

## On Course for Collisions

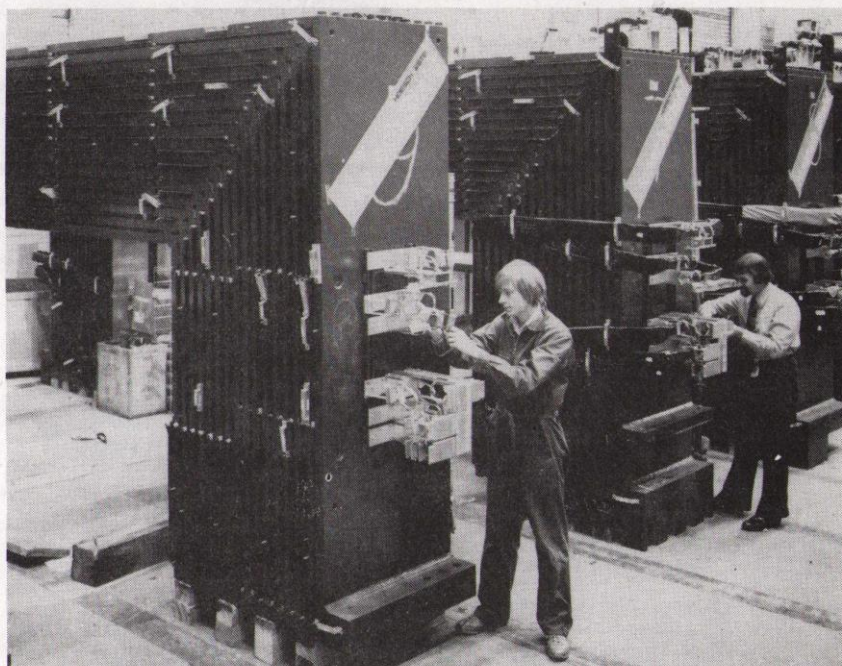
The Rutherford Laboratory is participating in two of the first five experiments approved for Europe's new Proton-Antiproton Colliding Beam Machine due to start operation at the CERN Laboratory in 1981. The 'Collider', which is a conversion of CERN'S 400 GeV Super Proton Synchrotron, will provide head-on collisions between protons and antiprotons with a centre-of-mass energy 20 times the original accelerator. Such collisions are expected to reveal effects which are crucial to the basic ideas of particle physics and, hopefully, to yield some suprisingly new phenomena!

### 'Centauro' events

There are many reasons why there is great interest in these ultra high energies. Cosmic rays which are the only present source of such high energies indicate that interactions here may be quite different from those at lower energies. In particular events named "Centauro" appear to show the production in a collision of large numbers of charged pions and the total absence of neutral pions, and other results at similar energies suggest the appearance of an interaction of different strength from the conventional hadronic force. The cosmic ray experiments are performed under very difficult conditions and result in only a handful of events. If these events are interpreted correctly they ought to be produced very copiously at the Collider.

### Untested Predictions

In quantum theory the various forces in nature are considered to be caused by the exchange of particles. Thus the familiar electromagnetic force is due to the exchange of photons. The strong or hadronic nuclear force is believed to be carried by gluons. The weak interaction which is responsible for the decays of many particles, for neutrino interactions and for hydrogen fusion in stars, is expected to be due to the exchange of very heavy particles called W and Z



The 'C' shaped magnets being assembled at CERN. (Photo CERN 502-01-80).

bosons. The theory of Salam and Weinberg which bring the electromagnetic and weak interactions together into the same framework, has made a number of predictions which have been verified in the past few years. However one important prediction remains untested. The masses of the W and Z are calculated to be 80 and 90 GeV respectively, and the Collider should provide the first opportunity to create masses of this magnitude.

### Proton-Antiproton Collider

In the CERN project antiprotons will be produced every few seconds when the extracted proton beam from the Proton Synchrotron hits a target. The antiprotons produced will be stored, cooled and accumulated in a new ring of magnets for about a day. Bunches will then be transferred into the Synchrotron, accelerated up to 26 GeV and injected into the Super Proton Synchrotron in the opposite direction to an equal number of bunched protons transferred from the PS. The two

beams will be accelerated up to energies of 270 GeV, the highest energy at which the SPS magnets can be powered in a D.C. condition, and will circulate for about a day. Collisions can occur at several positions around the SPS ring.

Experimental areas for collider physics are being constructed at two positions. The SPS is situated in a circular underground tunnel and the experimental areas, which surround the interaction regions, must therefore necessarily be underground. One such area is 25 metres deep and is being excavated by means of vertical shafts from the surface. Because of the undulating terrain above the machine, the other area is 80 metres deep and must be constructed by tunnelling techniques.

### All-Purpose Detector

Groups from Birmingham, Queen Mary College and the Rutherford Laboratory are collaborating with several other groups in the construction of a very large all-purpose detector which will be located in the shallower

Cont'd on p3



# INTERNAL Events

## NIMROD LECTURES

LECTURE THEATRE - 1400 hrs.

- 10 March Prof D H Perkins/Oxford  
"Past and Future Experiments  
on the Proton Lifetime."
- 17 March Dr Bjorn Wiik/DESY  
"Electron-Proton Colliding  
Ring Machine at DESY."
- 24 March Dr John Peoples/FNAL  
Title to be announced

## HEP SEMINARS

CONFERENCE ROOM R61 - 1100 hrs.

- 12 March Frank Close/RL  
"QCD Perturbation Theory for  
Confined Quarks and Gluons."
- 26 March R J Hughes/Oxford  
"Asymptotic Freedom"

## RUTHERFORD LABORATORY LECTURES

LECTURE THEATRE - 1515 hrs.

- 20 March Dr J M Hammersley, FRS/Oxford  
"The Technology of Thought"

## COMPUTING SEMINARS

COLLOQUIUM - ATLAS CENTRE - 1400 hrs.

- 11 March G G Scarrott/ICL  
"The Role of the Research  
and Advanced Development  
Centre in ICL."
- 25 March D H Lord/CERN  
"The 169E System."

# EXTERNAL Events

## NPD COLLOQUIUM

H8 CONFERENCE ROOM - AERE - 1530 hrs.

- 20 March Dr J A Cairns/AERE  
"Aspects of Current Catalysis  
Research at Harwell."

## ELEM. PART. THEORY SEMINARS

N.P.D. L. TH. - OXFORD - 1430 hrs.

- 14 March S Mandelstan/Paris  
Probably a review of recent  
work on confinement.

## ELEM. PART. PHYS. SEMINARS

N.P.D. L. TH. - OXFORD - 1430 hrs.

- 13 March Dr P Grossman/Oxford  
"Scaling Violations in  
Leptonproduction Experiments:  
Perturbative QCD or Hadronic  
Structure."

- 20 March Dr. G Myatt/Oxford  
"Results from Beam Dump  
Experiments."

## COMPUTING SEMINARS

NPD - OXFORD - 1630 hrs.

- 13 March Prof J Alty/Liverpool  
"Software and Evolving  
Technology."
- 20 March Prof F Walkden/Salford  
"A User's View of Parallel  
Processors."

## NUCLEAR STRUCTURE SEMINARS

NPD - OXFORD - 1430 hrs.

- 10 March Dr L K Fifiield/Oxford  
"Experiments Related to the  
Search for Neutral Weak  
Current Effects in Nuclei."

## THEORETICAL PHYSICS SEMINARS

CLARENDON LABORATORY-OXFORD-1615 hrs.

- 13 March Prof D Lichtenberg/Indiana  
"Quark Bound-state  
Phenomenology."

## HEP SEMINARS

CAVENDISH LABORATORY-CAMBRIDGE-1500 hrs.

- 12 March Dr M Green/QMC  
Title to be announced

## ELEM. PART. PHYS. SEMINARS

DAMTP - CAMBRIDGE - 1500 hrs.

- 14 March B R Webber/ Cambridge  
"Observability of QCD Effects  
in Jets."

- 18 March M B Green/QMC  
"Loop Formulation of  
Gauge Theories."

## PHYSICS COLLOQUIA

BRISTOL - 1700

- 17 March Prof J F Nye, FRS/Bristol  
"Fluid Flow Fields,  
Catastrophe Theory and  
Light Caustics."

## PART. PHYS. SEMINARS

BIRMINGHAM - 1615 hrs.

- 14 March Dr B R Webber/Cambridge  
"Topics in QCD Spectroscopy  
and Multiquark States."

- 21 March Dr N Booth/Oxford  
"Neutrino - Electron  
Scattering."

## THEORETICAL PHYSICS SEMINARS

MANCHESTER - 1430 hrs.

- 12 March Dr D Sherrington/Imperial  
"Elementary Excitations of  
a Disordered Magnet."

- 19 March Dr J K Storrow/Manchester  
"QCD Approach to Large  
Transverse Momentum  
Phenomena."

## SHEP SEMINARS

SOUTHAMPTON - 1430 hrs.

- 14 March C T Sachrajda/Southampton  
"Topics in Perturbative QCD."

## ELEM. PART. PHYS. SEMINARS

PHYS. L. TH. - UCL - 1415 hrs.

- 12 March M Kugler/Weizmann Inst  
Title to be announced.

- 18 March Dr M B Green/QMC  
"Gauge Theories and  
Statistical Mechanics."



experimental area. The Detector consists of a large image chamber in a magnetic field, calorimeters, muon detectors and various other devices. With this detector it is hoped to explore the whole range of ultra high energy physics, including (once the Collider reaches full design luminosity) the search for the W and Z bosons. The UK groups with technical support from the Rutherford Laboratory are building a hadron calorimeter - a device for measuring the energies of the strongly interacting particles that emerge from the collision, and also the electronic trigger that will determine which events will be recorded by the experiment.

The magnet, designed by CERN, is made of 16 "C" shaped iron modules each about 6 metres tall and weighing 55 tonnes, and a set of large aluminium coils. The iron is not solid but is made of many 50mm thick slabs separated by 17mm gaps. The calorimeter consists of about 7000 pieces of plastic scintillator embedded inside these gaps and in gaps in 12 "I" shaped modules of similar construction and mass, which are placed at the ends of the magnet. The scintillator light caused by the passage of charged particles is read out via 12000 waveshifter bars and lightguides into about 1200 photomultipliers. Several other calorimeters, primarily for the detection of electromagnetic showers, are being built by other groups within the collaboration. Fast analogue-to-digital converters give a measurement of the light output and hence of the energy deposited in various parts of all the calorimeters by particles coming out of the collision. Finally some special electronics including purpose built processors will allow the experimenters to choose various patterns of energy flow to trigger the apparatus and record the events.

## Streamer Chamber

The Rutherford Laboratory is also involved in the construction of light-guides for a large streamer chamber which will sit in the deeper experimental area. This apparatus will provide a quick overall view of the complex events which occur at these high energies and yield a definite answer about the existence of Centauro events.

*(We thank Professor Peter Kalmus for this interesting news.)*

## CERN Fellowships

Any member of staff interested in CERN fellowships, please contact Personnel, Room 68, R20 for further details and application forms. The closing date for application is 1 April 1980.

## Rutherford Laboratory Lecture

"The Technology of Thought"  
by Dr J M Hammersley, FRS  
Reader in Mathematical Statistics,  
University of Oxford.

This lecture was originally commissioned by the U S National Academy of Science for their celebration of the quincentenary of the birth of Copernicus, and is largely non-technical and aimed at the intelligent lay public.

It considers the interaction and social implications of five themes: (i) the nature of technology, (ii) the function of mathematical symbolism in science, (iii) the laws of thought formulated by George Boole, (iv) the pioneering work of Charles Babbage on computers, and (v) the intuition of Copernicus and other revolutions in scientific thought.

## New Co-ordinator

On 1 April Dr Jack Butterworth becomes Co-ordinator of Energy projects in the Science Research Council.

Based at the Appleton and Rutherford Laboratories he will be responsible for the Energy Research Support Unit (ERSU) which supports energy research projects in the universities, and will co-ordinate the Engineering Board's specially promoted programme in energy and materials conservation in the appropriate processing industries. He will also act as a link with government and industry defining areas where SRC support would be beneficial.

Dr Butterworth comes to us from Harwell where he is currently assistant Head of the Energy Technology Support Unit.

## Sales to Employees

Sales of scrap metal/plastics as set out in RLN 12/73 will be made on March 14 and 28 at the scrap compound, near R40 from 1200 - 1230 hours.

## Thanks

Charles Gascoigne would like to thank all at the Laboratory, who contributed to his farewell gift, also for his wife's bouquet. "Sorry I couldn't see you all before leaving" he writes. "All the best; keep mowing!"

Mr W Mears would like to thank all friends and colleagues for their generous gifts on his retirement, and apologises to those friends he did not manage to say farewell to personally. "Best Wishes to all" he writes.

## STELLA

On 6 March, the STELLA earth station at the Atlas Centre, Rutherford and Appleton Laboratories, was linked to its fellow installation at CERN, in a demonstration of the rapid transmission of high energy physics data via satellite, as part of an inauguration ceremony to mark the start of the European STELLA experiment.

As reported in the Bulletin of 10 Dec the aim of the experiment is to develop a reliable and easy-to-use service to transmit large blocks of data at high speed from the International accelerator centres back to home bases, and to provide information useful for the planning of Europe's communication of the 1980's. Collaborating in the experiment are the Commission of the European Communities, the European Space Agency, and the Laboratories at CERN, DESY, Saclay, INFN Pisa, Dublin, Graz, and Chilton.

## OVERSEAS Visits

R J Gray to CERN from 10 Mar-2 Apr to work on WA62 experiment.  
S Lovesey to DESY from 10-12 March to present paper.  
J Tomkinson to ILL from 10-27 Mar to carry out experiment on IN4 and IN1B  
C J S Damerell to CERN from 11-28 Mar to work on NALL.  
F E Close to Amsterdam from 12-14 Mar to visit University.  
D Clarke to DESY from 14-24 Mar to work on JADE.  
R Marshall and S Yazaki to Les Arcs from 15-21 Mar to attend Rencontre de Moriond.  
J C Hart to DESY from 16-21 March to work on TASSO.  
A K Nandi to CERN from 17-27 March for discussions.  
A Astbury to CERN from 23-27 Mar to work on Expt.204.  
P G Davey to W Germany from 23 Mar-4 Apr to contact robotic researchers.  
J B Forsyth to ILL from 24-27 Mar to attend meeting of instrument sub-committee.

## Film Badge Notice

It is period 3. Colour strip BROWN for beta-gamma films.  
Please check that you are wearing the correct films and all old ones are returned.

Next Film Change  
Monday 24 March.

## Christian Fellowship

Everyone is welcome to join us on Thursdays at 1230 hours in Conference Room 6, Building R2.

- 13 March The monthly meeting for prayers and praise will be led by David Bell.
- 20 March This will be a Bible study meeting -- the subject and leader as yet to be arranged.



## It's been a Pleasure



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On Monday 25 February, a ceremony took place in the R2 Workshop to mark the retirement of Mick Mears, a "Rutherford supporter" since 1961.

He was presented with a handsome carriage clock and a suitcase, a farewell gift from his many friends and colleagues, by David Gray. Mick's long career at the Laboratory spanned from beginning to end of the Nimrod era, throughout which he had played a great role in the preparation of Nimrod and in the task of "keeping it on the air". Always keen and knowledgeable on survey and alignment work he had maintained this interest throughout his time with us.

"Let me thank you for all the work that you have done for the Laboratory", said David, "and wish you all the best in your retirement."

Mick thanked everyone for their good wishes, - he appreciated the generous parting gifts. He and Nimrod had served together -- now, he felt, as Nimrod had gone, there was no point in his staying. "Thank you and Good luck" he concluded.

On Friday 29 February two more of our colleagues left us. Cyril Briscoe's friends gathered in R2 Conference room to wish him well for the future. David Gray was again in action, outlining Cyril's valuable work at the Laboratory and making the presentation of an Electric Hammer Drill.

Cyril had joined us in 1955 as a member of a small but happy band developing Grounded-grid Triodes for the PLA (no suitable commercial valve existed). They proved highly successful and once the PLA was running, Cyril continued to nurse the GGT's making new cathodes, assembling and re-pumping them. In 1968 with the closure of the PLA he moved to the Nimrod vacuum section where his knowledge of vacuum and mechanical skill continued to prove invaluable.

Lastly he applied his expertise to making the small, intricate parts of the first ion source, helping Peter Gear and Reg Sidlow, - who are already missing his assistance in this project.

All Cyril's colleagues are sorry he has had to retire due to ill health and will miss him and the help he has given them over so many years in his own quiet and cheerful way.

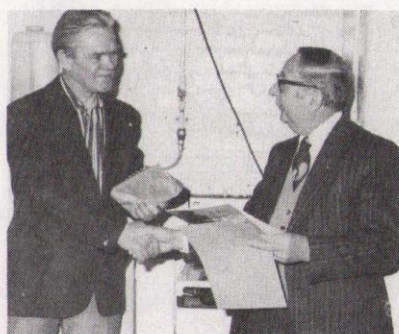


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Cyril thanked everyone for the gift; "It was a sad day for him" he said, "I never thought to have to retire for reasons of ill health. It has been a pleasure to work with you all, - thanks for everything."

At the same time, on another part of the site, R18 workshop to be exact, Ernie Boyers was being wished farewell by his friends and colleagues.

Bert Brooks gave a resumé of Ernie's career, which appeared to feature numerous returns to Sunderland Forge, and remarked that as Ernie had been with us for twenty years, we can't be too bad -- or Sunderland Forge must have gone out of business! He hoped that the parting gifts which he was presenting on behalf of Ernie's friends and colleagues would remind him of the happy days he had spent at the Laboratory and especially the many fascinating hours he had spent completely engrossed in portable tool testing!



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"Thank you Ernie for the work you have done for the division over the years," he said. "These gifts are a small token of the esteem in which you are held by your colleagues, and with them come our very best wishes for a happy retirement."

Ernie replied that he would make his thanks brief -- he knew how keen everyone was to get back to work! He thanked them all for the beautiful wrist watch, and wonderful mounted model of an engraving tool. He had enjoyed working with them all these years, and would express his gratitude in a more concrete form at the 'local' later.

## Lunchtime Laughter

WEDNESDAY 12th MARCH AT 12.30

TONY HANCOCK - "TWELVE ANGRY MEN"

MONTY PYTHON - AMNESTY INTERNATIONAL PERFORMANCE  
(Including "THE COURTROOM SKETCH")

This is something of a departure from our usual lunchtime music but some songs are included e.g. "The Lumberjack Song" - a stirring invocation to the healthy outdoor life and Cole Porters "Anything Goes" - but not THE Cole Porter apparently.

There are interesting comparisons, for students of humour, in the comedy treatment of "Great British Justice" between Hancock in 1959 and Python a decade or so later. Both are uproariously funny but show completely different attitudes to the system and approaches to the topic. Hancock shies coconuts, Python pokes with a sharp stick. Who scores the most? Well, come and judge for yourself - as it were.

## Folk Club

Our next meeting is on Friday, 11 April at 8pm in the Restaurant Coffee Lounge, featuring a very popular northern trio, "Roaring Jelly" who have a repertoire that spans the whole folk scene. We are very fortunate to be able to book this trio, who normally play the northern circuit.

We also have 'Jack Holt' from Reading who sings contemporary and traditional folk songs. Everyone is welcome.

Tickets are £1.40 at the door or £1.20 in advance from:

John Ellis Ext 6369/494  
Alan Hodges Ext 6323



Deadline for Insertions

# BULLETIN

1000 hrs Monday 17 March

Editor: Jean Banford

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