

24 March.



## INTERNAL EVENTS

### NIMROD LECTURE SERIES

Monday 17 March  
11.30  
Lecture Theatre

Hadron Production In Muon-nucleon Collisions

*Dr C A Heusch/SLAC, CERN*

### HEP SEMINAR

Wednesday 19 March  
11.00  
Conference Room, R61

On the Parity of Regge Cuts

*Professor Lorella Jones/DAMPT Cambridge and Illinois*

### RUTHERFORD LABORATORY LECTURE

Thursday 20 March  
15.15  
Lecture Theatre

Medical Aspects of Space Flight

*Professor Edward H Kass (see General News section)*

### NIMROD LECTURE SERIES

Monday 24 March - 11.00 hours  
Tuesday 25 March - 11.00 hours  
Wednesday 26 March - 11.00 hours  
and 14.00 hours  
Lecture Theatre

A Series of Four Lectures

How High are Higher Symmetries and  $\psi$ chology for J-walkers.  
(SU (2, 3, 4, 6, 8) for Experimentalists)

*Dr F E Close/CERN*

### RUTHERFORD INTERMEDIATE TECHNOLOGY GROUP MEETING

Wednesday 19 March  
12.30  
Conference Room, R61

Inaugural Meeting and Introductory Talk

*Mr J A Kozlowski/Power Projects Officer, Intermediate Technology Group*

(see General News section)



# EXTERNAL EVENTS

## QUEEN MARY COLLEGE

THEORETICAL PHYSICS SEMINAR/PHYSICS LECTURE THEATRE - 16.15 hours,  
17 March: Exactly Soluble Models in Statistical Mechanics - Prof R J Baxter/Canberra & Edinburgh.

## SOUTHAMPTON UNIVERSITY

THEORETICAL & HIGH ENERGY PHYSICS SEMINAR/LECTURE THEATRE C - 14.30 hours  
21 March: Current Algebra at Low and High Energies - Dr D J Broadhurst/Oxford.

## MANCHESTER UNIVERSITY

THEORETICAL PHYSICS SEMINAR/NIELS BOHR COMMON ROOM - 14.30 hours  
19 March: Radiative Damping and Level Shifts without Field Quantisation - Prof G Series Reading.

## DARESBUURY LABORATORY

DARESBUURY LECTURE SERIES/LECTURE THEATRE - 14.00 hours  
18 March: Title to be announced - C A Heusch/CERN, California.  
25 March: The  $\psi$  Particles - B Jean-Marie/SLAC, Orsay.  
  
THEORETICAL PHYSICS SEMINAR/OLD CONFERENCE ROOM - 14.00 hours  
24 March: The Pomeron, Regge Cuts, and Scaling - P D B Collins/Durham.

## SUSSEX UNIVERSITY

NUCLEAR PHYSICS SEMINAR/ROOM PD 1 A6 - 14.15 hours  
17 March: Charge-Dependent Effects in Nuclei - A M Lane/Harwell.

## EVENTS AT AERE HARWELL

NUCLEAR PHYSICS DIVISION COLLOQUIUM/CONFERENCE ROOM, HANGAR 8 - 15.30 hours  
20 March: Neutron Capture Studies in the Mass - 100 Region - T J Haste/NPD.

## MISSING EQUIPMENT

The following items of equipment have been reported missing from the R18 Electrical Services

Section:-

Two 15 amp Extension leads, red drum type, RL Nos. 14/2970 and 14/1418.

Anyone with information on the whereabouts of these items is asked to contact Mr A Hipwell or Mr A Wells, Ext. 573, R18.

## LOST & FOUND

At the last Rutherford Laboratory dance a pearl from an evening bag was lost & has been found. Would the owner please contact Mrs S Fones, Ext 495, R20.

## POSTAL ARRANGEMENTS AT EASTER

The last delivery of Atlas and Rutherford mail to the Post Office will leave the Post Room, Atlas Laboratory at 11.00 hours on Thursday 27 March. Mail reaching the Post Room after this time will not be taken to the Post Office until Tuesday 1 April.

## FILM BADGE NOTICE

It is Period 3. Colour Strip - YELLOW for 8y films. Please check that you are wearing the correct films and that all old ones are returned.

### Next film change

Period 4 commences Monday, 24 March. Colour Strip - BLUE for 8y films. Six monthly TLD change for people with surnames commencing M,N,O,P.

Note Will holders of fast neutron film badges return them as soon as possible.

## OVERSEAS VISITS

Dr R Taylor, to Paris, 16 - 17 March, to attend SEAS meeting.  
Dr W G Williams and Mr J Penfold, to ILL Grenoble, 17 - 21 March, to carry out tests on polarizing mirrors.  
Mr A G Wheldon, to SLAC, Stanford USA, 17 March for 3 months.  
The Director, to CERN, 18 - 21 March to attend meetings of CERN Scientific Policy Committee, Restricted ECFA, Committee of Council and CERN Council.  
Dr R A Rosner, to CERN, 23 - 26 March, for discussions on control systems.

## RUTHERFORD LABORATORY BULLETIN

Published by the Scientific Administration Group

Editor: H F NORRIS

Deadline for Insertions

GENERAL & SOCIAL NEWS  
Tuesday 1600

INTERNAL & EXTERNAL EVENTS  
Wednesday 1200

Room 42 Building R20  
Rutherford Laboratory  
Chilton Didcot Oxon  
Abingdon 1900 Ext 484



## THE VEE BOLT SAGA OF THE NIMROD ALTERNATORS

Let's face it, a bolt, although of importance in the right position is still a fairly mundane piece of equipment. Or is it? The Editor is grateful to Ron Baker of the Nimrod EE & AP-Group for the following article which gives some idea of the problems involved in the design of one particular type of bolt. Ron is very willing to talk to anyone interested in the subject of these particular bolts and their usage.

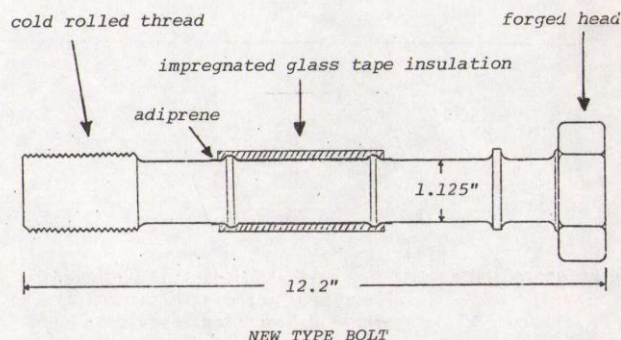
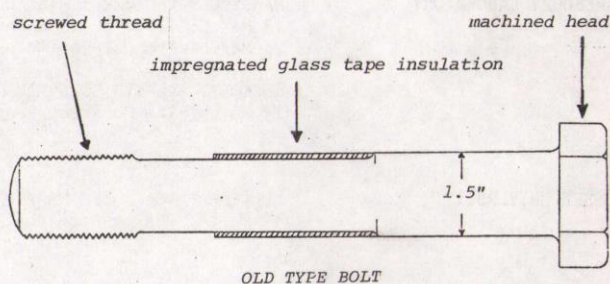
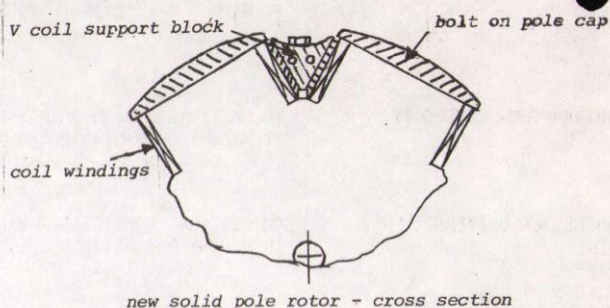
Following the breakdown caused by a "Vee Coil Support" bolt failure on a laminated pole alternator rotor in 1967, a detailed investigation of the Nimrod main power plant rotating machines was carried out. This revealed, amongst other things, that whilst these bolts were perfectly adequate for a steady state duty, they were totally inadequate for a fatiguing duty such as they encounter on the Nimrod rotors, each of which carries 60 such bolts and completes about  $7\frac{1}{2}$  million pulses per year.

A properly tightened bolt has a tension preload applied to it that is equal to or greater than the external load to be supported in service. Under this condition the bolt cannot fail by fatigue because there is no change in the stress in it regardless of the fluctuating nature of the operating load. However, in this particular situation, while it is possible to preload the bolts, they very rapidly lose this tension because of the yielding nature of the windings against which they are tightened. Even though solid pole rotors were just being introduced at the time of the investigation, a redesign to accommodate proper bolt preloading was not practical. The use of solid pole rotors in itself alleviates the bolt situation to some extent.

As even the bolts of the original design had survived 22 million machine pulses before a failure, it was decided to replace them with redesigned bolts. The objective was to obtain the best possible bolts for this arduous duty and to justify the choice by an exhaustive programme of modification and testing in order to gain reliability confidence. The redesigned bolts possess many advantages over the originals and the specification for the new design runs to some twelve pages! This includes such techniques as micro-inclusion counting of the vacuum remelted steel from which they are manufactured in addition to detailed mechanical and non-destructive testing.

The main fatiguing stress regime seen by the bolts in the machine is the  $15 \pm 1\frac{1}{2}$  ton in  $-2$  due to the pulsing variation of the rotational speed. In 1969 sample redesigned bolts had been tested in a fatigue rig to 100 million pulses at  $20 \pm 2$  tons in  $-2$  without failure. Nevertheless, prudence dictated that the safe operating life in the rotors should be only 30 million pulses until real operational experience had been gained.

Recently, a test series had been completed on bolts which had been removed from a rotor after 26 million pulses. These were then run for an additional 75 million pulses in a fatigue rig at  $20 \pm 2$  tons in  $-2$ . As a result of detailed examination of these bolts it has now been agreed with our advisers, Lloyds Register, that



the service life of the bolts be increased to 60 million pulses.

The life extension means that no Vee bolts will have to be changed for fatigue reasons before 1978. Based on the current cost of a bolt, about £70, and the costs of unthreading large rotors this will result in a direct financial saving of at least £40,000 during the next six years with a great reduction in the considerable risk and inconvenience factors inherent in working on large machines.

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## SOCIAL NEWS

### INFORMAL LUNCH-TIME ORGAN RECITAL

Depressing times, depressing weather - so we offer a little light relief in the form of an

Informal session of light music, both old and new played on the electronic organ (Yamaha D3) by John, who plays under the name of Jonathon! Around 12.30 on Friday, 21 March - just drift in and out, it's very informal.

### RL ANATEUR RADIO CLUB

The Club station is now "on-the-air". The AGM will be held on Tuesday 25 March at 12.45 in R15, and all those interested are welcome to attend.

### CHRISTIAN FELLOWSHIP

Mrs Joannie Yoder of Reading will be visiting the Laboratory on 21 March to give another talk on 'Neighbourhood Evangelism'. All are welcome to come along and the meeting commences at 12.30 in the R12 Conference Room.