAR
Wednesday 2 November
1100
R61 Conference Room

Results from the Fermilab 100 GeV $\bar{p}$ $\bar{p}$ Experiment

D R Ward/Cambridge University

HEP SEMINAR
Wednesday 9 November
1100
R61 Conference Room

Preliminary Results on Y* Production in the SLAC Hybrid Bubble Chamber

P Doman/Imperial College

SPECIAL LECTURE
Thursday 10 November
1515
Lecture Theatre

The SNS - What is it and why do we want it?

Dr G Manning/Deputy Director, RL

ABSTRACT: The Rutherford Laboratory has recently received approval to construct a new proton accelerator to produce intense beams of neutrons. Many of you have a large number of questions concerning the "SNS" that you would like answered: What is it; why do we want it; why not use NIMROD; why use neutrons; why not use a reactor; etc? The lecture will endeavour to answer these questions, it will assume no prior knowledge of the subject and will teach the expert nothing. The lecturer is a new boy in this field and hence has the advantage of having asked the questions himself and not knowing enough about it to be able to blind you with science.

EXTERNAL EVENTS

THEOR PART PHYSICS SEMINARS/NP DEPT OXFORD - 1430 hrs
- 4 Nov: Prof M Atiyah - Geometry of Instantons.
- 11 Nov: Dr E de Rafael/Marseille - Large p_T behaviour of gauge theories

MANY BODY SOLID STATE PHYS SEMINAR/CLARENDON - 1430 hrs
- 3 Nov: Dr Y Yacoby/Edinburgh - On the nature of the paraelectric phase of mixed perovskites

THEORETICAL PHYSICS SEMINAR/CLARENDON, OXF - 1615 hrs
- 10 Nov: Dr D ter Haar - Ergodic and non-ergodic behaviour

NUCLEAR STRUCTURE SEMINARS/NP DEPT, OXF - 1430 hrs
- 7 Nov: Prof A Poletti/Auckland - Physics down under with an up and down tandem.
- 14 Nov: Dr N W Tanner/NP Lab - Charge Symmetry

ELEMT PART PHYSICS SEMINARS/NP DEPT, OXF - 1430 hrs
- 3 Nov: Dr P G H Sanders/Clarendon - Parity conserving optical rotation in bismuth : atomic theory
- 10 Nov: Dr J Dowell/Birmingham - Ψ production experiments at CERN

PART PHYS DISCUSSION GROUP/BIRMINGHAM UNIV - 1615 hrs
- 4 Nov: Dr Shaw/Manchester - Shadowing in photo - and electro production
- 11 Nov: Dr P G H Sanders/Clarendon - Weak neutral currents in atomic physics

PHYSICS & GEOPHYSICS COLLOQUIUM/BRISTOL UNIV - 1700 hrs
- 7 Nov: Dr P G H Sanders/Clarendon - Weak interactions and the search for parity violation in atoms

HEP SEMINARS/ROOM A, DAMPT, CAMBRIDGE - 1500 hrs
- 3 Nov: Dr R Wha/Oregon & RL - Parton transverse momentum and related problems
- 10 Nov: Dr R Slansky/Los Alamos & CERN - Attempts to unify electro-magnetic, weak and strong interactions

HEP SEMINARS/ROOM B, CAVENDISH LAB, CAMBRIDGE - 1500 hrs
- 2 Nov: Dr T W Quirk/Oxf - e^+e^- interactions and the New Frontier
- 9 Nov: Dr P Norton/RL - Plans for muon physics at the SPS

HEP SEMINAR/4th FLOOR SEMINAR RM, MANCHESTER U, - 1415 hrs
- 1 Nov: T Weiler/Liverpool - Is there another neutral current?

THEORECTICAL PHYSICS SEMINARS/MANCHESTER UNIV - 1430 hrs
- 2 Nov: Dr R B Stinchcombe/Oxf - Renormalisation group approach for random systems
- 9 Nov: Prof A M Green/Helsinki-Sussex - The N-N potential and isobar configurations in nuclei

ELEMT PART PHYSICS SEMINARS/WESTFIELD COLLEGE - 1400 hrs
- 2 Nov: Dr R C Wha/Oregon & RL - Deviation from the naive quark parton model
- 9 Nov: Dr R Slansky/Los Alamos & CERN - Attempts to unify strong, electro-magnetic and weak interactions

THEORECTICAL PHYSICS SEMINARS/QMC - 1615 hrs
- 31 Oct: Prof R H Dicke/Princeton - "The enigmatic distortion of the sun"
- 7 Nov: Prof M Azbel/Tel Aviv - "A physical approach to the investigation of DNA and RNA sequences"
- 14 Nov: Prof J G Taylor/King's College - "Quantising Gravity"

NUCL PHYS DIV COLLOQUIA/CONF RM, H8, AERE - 1530 hrs
- 3 Nov: Mr P Swann/Esso - North sea progress (Film and talk in collaboration with MATSU)
- 10 Nov: Dr R S Nelson/Met Div - Radiation effects on materials

THEOR PHYS SEMINARS/CONF RM, BLDG 8.9, AERE - 1400 hrs
- 1 Nov: Dr B C Tofield/MPD - Properties and applications of fast ion conductors
- 8 Nov: Dr I M Blair/E & MSc - Safety and nuclear power (tape/slide presentation)

STOP PRESS

TRAVEL SECTION **Please note that Mrs G Landy who deals with all travel arrangements except CERN is now in Room 62, Bldg R20 Ext 6184.**

CERN travel is dealt with by Mrs P Shipley in Room 69 Bldg R20, Ext 575.

LIBRARY MANNERS The Library is fortunate in having the co-operation of most Lab staff so that we do not need a long list of Rules and Regulations. It is this which allows us to leave the Library available to use at all hours and be able to trust our users.

Recently we have been finding a small but annoying increase in losses and misuse of publications. These include articles torn from Vacuum and Wireless World and a bound volume of Physical Review D3 missing. New copies of New Scientist and Scientific American are being taken from the display racks. The latest to go is Sci Amer with an article on Electron-positron annihilation.

Journals on display, bound volumes and reference copies may only be borrowed in special circumstances and with library staff permission. Please don't spoil a beautiful friendship.

FILM BADGE NOTICE Period 12 commences Monday, 31 October. Colour Strip - PURPLE for $\beta\gamma$ films and neutron packs.

Please change your old films promptly and return all old ones.

Six monthly TLD change for people with surnames commencing S,T,U and V.

MISSING EQUIPMENT The following item of equipment has been reported missing from the Resin Lab, R34:
Hot Voss Inst Hotplate, AERE No 22849, SRC No 14/4601
Anyone with information on the present whereabouts of this item is asked to contact J Bradley, R34, Ext 508.

CLEARANCE REMINDER As stated in the last issue of the Bulletin, anyone having a claim to apparatus or effects in Room 16, R34 (Machine Spares Stores) should contact A G D Payne, Ext 460/6625 or D Jones, Ext 466/6185 by the end of October regarding its removal. After that date it may be summarily disposed of.

SALES TO EMPLOYEES Sales of scrap metal/plastics as set out in RLN 12/73 will be made on 4 and 18 November.

CONFERENCES IN'78 The Institute of Physics has announced details of the "Third International Conference on Submillimetre Waves and their Applications", to be held 29 March-1 April 1978 at the University of Surrey, Guildford.

ECOSA 1 - the first European Conference on Optical Systems and Applications will be held at the Hotel Metropole, Brighton from 4-6 April 1978. Invited papers will include - Semiconductor Lasers .... in Video Disc Systems, Laser-isotope Separation; Laser Fusion; Solid State Lasers; Radar and Propagation; Quasielastic Light Scattering; Optical Fibres .....and Opportunities; UV Lasers; Laser Machining; Laser Doppler Systems; Integrated Optics in the USSR; Dye Lasers; Parametric Oscillators; Gas Laser Research at Culham and Pollution Monitoring using Lasers.

Contributed papers are invited on these and related topics. Deadline - 1 December 1977. Further information from the Editor.

The Seventh International Cryogenic Engineering Conference and Exhibition will be held at Imperial College from 4-7 July 1978.

OVERSEAS VISITS Dr W Cameron, to CERN, 31 Oct-4 Nov, for preparation work for WA30.
Dr D J Crennell, (departing 1 Nov), Dr C Comber and Dr K Paler, to CERN, 4-14 Nov, for data taking on WA26.
Mr J F Ayres and Mr A W Eastwood, to CERN, 2-4 Nov, for discussions on the RCBC.
Dr P J Litchfield and Dr I F Corbett, to CERN, 2-4 Nov. for discussions.
Dr J M Valentine, to CERN and ILL, 7-10 Nov, for discussions.
Mr G L Greene and Mr A G D Payne, to ILL, 7-16 Nov and 7-18 Nov respectively to work on neutron lifetime experiment.
Mr D A Gray, to CERN, 14-16 Nov, to attend ECFA meetings.

REGLAZING - R1 The office windows on the first and second floors of Building R1 are being modified to reduce the energy loss from the building. The work of changing the windows will commence in early December and should be completed by the end of January 1978.

Staff affected by these alterations will be kept informed of details as they affect them.

Sports Day 1978

An attempt is being made to stage Sports Day next year at a place other than Chiswick. As it is difficult to find a place sufficiently large, it has been suggested that two Sports Days should be held; one for outdoor sports, and one for indoor. It may be possible to include sports like swimming, snooker, squash etc. The following conditions would apply:

(1) Special leave, together with travel subsistence, would only be available for one day. People wishing to take part in both would have to take ordinary leave, and pay travel costs.

(2) It would probably be necessary to make a contribution towards the hire of the indoor premises.

In order to gauge reaction to this idea, you are asked to complete the cut-off slip below, and send it to Eric Thomas, R27, before November 18th.

.....cut here .....

To: R Eric Thomas, R27 Subject: Sports Day

1. I would attend Indoor Sports Day instead of/as well as Outdoor Sports Day.

2. I would be prepared to contribute towards the cost of Indoor Sports Day.

3. I would not attend Indoor Sports Day.

Cross out as applicable.

OBITUARY NOTICE

It is with deep regret that we announce the death of Mrs E Smith in the Radcliffe Infirmary on Sunday 16 October. She was aged 51.

Eileen had been at the Laboratory for 11 years, the last 3 as a part-time data processor and she will be sadly missed.

A collection is being made (standing so far at £30) which at the request of the family will be sent to the Churchill Hospital in aid of cancer research.

We extend our deepest sympathy to her husband Derek and daughter Judith.

The following message has been received.
"Derek Smith and Judith sincerely thank all Eileen's many friends at the Rutherford for their unfailing kindness and friendship to her during her long illness and for their sympathetic messages, tributes and flowers since her death".

WELFARE FUND

The Welfare Fund exists to provide temporary financial assistance for any needy employee, whether industrial or non-industrial staff, at Harwell, Culham and the Rutherford Laboratory.

Applications for help receive the immediate attention of the Welfare Officer, and a loan or grant can be organised very quickly. In the past, grants have been made to recent widows and towards convalescent holidays for staff after long-term illness. Families needing money as a result of some misfortune may be given a loan or grant, depending on the circumstances.

Not to be confused with the UKAEA or Civil Service Benevolent Funds, the Welfare Fund is administered locally. Its resources are devoted entirely to the provision of grants of money or interest-free loans to employees, and their families. The Fund is a registered charity, and its income is derived solely from voluntary donations.

Employees were previously asked to donate 1p per week or 5p per month. An appeal has recently been launched asking staff to give 2p per week or10p per month, hence the posters you may have seen asking "Is 2p per week worth giving?" The reply as far as the Welfare Fund is concerned, is certainly "OH YES IT IS".

If you wish to know more about the Welfare Fund, please contact the Welfare Officer, Building 166, AERE, (Extension 3061).

NATIONAL SAVINGS

Wages cycle 19 ending 5 November 1977. Certificates will be ready for collection on Monday 14 November at the Cash Office R20.

Any employee wishing to join the scheme or to change the amount being deducted from their wage, please fill in a savings form (obtainable from the Cash Office R20) as soon as possible.

CHRISTIAN FELLOWSHIP

Please note that until further notice, all meetings will be held in the R2 Conference Room (Top Floor) at the ususal time of 12.35 pm.

4 Nov: The monthly prayer-meeting will be led by D Ness Wilson of R36. If you have any requests for prayer please contact the committee (D Williams/F Smith/C Biddlecombe/R Powell) or any member of the Fellowship. Prayer does change things.

11 Nov: All are welcome to a Bible Study led by Chris Biddlecombe.

SILVER JUBILEE APPEAL

The collection made around the Laboratory for the Queen's Jubilee Appeal amounted to £22.02½.

The local organiser wishes to thank all who contributed and our cheerful and ever helpful messengers who went around with the collecting boxes.

AERE RECREATIONAL ASSOCIATION

At the AGM on Wednesday, 19 October, 1977, it was agreed that the Association subscription would be raised by 1p per week.

The new rates will be:
Ordinary Members - Salaried Staff 30p per month
Ordinary Members - Wages paid 7p per week
Associate Members £4.02 per annum
Family Members - Adults - £1.52 pa
Juniors (10-18 years) 76p pa
(Under 10s) FREE

All Memberships end on 30.4.78 and the renewal fee for Associate and Family Memberships are due in full from 1.5.78.

The revised rates will take effect from 1 December, 1977, and from that date the new rate will be deducted automatically unless you notify the Association Secretary and your Pay Office in writing to the contrary.

HARWELL FILM SOCIETY

Tuesday and Wednesday, 8 & 9 November at 1945 hours in the RL Lecture Theatre. 'The Last Detail' (Hal Ashby) - a ruthlessly witty morality about two American Navy shore patrolmen; one black, the other white, who take pity on their prisoner, a simple eighteen year old who has been given eight years for attempting to steal 40 dollars from a charity box. The patrolmen encourage him to revolt, never realising the extent to which they themselves are prisoners. Ashby conveys that sense of belonging that you acquire in the services; the slang, the repartee and the language, which while being rather more than salty is not in the least offensive because any other sort of language would seem entirely out of character. (USA, 1973)

RUTHERFORD LABORATORY BULLETIN · *Published by the Scientific Administration Group*

Deadline for Insertions: 1000 hours Tuesday 8 November

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