

## Multibeam Laser Compression Facility

The Central Laser Facility is now routinely carrying out compression experiments with its new six beam target irradiation facility. With this system, greatly improved uniformity of target illumination is achieved with the result that compressed plasma core densities are much higher.

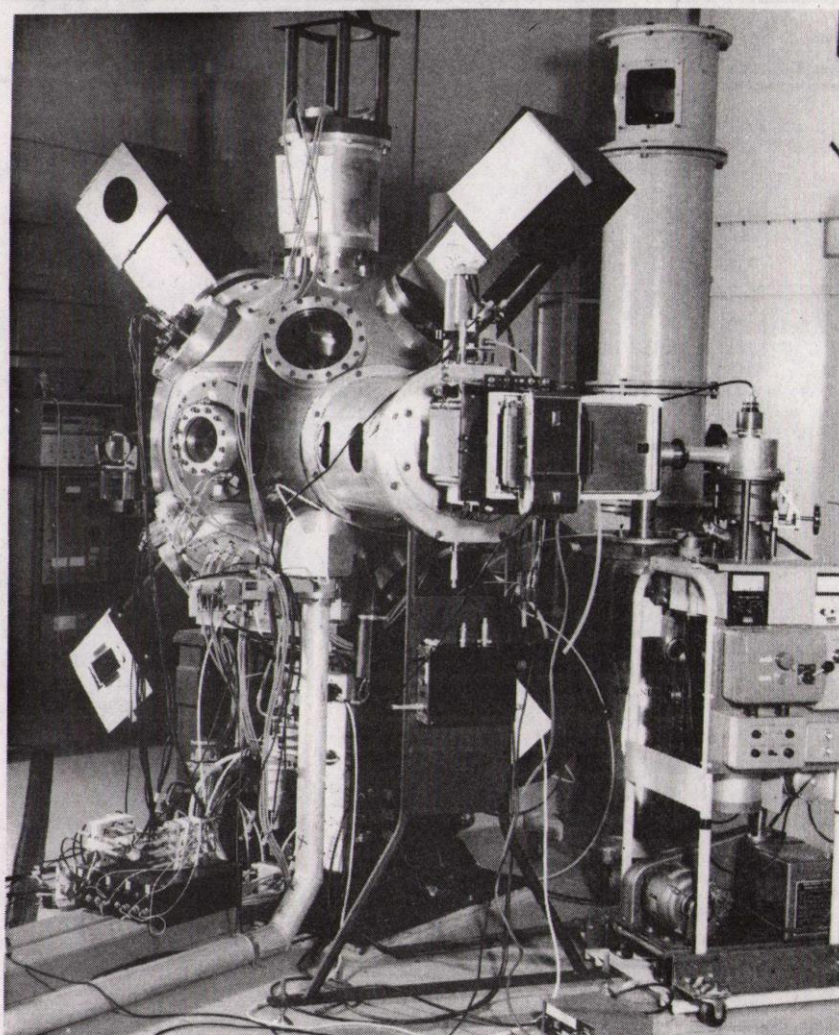
Powers on target in excess of 1 terawatt ( $10^{12}$  watts) have been delivered by a laser system that has been extensively modified and up-graded.

### Laser Improvements

The neodymium-doped silicate glass has been replaced by a newly developed neodymium-doped phosphate glass. The phosphate glass provides a higher gain and has a lower non-linear refractive index - and therefore the laser now operates with an increased power (by a factor of two) and with improved beam quality.

### Multibeam Operation

Previously all compression experiments used only two laser beams for irradiation, with consequently rather poor uniformity of target illumination. This was not a serious limitation for experiments of the "exploding-pusher" type where hot but relatively low density core plasmas were produced (see *Bulletin* 20, 1977). However, significantly higher core densities can only be achieved by changing to the so-called "ablatively-driven" mode of compression. This method requires that the shell of the microsphere target be sufficiently thick that only the outside of the glass wall is heated. Consequently the target behaves somewhat like a spherical rocket with the outside of the shell being gradually burned off, accelerating the remainder of the shell and gas fill inwards, thus producing a high density core. For this mode of operation it is essential to uniformly illuminate the target - and therefore a multibeam laser system is required.



*The new six-beam illuminated Target Chamber*

### New Target Chamber

A new target chamber is now in use in which 0.1 mm diameter microsphere targets are irradiated with six laser beams using  $f/1$  lenses. A symmetric system involving six beams requires that the lenses be situated on the six faces of a cube, providing a maximum diagnostic access in the eight

directions corresponding to the corners of the cube. For ease of experimental operation, the chamber is arranged so that four of these directions lie in the horizontal plane.

Suitable diagnostic equipment has been commissioned with the new chamber, including an X-ray backlighting source for diagnosing the high density

*Continued on p.3*

# INTERNAL Events

## NIMROD LECTURES

LECTURE THEATRE - 1400 hrs

29 Oct: Dr S Weisz/CERN  
"Experimental Determination  
of Hadronic Structure  
Function"

12 Nov: Prof E Paschos/Dortmund  
"Testable Consequences of  
Grand Unified Gauge  
Theories"

## HEP SEMINARS

R61 CONFERENCE ROOM - 1100 hrs

31 Oct: Dr Hidaka/Westfield College  
"Spin-spin Asymmetry in the  
Production of Heavy  
Particles at Large  $p_T$  in  
QCD and the Weinberg-Salam  
Model"

R12 CONFERENCE ROOM - 1400 hrs

7 Nov: "Dr A Geavons/CERN  
High Density MWPCs and  
their Application"

## RUTHERFORD LECTURE

LECTURE THEATRE - 1515 hrs

15 Nov: Dr R Hancox/Culham  
"Fusion Power, Progress  
and Prospects"

# EXTERNAL Events

## THEO.PHYS.SEMINARS

TPD CONF. RM-AERE - 1400 hrs.

30 Oct: Mr G A M Webb/NRPB  
"General Aspects of  
Radiological Protection"

6 Nov: Dr A D Taylor/RL  
"The Rutherford Spallation  
Neutron Source"

## NPD COLLOQUIUM

H8 CONF. RM-AERE - 1530 hrs.

1 Nov: Dr S Rae/NRPB  
(551) "Assessing the Effects of  
Low-level Radiation"

8 Nov: Dr D G Gearne/RAE  
"Ion Propulsion - A Review"

## THEO.PHYS.SEMINARS

SCHUSTER LAB-MANCHESTER - 1630 hrs.

7 Nov: Dr V Heine/Cambridge  
"Throwing Out K-Space:  
Electronic Structure of Solids  
from the Point of View of the  
Local Atomic Environment"

## ELEM.PART.PHYS.

WESTFIELD COLL. - 1400 hrs.

1 Nov: Dr B Nicolescu/IPN Orsay  
"An Attempt to Derive the  
Hadron Mass Spectrum from the  
Topological Expansion"

8 Nov: Dr R Cashmore/Oxford  
"The Gluon in  $e^+e^-$  Annihilation:  
Evidence from the TASSO  
Detector"

## THEOR.PHYS.SEMINARS

QMC - 1615 hrs.

29 Oct: Prof F Calogero/Rome & QMC  
"Integrable many-body problems"

## PHYSICS COLLOQUIA

CLARENDON LAB-OXFORD - 1615 hrs.

2 Nov: Dr C H Llewellyn Smith/Oxford  
"Unified Models of Strong,  
Weak and Electromagnetic  
Interactions"

9 Nov: Prof F R A Hopgood/RL  
"High Speed Computing -  
Faster than the Speed of  
Light"

## ELEM.PART.PHYS.SEMINARS

NPD OXFORD - 1430 hrs.

1 Nov: Prof S Ting/MIT  
"Search for New Particles at  
High Energies"

8 Nov: Dr N Booth/Oxford  
"Neutrino - Electron  
Scattering"

## NUCLEAR PHYS.SEMINARS

NPD LECTURE THEATRE-OXFORD - 1430 hrs.

5 Nov: Dr M A Grace/Oxford  
"The Magnetic Moments of  
Short-lived Nuclear States"

12 Nov: Prof R Penrose/Oxford  
"Twistor Theory:  
An Introduction and status  
Report"

## PART.PHYS.DISCUSSION GP.

W.SEMINAR RM-BIRMINGHAM - 1615 hrs

2 Nov: Dr K Barnham/Imperial  
"Results from the CERN  
Neutrino Beam Dump  
Experiment"

9 Nov: Dr J K Davies/Oxford  
"Results on Muon Scattering  
from the European Muon  
Collaboration"

## ELEM.PART.PHYS.SEMINARS

DAMP-CAMBRIDGE - 1500 hrs.

6 Nov: C Michael/Liverpool  
"Quark Beams"

9 Nov: J S Dowker/Manchester  
Title to be announced

## HEP SEMINARS

CAVENDISH LAB-CAMBRIDGE-1500 hrs.

7 Nov: Dr F P Payne/Liverpool  
"Relativistic Treatment of  
Charmonium Decays"

## SHEP SEMINARS

SOUTHAMPTON - 1430 hrs.

2 Nov: Drs B and F Schrempp/Durham  
"QCD at Low  $Q^2$  -  
A Correspondence Relation for  
Moments of Structure Functions"

9 Nov: Dr J G McEwen/Southampton  
 $\psi$ 's Quarks and Gluons"

## THEORY GP SEMINARS

DARESURY - 1400 hrs.

5 Nov: Dr C W Clark  
"Hyperspherical Approach to  
the Atomic Four Body Problems"

12 Nov: Prof A E Davies/Leicester  
"Defects in Amorphous  
Materials"

## LOW.TEMP.PHYS.SEMINARS

SUSSEX - 1415 hrs.

6 Nov: J Bass/Michigan State &  
Imperial  
"Search for Electron -  
Electron Scattering in  
Simple Metals"

## Library Notice

COSENER'S HOUSE MEETING ON  
NEW PARTICLES, SEPT 28 - 29 1979

Transparencies from this meeting  
are now available, for consultation  
or Xeroxing, from the Library R61.  
Please ask at the Issue desk for  
these.

## Film Badge Notice

It is period 11, colour strip YELLOW.  
Please check that you are wearing  
the correct film and all previous  
ones are returned.

Next Film Issue  
Monday, 5 November.

## Christian Fellowship

The Fellowship welcomes everyone to  
its meetings, which are held at  
1230 hrs in R2 Conference Room.  
The next meetings will be held on  
Thursday, 1 and 8 November.

## Multibeam Laser

continued from page 1.

plasmas, an X-ray microscope and streak camera system, probe beams, particle detectors and spectrometers. Improved lens and target mounting and positioning assemblies have also been incorporated into the chamber design.

## New Target Area

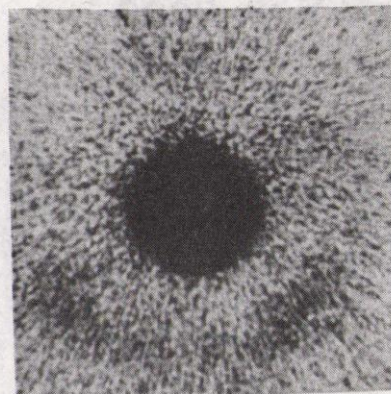
The six beam target chamber is situated in a new experimental area. The move to a new area gave an opportunity to improve the alignment and focussing system and to decouple the target area from the laser area activities.

The six main beams from the laser area are intercepted via mirrors on a three-level alignment and reference platform. The platform contains various alignment

lasers which can be injected into each of the six beams so that experiments can be prepared and targets aligned in the target chamber, independent of the operation of the main laser system. For the experiments it is necessary to arrange that all six laser beams arrive at the target within about 10 picoseconds so that path lengths do not differ by more than a few millimetres.

## Experiments Underway

The first round of experiments has been successfully completed and the results are being studied. The effect of the six beam illumination is already quite apparent in producing more uniform and denser core plasmas. We look forward to highlighting some of the new results in a future issue of the *Bulletin*.



X-ray pinhole image showing highly uniform target illumination.

# ELF Achieves 1000

On Friday the 5th of October the ELF electron-beam machine (*Bulletin* 22 1978) was fired for the 1000th time. In addition, the first original physics experiments on the machine have recently been successfully completed and the results have been reported at conferences in the UK and USA.

## KrF XeCl Efficiency

These experiments were designed to measure the efficiency of the 249 nm Krypton Fluoride (KrF) and 308 nm Xenon Chloride (XeCl) lasers using the high current (60 kA), short pulse (60 ns) electron-beam produced by the ELF machine. The experiments demonstrate that efficiencies of 10% and 6% could be achieved with KrF and XeCl respectively. If, as is planned, rare-gas halide lasers like KrF and

XeCl are to be used for laser-plasma interaction studies, it is essential (to minimise the capital cost of the system) that the laser efficiency should exceed 5%. Both KrF and XeCl satisfy this criterion.

## Next Generation

On the basis of the information gained, it is now possible to design the next generation of rare-gas halide lasers. The Gas Laser Development Group is currently designing an advanced laser device which will be ten times more powerful than the present one and will produce a laser pulse energy in the range 100-200 joules. This would make it the most powerful rare-gas halide laser in the world.

Construction of this new laser system will, hopefully, begin next year.

## Rutherford Laboratory Lecture

"FUSION POWER, PROGRESS AND PROSPECTS"

Starting from the basic requirements for a new energy gain from a thermonuclear plasma, the first part of the lecture will deal with past progress in the magnetic confinement of high temperature plasmas and summarize the outstanding physics questions which remain to be answered before a fusion reactor can be designed. In the second part of the lecture a conceptual tokamak reactor design will be described and a possible time-scale for the development of fusion power proposed.

For your diary :

Next Lecture on December 13th by Mr R J H Beverton "The Work of the National Environment Research Council"

## National Savings

Weekly Cycle no. 24 Certificates are now available for collection at the Cash Office, R20.

## Trade Exhibition

'CALORSTAT' (William Hughes Ltd) will be holding a one day exhibition of metal bellows and bellows assemblies in Conference Room 5 Building R20 on Thursday 8 November from 1000-1630 hrs.

On show will be examples of the Calorstat "Nested" bellows, as well as examples of the three most common forming methods, Hydroform, Edge Welded and Electro deposited.

## Sales to Employees

Sales of scrap metal/plastics as set out in RLN 12/73 will be made on 2 and 16 November at the scrap compound rear of R40 from 1200-1230 hrs.

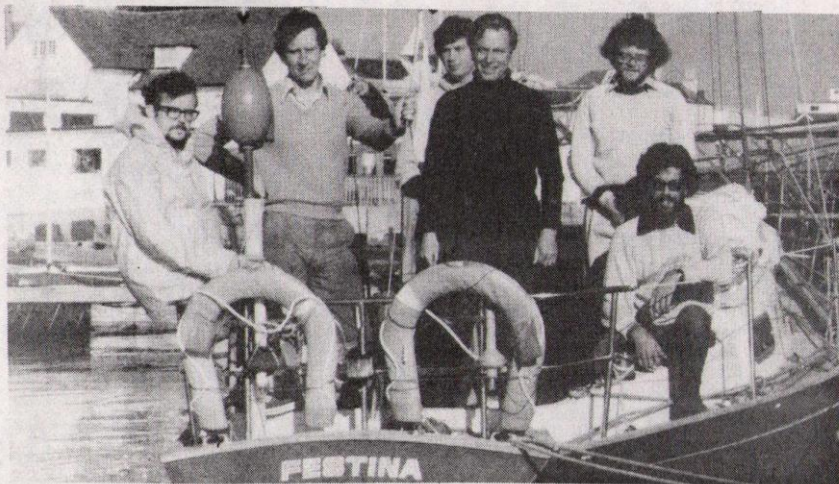
## Folk Club

Sorry everyone - but ALL TICKETS for the meeting featuring 'Fred Wedlock' and 'The Navvies' have been SOLD! The next meeting will be on Friday, 7 December, so keep an eye on the *Bulletin* and make your bids early.

## OVERSEAS Visits

C J Batty to CERN from 29 Oct-10 Nov to work on prop. 210.  
M Edwards to CERN from 30 Oct-9 Nov to install detector of EMC.  
D A Duce and R W Witty to Sweden from 4-9 Nov to establish links with DCS community.  
K Green to Grenoble from 5-16 Nov to work on edm experiment.  
J J Thresher to CERN from 1-2 Nov to attend Plenary ECFA meeting.  
G H Grayer to CERN from 5-8 Nov for collaboration meeting and discussions of Exp UA1.  
C J Damerell to CERN 6-16 Nov to work on NALL.  
C M Fisher to CERN from 7-20 Nov for setting up experiment NA16.  
J S Hutton to CERN from 7-16 Nov to work on experiment WA57.  
L J Wyatt and H Roskell to DESY from 12-16 Nov for administrative discussions.  
G H Stafford to Peking from 11-25 Nov to visit High Energy Physics Laboratory.

## SR Sea-dogs



From L to R Ken Pavitt, John Magraw, Lawrence Byrne, Martin Hall, John McDougall and Tony Damerell.

The SRC's team in this years "Civil Service Interdepartmental Cross Channel Yacht Race" failed to repeat last years success when they came second to the GPO overall, mainly owing to their acquisition of an intimate knowledge of the Solent's Bramble Bank. For the illumination of others, the Bank is 200 yds from the pole which marks it, the ebb tide from Southampton Water sets strongly on just prior to the Bank's emerging, and in the absence of enough wind to sail off, the Bank itself provides a good opportunity to stretch one's legs, visit ones neighbours, play cricket, or just watch the rest of the fleet drift by.

Paradoxically, Gale Warnings had caused the race to Cherbourg to be replaced by a three day series of races in the Solent - for the Friday, a "calm warning" might have been more appropriate. This gave the dinghy sailors in the crew full opportunity to exercise their skill in making use, and ..... in depriving the others, of every puff and waft of air, and it was the enthrallment of this close quarters battle of wits which took the leading three boats, among them SRC's

### Coffee at Cosener's

Start a new month by making new friends! Come to the Cosener's House Abingdon on Thursday 1 November, anytime between 10.30 a.m. and noon, and enjoy a good cup of coffee in pleasant surroundings. You'll be made very welcome, - children too.

Old friends will need no reminder.

For further information ring Gillian Litt (Abingdon 26009) or Dorothy Gibson (Abingdon 25250).

"Festina Secunda", to the vulnerable position north of the Bank in the crucial minutes as the ebb sluiced across the top.

The drifting match conditions of the Friday were replaced by a good blow on the Saturday and Sunday, and Festina, skippered by Appleton's Martin Hall, and crewed by Ken Pavitt and John McDougall also of Appleton, Tony Damerell and John Magraw of Rutherford, and Lawrence Byrne of Swindon office, redeemed herself by good showings in both races coming 3rd and 2nd respectively. In addition to the excitement of the racing, and the absorption of preparing and tuning a modern ocean racer (in which Rutherford's Tony Cash also took part), the meeting also provides an atmosphere combining competition with comradeship, and stimulating interaction between the departments both on the water and subsequently in the bar of the Island Sailing Club.

In the final placings SRC came equal seventh of eighteen, despite our enforced retirement in the first race, the overall winner being MOD's "Mosika Alma".

### Horticultural Society

The Lecture to be held on Wednesday 7 November at 7.30 p.m. in the Lecture Theatre will be given by Mr O J Clayton of the Royal Horticultural Society Garden, Wisley. He will speak on "Trees and Shrubs for Small Gardens". The talk will be illustrated.

Entrance fees:- members 25p visitors 30p. Coffee and biscuits are available and a raffle will be held.

## A Model Storeman



Friday, 19 October, saw the retirement of Cyril Chandler after 12 years of working in various sections of the Laboratory Stores.

Cyril came to us in 1967 after having worked at the Glove Factory in Abingdon for 33 years, with a short break, during which we understand, he assisted the late Earl Mountbatten to win the war in Burma!!

His many friends both in the Stores and throughout the Laboratory will miss his cheerful manner and willingness to assist those in difficulty. For the past eight years, he has worked in R56 Receipts & Dispatch as a Senior Storeman, and many of us will remember well the "impossible" packing problems he has overcome by using his skills as a carpenter. Sometimes there was need for a set of plans to unpack, at CERN, DESY or ILL, one of Cyril's boxes!

At a farewell gathering on Friday he was presented with a Hornby Engine 2-10-0 00 gauge "Evening Star", a model of the last steam engine made at Swindon.

We wish Cyril many happy hours of "railway fun" and the best of health in his retirement.

### Lunchtime Films

These Films are shown at 1230 hrs in R22 Lecture Theatre on Wednesdays and everyone is welcome. There is no charge.

31 Oct: "QUESTIONS OF TIME" - an investigation into the different ways people look at time.

"ABYSS" - a gripping short film reconstructing a climbing accident.

14 Nov: "A CURIOUS HISTORY OF BRITISH FOOD" - an interesting look at the way food has been prepared throughout the ages and the origins of some of our popular dishes.

"COUNTY CRICKET COMMEMORATIVE STAMP" - the background to the design of this recent postage stamp issue.



RUTHERFORD LABORATORY

# BULLETIN

Deadline for Insertions

1000 hrs Monday, 5 November.

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