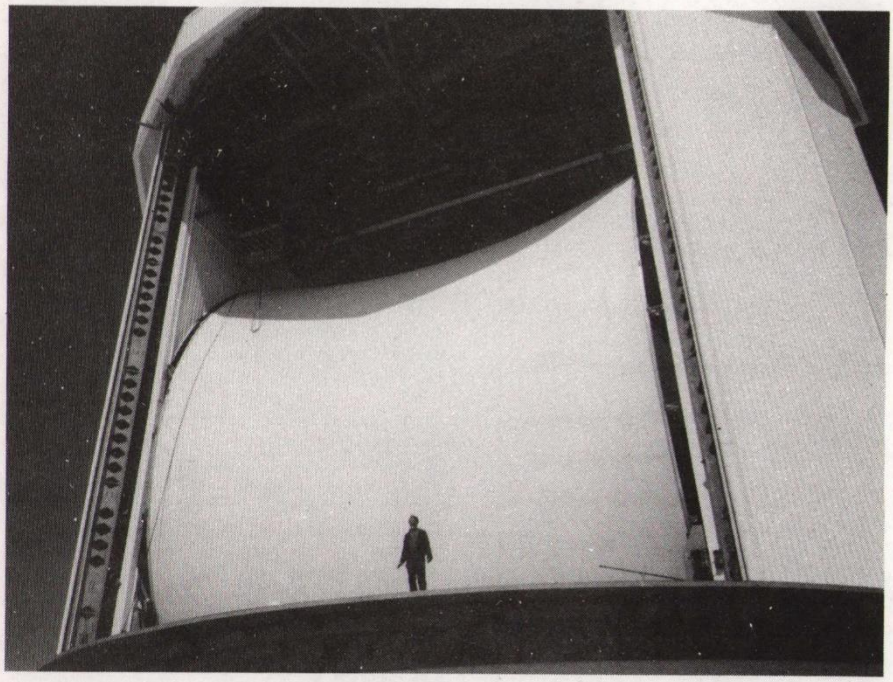
Bulletin
of the Rutherford Appleton Laboratory
28 April 1986 No.4

The James Clerk Maxwell Telescope



The Telescope enclosure showing the membrane installation.

The UK/NL Millimetre Wave Telescope is to be called The James Clerk Maxwell Telescope (JCMT) after the famous physicist.

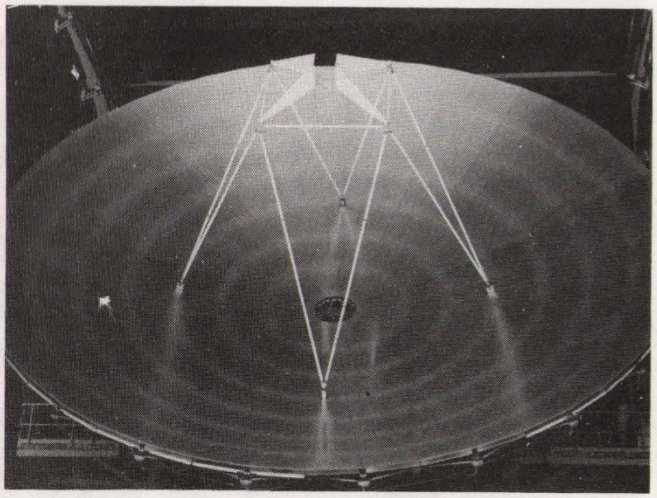
James Clerk Maxwell was born in Edinburgh in 1831 and was educated at that University. He later became the first Cavendish Professor of Physics at the University of Cambridge. His contributions to physics spanned essentially the whole of the discipline but his key contributions lay in the theory of electromagnetism and in the kinetic theory of gases. In the latter field he discovered the velocity distribution of atoms and molecules in gas, known as the Maxwell Velocity Distribution.

Of greater relevance to astronomy, he discovered the laws of electromagnetism through a brilliant piece of mathematical physics. In making these discoveries he showed that light is a form of electromagnetic radiation.

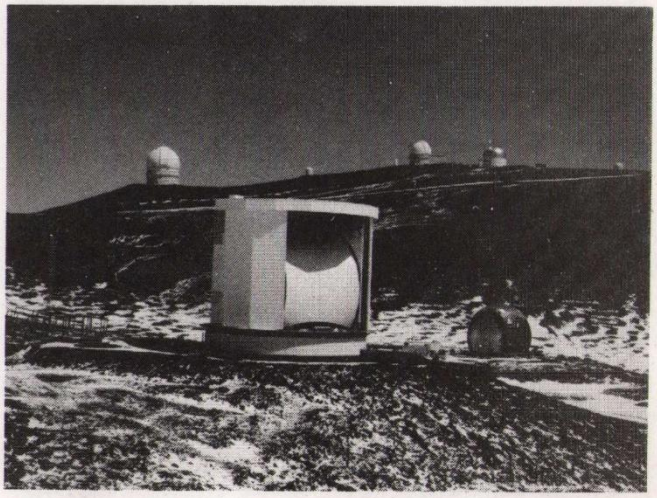
The telescope is now nearing completion in Hawaii

Some tests have already been carried out, in particular, the azimuth and elevation drive systems have been operated to the specification. A full programme of technical and astronomical commissioning has been defined and is expected to be completed in time to hand over to the Royal Observatory, Edinburgh, for operation to begin in April 1987.

R W Newport



Completed antenna surface of the JCMT.



JCMT with Mauna Kea Observatory in the background.

CCDs for Detecting Charm Particles

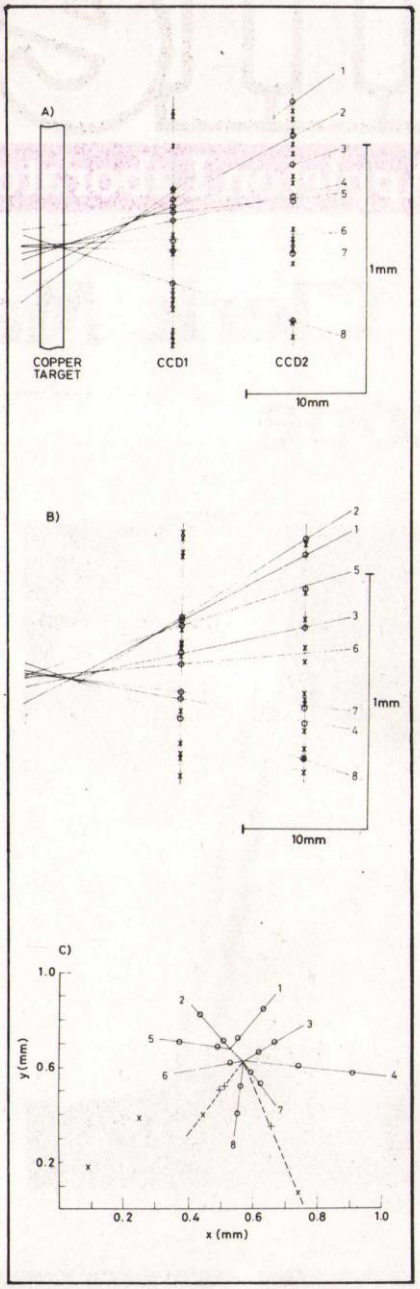
Five years ago, a group at the Rutherford Appleton Laboratory started to develop the application of imaging CCDs for precise tracking of high energy particles. The aim was to detect the decays of the short-lived charm particles which are produced in high energy collisions. This work has come to fruition in an experiment on the CERN SPS by the ACCMOR Collaboration (Amsterdam, Bristol, CERN, Cracow, Munich, Rutherford). The figure shows the first of many charm decays which are being found in the data analysis.

Pions of 230 GeV/c collide with nuclei in a 2 mm thick copper target. The tracks of the outgoing particles are reconstructed by computer and are illustrated in Figure A. Note the distorted scale used for visual clarity; the real tracks are all in a very small forward cone. Also shown are the CCD hits used in the track fitting (circles) and unused background hits due to out-of-time beam tracks (crosses). Apart from the production vertex, Figure A shows clearly a decay vertex made up of tracks 1, 2 and 5 and possible 3, which looks compatible with both vertices. The beauty of CCDs is that they measure space points (being pixel-based devices) and so one can get further information by rotating the viewing direction about the beam axis. This is done in Figure B, where one sees that track 3 indeed comes from the primary vertex.

The clearest visualisation is to look face-on at the CCDs; this is seen in Figure C, a beam's view of the event. Virtually all the background hits disappear (being beyond the range of the plot in X or Y) and the event topology is obvious to the eye. Note that this reveals two additional tracks (broken lines) from the primary vertex, which were not found by the reconstruction program, since they fell outside the acceptance of the rest of the spectrometer.

The decay tracks 1, 2 and 5 are identified by Cerenkov hodoscopes and the magnetic spectrometer to be a π^- of 18.80 GeV/c, a K^+ of 22.35 GeV/c and a π^- of 43.22 GeV/c respectively. These reconstruct to an effective mass of 1869 ± 6 MeV so we are looking at a D^- decay. The lifetime was 5.48×10^{-13}s.

Note that CCD1 reconstructs 8 hits within 0.04 mm^2, a density of 200 hits/mm^2. With these very accurate detectors which can be placed so close to the interaction point, we have a "vertex microscope" of unprecedented precision. It is hoped, using data already on tape, to determine precisely the lifetimes of the shorter lived charm particles F and A_c.



A much larger CCD vertex microscope containing 200 rather than 2 detectors is being prepared by the RAL group and physicists from Brunel University for a study of multi-vertex events in the SLD spectrometer at SLAC. It is expected that the Z^0 will provide a particularly rich source of new physics via the decays of charm, bottom, tau leptons, and possibly new short-lived particles. The specially low noise CCDs used are produced by the GEC Company of England.

C Damerell

RAL Lectures

The next lecture in this series will take place on Thursday 1 May 1986 at 3.15 p.m. in the R22 Lecture Theatre.

"GENES AND CANCER"

by

SIR WALTER BODMER

Imperial Cancer Research Fund Laboratories

There are many lines of evidence to suggest that cancers arise from a single cell by a series of changes or mutations in different genes. These successive mutations enable the cell to escape from its normal growth controls and become a highly malignant disease, spreading throughout the body, which we call a cancer. The study of viruses which can cause cancers in animals and experimental model cellular systems, together with the application of modern genetic engineering techniques, has identified some of these genetic changes quite specifically and helped us to understand how they contribute to the progress of a cancer. Some of these changes are associated, strikingly, with visible abnormalities in the chromosomes of cancer cells.

The statistical distribution of different types of cancers in different countries suggests that environmental factors play a major role in causing the disease. Nevertheless, there are inherited cancer susceptibilities and these may provide important clues to the mechanism by which cancers arise. Genetic engineering techniques, here also, are providing a new and powerful approach to identifying and understanding inherited susceptibilities to cancer.

Obituary

Charles Greenhalg

We are sorry to announce the death of Charles (Charlie) Greenhalg at Reading Hospital on 15 March. Charlie worked in R2 workshops on the maintenance of Nimrod and later on the building of ISIS, until his premature retirement in 1984.

An amusing and cheerful character, he will be sadly missed by all who knew him.

He leaves behind his wife Philly and three married children, to who we send our deepest regrets.

Donations to the Cancer Research Fund may be made in his memory via A B Walker & Sons, Eldon House, 36 Eldon Road, Reading, Berks, who will include the donors name on a card to Charlie's family.

Possible RAL Involvement with SDI

I know that there has been some concern in the Laboratory over the question of our possible involvement in the SDI programme. Some statements have appeared in the Press which are inaccurate.

I have recently written a letter which reads as follows:

"RAL's role is to provide support for University research selected by the SERC's peer review system. 90% of our programme is to this end and is determined by Council or its Boards and Committees. We have more than 4000 external users, mainly from the Universities, supported by our resources. RAL is a completely open Laboratory and none of our staff requires security clearance. This is basic to the whole of our policy and we will not accept any programmes that compromise this fundamental issue.

10% of our programme is commissioned research for other Government Departments or for industry. Our policy is that RAL staff will only undertake such work providing it satisfies the following criteria:-

a. It does not require RAL staff to have security clearance.

b. It is consistent with RAL remaining a Laboratory open to all comers.

c. It is supportive of, and relevant to, the RAL/SERC programme.

d. The work will be open and published, although we do accept work where publication may have to be delayed for commercial reasons.

e. Staff can be made available for the commissioned work without prejudice to the SERC programme.

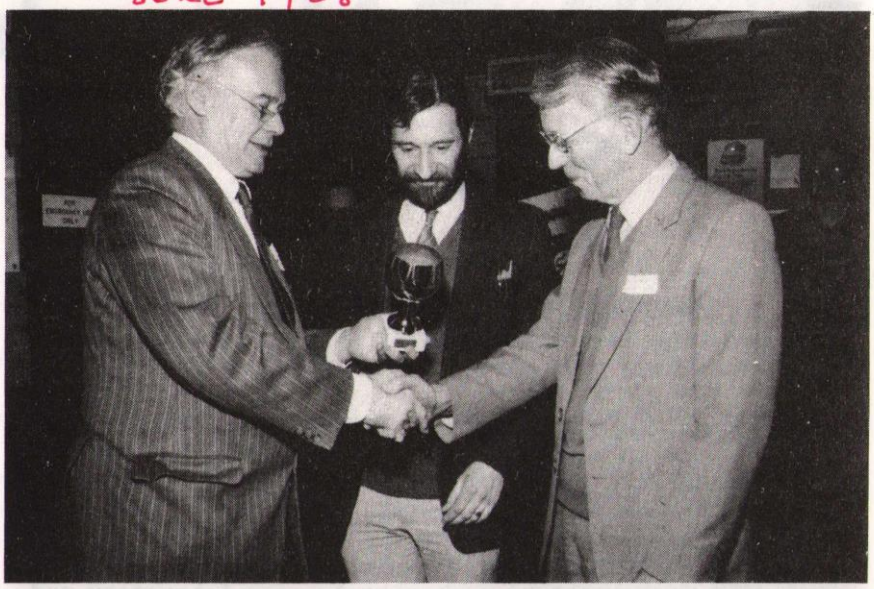
If I now turn to the SDI programme RAL has not agreed to build a laser system for the SDI programme. We have made a provisional proposal but on the clear understanding that the policy given above is accepted. No commitments have been made by the SDI Office, SERC or RAL.

I hope this statement corrects some of the misconceptions created by inaccurate reports in the press."

G MANNING
21 Apr 86

Indoor Sportsday 1986

86RC 1708



One of the most successful Sports Days for the Lab! A record number of personnel attended the event at the Oasis Sports Centre at Swindon, and we also won the majority of events. The only hiccup was the cancellation of the Evening Disco at the last minute due to lack of support.

CHESS. The event was run this year for the first time in 3/4 years and it was nice to see 9 players taking part. After an all-play-all competition the winner was Martin Bush of RAL with Mick Morton of Central Office runner-up.

DARTS. A rare defeat for the Lab. This was the first time an RAL team had not won since the Sports Day started. But, as usual it was a good tournament with lots of good darts thrown. Daresbury won!

BADMINTON. At last Wolfenden and Wootton have been beaten in the Men's Doubles! After dominating the event for years they were beaten (just) 20-21 in the final by Richard Lawrence and Ralph Duffill - of RAL, of course.

86RC 1709

The SERC Chairman, Prof. Bill Mitchell presents trophies to RAL winners at Indoor Sportsday.

Chess -(left) Martin Bush

Snooker -(top right) Richard Stephenson and John Jones

Table Tennis--(centre right) Paul Hedlund Eric Thomas, and Peter Kent.

Bridge - (bottom right) Reg Barnard and Peter Parry.

86RC 1704

86RC 1707.

The Ladies Doubles was won again this year by a Central Office team. RAL Ladies just can't seem to get together a pair able to break the winning streak of the C.O. girls.

CRIB. The RAL teams after dominating this event for years seem suddenly to have lost their touch. Central Office won this one too.

SQUASH Five teams entered again this year, three from RAL, one from CO, and one from Daresbury. A strong team from Daresbury threatened to take the trophy, despite a missing team member, but the weight of RAL team B wins finally told and we edged through to win. Unfortunately, none of the winning team were able to attend the prize giving, needing to leave early; however, the trophy was not available, leaving the sad situation of no one to receive a trophy that did not exist! Anyhow, all had a good, if exhausting day, and thanks to all who took part.

Winning team: John Ballard, Nick Whitehead, Martin Purling.

BRIDGE RAL Bridge Club were determined to defend the cup they won last year and as a result (though last years winning pair was unable to participate) managed to enter nine pairs. As usual last minute re-shuffling had to be done due to prevailing northern winds bringing 'flu and similar ailments.

Central Office and RGO were the other original participants but RGO had to drop out. So, a lively enjoyable 30 hands duplicate bridge was played from around 1300 to 1730 hrs - with a suitable interval for refreshments. The room in the Oasis was very small and was shared with the chess players. In future Bridge could certainly do with a quieter venue.

At the end of play, tournament director Terry Patterson, his partner and Hari Shah evaluated all hands and RAL's Peter Parry and Reg Barnard emerged winners. RAL retained the trophy. All teams were of a pretty high standard - including first-time entrants - as the closeness of the scores showed.

For those who do not know, RAL Bridge Club plays regularly at lunchtimes on Tuesdays and Wednesdays, usually in R61 Conference Room. Do come along!

Thanks to Peter Craske, Hari Shah, and Nick Whitehead for these reports.

Thanks

"Dear Friends", writes Sylvia Norris "Thank you very much for all your good wishes and the beautiful 'cello bow - I am delighted with it.

I feel very lucky to have worked with such a good bunch over the years and I shall think of you often (every time I play a wrong note). All the best to you in the future."

Cambridge Univ Telephones

Cambridge University have recently changed their telephone system. The numbers that used to exist for individual departments have now been changed. All enquiries should be directed to their operators:

Cambridge (0223) 337733 or 3045 on the RAL Short Code.

A large number of their extensions have been put on Direct Dial In (DDI). To use their DDI system dial:

Cambridge (0223) 33XXXX or 3178XXXX on the RAL Short Code.

where XXXX represents the extension number.

If an extension is not on the DDI system it will automatically be switched to their switchboard operator.

Film Badge Notice

It is period 5 Colour strip ORANGE Please remember to wear the correct dosimeters and to return all old ones to Jenny Coates.

Due to the ISIS shutdown there will be no issue of neutron packs for periods 5 and 6. All outstanding red packs should be returned immediately. Neutron source users please 'phone Jenny Coates, Ext. 5430.

Missing

These items are the subject of loss reports. Please relay information on their whereabouts to the enquirer.

"Tektronix Camera type C30 A/R
Serial No. 021204. V006115

Fluke Multimeter type 8000A-02
V007789

Piers Eggett Ext. 6546.

Coffee at Cosener's

There will be a coffee morning at The Cosener's House, Abingdon on

Thursday 15 May

from 10.30am until noon. Please try to come along, especially if you are a newcomer or visitor. Pre-school children are always welcome.

On Thursday 19 June our coffee morning will be held at Sheila Harries' house at

38 Oxford Road
Cumnor

where we hope to be able to go outdoors if weather permits. We look forward to seeing you there at the usual time of 10.30am until 12.00pm.

Internal Events

GEOPHYSICS SEMINARS
R68 CONF RM - 1400 hrs

6 May Dr D Rees/UCL
'High Resolution Spectroscopy and Imaging Techniques in Remote Sensing.

13 May Dr R Wayne/Oxford
'Contribution of Laboratory Kinetics to Problems in Atmospheric Chemistry'

20 May Mr D Hall/RAL
'Electrons - from the Sun to the Aurora'

ASTROPHYSICS SEMINARS
R61 CONF ROOM - 1400 hrs

7 May Dr G Skinner/Birmingham
'Results from the Coded Mask Telescope on Spacelab 2'

COMPUTING SEMINARS
ATLAS COLLOQUIUM - 1515 hrs

13 May Peter Stocker/E. Anglia
'Specifying the Information in a Database for Man, and for Computer System'.

NIMROD LECTURES
R61 CONF RM - 1400 hrs

12 May K Ragan/Geneva
'First Observation of Ω^* Resonances

19 May M Niato/Copenhagen, Los Alamos.

Meanwhile, we wish to thank Mrs Flynn, Manageress of The Cosener's House, and her staff, for providing us with such an excellent buffet supper last Friday 18 April. We all enjoyed a wonderful evening.

Watch this space for details of our events, and let us know if you wish to be placed on our mailing list. Also, may we remind husbands that it is always up to them to keep wives informed!

For information about our gatherings, please contact:

Celia Lockwood
6 Long Barn
High Street
Sutton Courtenay
Tel:
Abingdon 847266

Zoé Patrick
3 Bosley's Orchard
Grove
Wantage
Tel:
Wantage 68809

Suggestions Awards

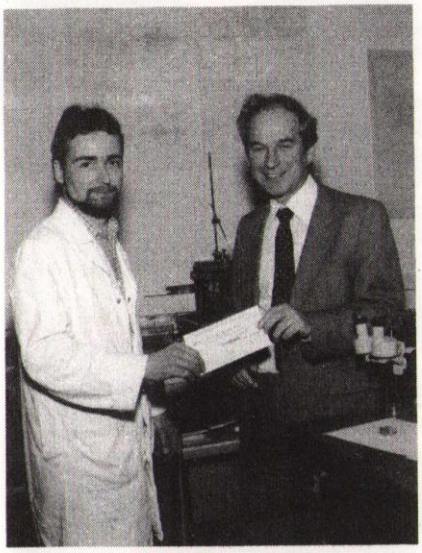
Two sizeable awards gained under the SERC Suggestions Award Scheme were presented in March.

Apprentice Trevor Timpson received £150 for his novel and simple method of coping with an intransigent foam material being used to produce light sealing gaskets of specific cross-section for the OPAL experiment. These could not be cut accurately by standard methods. Using scrap materials and a borrowed air-motor, Trevor cut wastage on the work from 100% to almost zero.

David Bailey of R25 workshop was presented with £500 for an idea, simple but technically much more difficult to acheive. Components for devices, urgently needed for the UK contribution to the Microwave Limb Sounder experiment on the Upper Atmosphere Research Satellite, were being delivered late and faulty.

The suggestion which David formulated and implemented avoided a long delay in the delivery of our Engineering Model to the USA avoiding considerable embarrassment and cost to the UK in this International programme. The tooling was difficult to manufacture and without considerable thought and a concientious attitude by David it would not have been a success.

David Bailey



86RC 2012

Both David and Geoff Manning (Director RAL) look happy with the Award.

Trevor Timpson

86RC 2008

Trevor receives his award from Ron Newport (Division Head, Instrumentation)

ISIS Continues to Impress

On Thursday 27 March ISIS reached its highest intensity when 5 x 10^{12} protons per pulse at 550 MeV and 50 pulses per second were delivered to the neutron producing target. This 40 microamperes of mean proton current is 20% of the design performance and confirms once again the potential of ISIS as the world's most powerful accelerator-based pulsed neutron source.

Much hard work had gone into achieving this important milestone. It was the first time that there had been a sustained run at 50 Hz and confirmed that all systems are capable of performing at the design repetition rate. Just prior to this highest intensity run, with 4 x 10^{12} ppp hitting the neutron target 80% of the particles from the injector were transported to the target station. Efficiency of injection into the synchrotron was typically 96%, trapping and acceleration efficiency was 86% and extraction efficiency 99%. The large majority of the protons lost in the trapping and acceleration process found their way to the installed beam collection system as designed. In general the synchrotron and target station equipment has reached the reliability expected at this stage.

Shutdown Plans

Sustained running of the facility has been curtailed because some of the complex equipment in the injector has not been sufficiently reliable. The two main systems giving problems have been the pre-injector and the modulators for the RF system for the linac. The 665 kV pre-injector column sparks over at a frequency which depends on the mean current being accelerated. By fitting extra electrodes to the inside of the column to shield insulators between the electrodes a factor of about 50 improvement has already been made but further improvements are needed. The main effect of the column spark-over is to cause damage to low level solid state electronics and power supplies. A strong attack on these problems is being made in the current 3-month shutdown.

In the other area, the modulators, where there are high voltages (35 kV) and high power (2 MW) radio frequency pulses there is also consequent damage to lower level components in the case of faults in the high level components. Again there is a plan for an intensive schedule of work during the shutdown.

Muon Beam Installation

Also during the shutdown, major installation work will take place on the first stage of the muon spin rotation and resonance beam which is funded by the EEC, France, Germany, Italy and others. This beam is designed as the most powerful muon beam for the study of condensed matter.

On the target station further improvements will be made and the front ends of 3 new neutron lines will be installed. The remaining 2 RF cavities will be installed on the synchrotron to permit trials of operation towards the design energy of 800 MeV. However, priority will be given to the injector work so that we can achieve a period of reliable running for the neutron scattering research programme during the second half of this year.

D A Gray

FRS for Prof. Bill Mitchell

Professor Edgar William John (Bill) Mitchell, CBE, Chairman of the SERC was elected Fellow of the Royal Society on 21 March for his many contributions to solid state physics, particularly through studies of electrons and defects in solids, and of molten salts, by optical and neutron scattering techniques.

Congratulations.

Sales to Employees

The sales of scrap materials will take place at the R24 Scrap Compound from 1200 - 1230 hrs on 2, 16 and 30 May.

Retirements

Sylvia Norris

Sylvia Norris fitted so much into a working life, that the miriad plans she has for the future came as no surprise to the many friends who came to wish her well at her retirement presentation on Tuesday 25 March.

The changes in computing since she joined RAL in 1958 have been vast but the challenges were met and mastered with the calm and competance which has led to the high esteem in which Sylvia is held. A lively intellect, wide ranging interests and a genius for stimulating conversation and ideas has earned her, also, great affection.

Music has always been a joy to Sylvia - she has sung in Oxford choirs for many years, and is now learning to play the 'cello. Travel and languages will continue to be on his list of pleasures (she's learning Turkish) and computing will not be abandoned (consultancy was mentioned).

Making the presentation of a 'cello bow, Paul Thompson thanked her for her tremendous work for the Laboratory. "This is a token of our great love and affection," he said.

"Thank you all very much for coming to wish me goodbye - though I hope it's not goodbye," Sylvia replied. "Thanks for the wonderful things you've said about me Paul. If they are all true, I wonder why I'm not a PSO," she gently enquired with one of her enigmatic smiles.

Albert Taylor 86 Rc 2033

In a packed coffee lounge on 26 March, Albert Taylor said his farewells to RAL.

Albert left his native Wales in 1961 to join the Laboratory as a Clerical Officer in the Personnel Group, and he must have found it suited. Out of 24 years service with the Council, 21 of them were spent in Personnel and all but one at RAL. His one sortie away was to Slough for a year, (personnel) and he did spend 3 years in HEP as DAO working for both Godfrey Stafford and Geoff Manning - so sinecure.

In retirement he will continue to improve his golf, learn the secrets of greenhouse horticulture and as a qualified cricket umpire, treasurer for Faringdon Football Club and Bremhill Park Golf Club will not find time hanging heavily on his hands.

Dr Jim Valentine making the presentation of a watch ("a timely gift") and a set of garden loungers, thanked Albert for many years of hard work and wished him well on behalf of all friends and colleagues.

Albert in reply thanked everyone for the gifts. He remembered, he said, that on his first sight of RAL, 24 years ago, he had thought, "I'll never stay there long! But - I'm glad I did, I've enjoyed it and made many good friends. Thanks, and the very best for the future".

Crib

The lunchtime league programme for 1985/86 has just been completed, 10 teams took part each playing 9 home and 9 away games.

CHAMPIONS - LIVE WIRES - with 32 points
RUNNERS UP - JOKERS - with 30 points

LIVE WIRES team: Janice Brown (captain)
Geoff Brown
Ken Miles

JOKERS team: David Kent (captain)
Andrea Roberts
Maureen Smith
Cyril Watkins
Brian Wheeler

Congratulations to these and thanks to all those taking part.

The results were close - Oddbods scored 30 points but had one fewer wins than Jokers - only 5 points separated the first 6 teams - and the team with the fewest points scored 21.

CRIB EVENING

The annual gathering for an evening of Singles and Doubles competitions will be held on Friday 9th May in the Rec Soc building R58.

Play will commence at 7pm sharp.

The bar will be open and light snacks available.

Entry fee £1 per head.

Entries as soon as possible please to Tony Lubbock Room 2.66 R1 (or through team captains).

Christian Fellowship

The fellowship meets in R2 Conference Room at 12.30 pm on Thursdays. Visitors are always welcome.

Programme for May.

1 May Bible Study - Trevor Lucas
8 May Prayer Meeting - Frank Smith
16 May Music & Praise - Steve Walters (note - this is a Friday)
22 May "Personally Speaking" (suggested reading beforehand - Acts 2)
29 May Tape Presentation - Eric Greenslade.

Many thanks to all those people who contributed to our Easter Bookstall. An amount of £5.34 has been sent to TEAR fund, (The Evangelical Alliance Relief Fund) as a result.

Barn Dance Club

Come and learn to Barn Dance on Tuesday Lunchtimes in Building R58.

Enquiries to D Cragg Ext. 6620
or K Knight Ext. 5123

Bulletin

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