

Bulletin

of the Rutherford Appleton Laboratory

27 Mar 1984 No.5

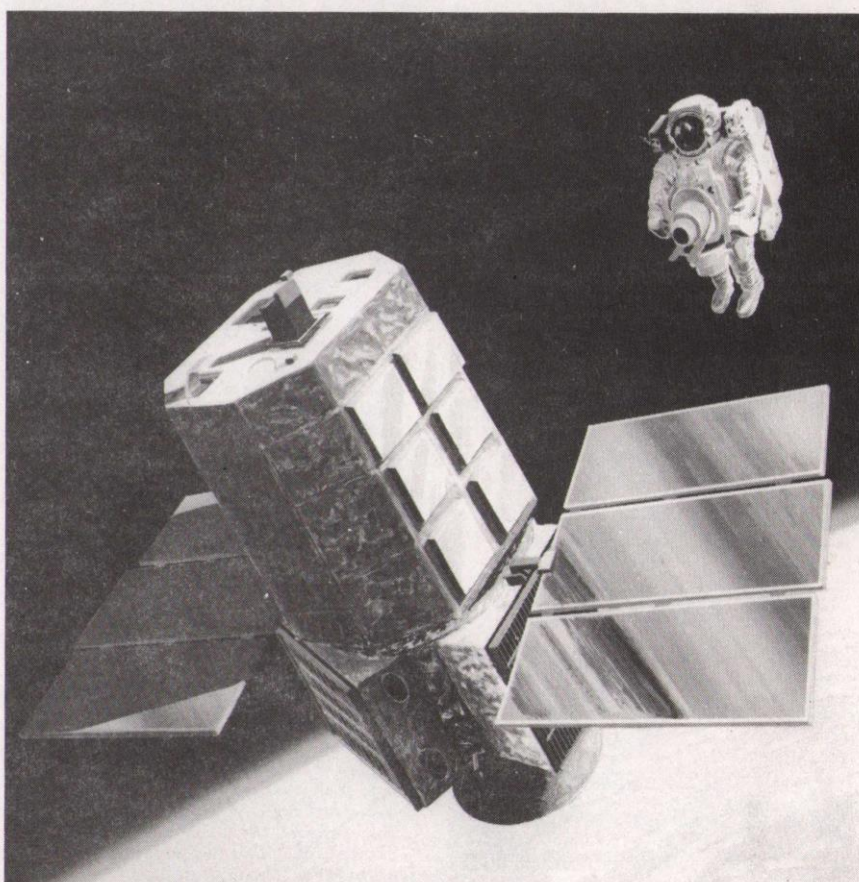
SMM Satellite - First Repair in Space

On or about 6 April the Space Shuttle will be launched by NASA from Cape Kennedy in order to carry out one of the most ambitious manned space activities yet performed. The NASA Solar Maximum Mission satellite, launched in February 1980, has been unable to continue its planned observations since it developed a fault in its fine pointing system nine months after launch. Some of the instrumentation on board is provided by the UK, and the RAL has a major responsibility for the X-ray spectrometers. This repair mission, involving some of the most demanding tasks for man in space, will if successful lead to a renewed period of operations for these instruments.

Solar Flare Study

The SMM was designed to study the phenomenon of solar flares - explosive energy release that occurs sporadically in regions near the surface of the sun, due to reorganisation of the energy stored in its magnetic field. A large flare can release up to 10^{32} ergs, equivalent to more than a billion megaton hydrogen bombs. Since this results in very high temperatures, the most dramatic effects lie in the X-ray and γ -ray regions of the spectrum, flares being detectable only with difficulty in the visible region. The SMM payload includes a number of instruments which together cover a wide range of wavelengths. RAL has a major share in one of these instruments, the X-ray Polychromator or XRP which was built jointly with the Mullard Space Science Laboratory and the Lockheed Palo Alto Research Laboratory. The XRP examines spectra in the range 1.5\AA to 22\AA , a critical region for the transfer of energy from thermal to non-thermal modes.

In its nine months of observations, SMM has collected much valuable data which has led to insight into the flare mechanism and greatly narrowed the choice between competing mechanisms for flare production. The XRP instrument has contributed with vital data on the physical conditions, recording temperatures of 30 million degrees K and densities of 10^{12} cm^{-3} .



Astronaut with Man Manoeuvring Unit approaching the SMM.

Artist's impression - NASA.

It has also made the first direct measurement of "chromospheric evaporation", the process whereby the atmosphere heated to high temperatures and pressures expands outwards with velocities of 400 Km per second. However because of the unprecedented complexity and versatility of the instruments, it takes time to develop and optimise the observing procedures. After only nine months of operation, many of the more challenging observing sequences have yet to be carried out. Thus the repair of the SMM is of importance, not to do more of the same thing, but to make new and more exciting measurements.

Repair Procedure

SMM was designed to be retrieved by the Shuttle at the end of its normal operation. However the failure of its attitude control, together with the aim to repair it whilst it remains in orbit, poses new problems unforeseen during its design. It is pointing approximately towards the Sun, but is rolling on its axis at about half a revolution per minute. In this mode it cannot be safely captured by the Shuttle's manipulator arm. The

(cont'd over)

SMM Repair (cont'd from p1)

planned sequence of operations takes three days, and is as follows:-

- After the Shuttle rendezvous with SMM in orbit, an astronaut sets out in his Man Manoeuvring Unit (MMU) to dock with the rolling satellite. This spectacular untethered space-walk was practiced on the last Shuttle flight and was seen on TV at the time.
- After docking, the MMU's gas jets are used to stabilise the motion of the SMM. A new docking adaptor is fitted by the astronaut, so that the Shuttle manipulator arm can get hold and bring it into the open Shuttle payload bay.
- In the bay, but still working in the vacuum of space, two astronauts undertake the repair. First the SMM attitude control module is exchanged for a new unit, then the control electronics box of one of the instruments is replaced. Finally a small fix is carried out on the XRP involving the fitting of a plasma baffle over one of the openings.
- After the repair, the shuttle will boost the orbit to a higher altitude in order to prolong SMM's future orbital lifetime. SMM will then be checked out on the end of the manipulator arm and again, after release.
- In the event that the repair has not been successful, SMM will be returned to the Shuttle and brought back down to earth.

We are looking forward to a renewed period of successful operation and some RAL staff are already installed at the Operations Centre at Goddard, in preparation.

Further information on XRP or the SMM repair can be obtained from Dr A H Gabriel (Ext 6206) or Dr J C Sherman (Ext 6367).



Please note that the Lecture arranged for Thursday 29 March 1984 by Professor G Musgrave of Brunel University entitled "Computer Aided Design", has been postponed until the Autumn session.

Missing

The following items are subjects of a loss report, and any information concerning them should be relayed to David Norgrove Ext 5694.

HP Calculator type 41C No RO 22230
HP card reader type 41C No RO 22736.

Obituary

Bob Carr

We regret to report the death on 29 February 1984 of Bob Carr, who retired from SNS Division in April 1980.

Bob had been ill for a few months but he died quite suddenly without realising his wish to visit the SNS on Open Day, a visit which was planned only a day earlier.

He worked in the experimental areas during the period of intense use of Nimrod for experiments before becoming Group Leader responsible for mechanical installation and maintenance on Nimrod, and building the new 70 Mev injector. He saw the close down of Nimrod and the start of the SNS.

Bob gave himself wholeheartedly to his work, enjoyed a challenge, had strong opinions and was not afraid to voice them. Nevertheless he was a compassionate man, a quality borne out in his care for his staff and his family and in particular, in his love, and pride, for his three grandchildren.

To his wife Laura, daughters Maureen and Linda and their families we offer our sympathy and support.

Acknowledgement

Mrs Rosemary Craddock wishes to thank everyone at RAL for their kind wishes and the beautiful floral tributes received during her recent bereavement.

That so many of her husband David's friends and colleagues attended his cremation pleased and comforted her, she writes.

Alvey NAG Toolpack

Workshop

A workshop will be held on Tuesday 10 April 1984 at the Rutherford Appleton Laboratory, jointly organised and supported by the Software Engineering Division of the Alvey Directorate and the Numerical Algorithms Group.

The aim of the Toolpack project is to develop a systematic and powerful collection of software tools to assist in the development and maintenance of Fortran programs. The first public release of the Toolpack suite is due later this year.

The Workshop will begin at 10.00am. Presentation and discussion sessions are planned to finish around 5.00pm, with the informal demonstration session ending at 6.00pm. Luncheon facilities will be available at the Laboratory.

For application forms please contact Lilian Valentine Ext 5629.

SNS Open Day

An invitation to local councillors, RAL families and friends on Saturday 10 March to an SNS Open-day proved very popular. Over 50 district and parish councillors attended the morning tour where, after an introductory talk by the Laboratory's Director, Dr Geoff Manning, they were conducted by SNS staff around the facility, tracing the path of the particle beams from ion source to target.

The afternoon, given over to families, was also well attended, much lively explanation being given to very impressed audiences of yet another RAL world-class facility.

The Spallation Neutron Source (SNS) will be the world's most powerful neutron source, serving an extensive community of research workers who use neutron scattering techniques for their studies into the structure of materials. These vary widely from

RAL Dete UOSAT 2

UOSAT 2, the second British spacecraft intended, primarily, as an educational stimulus to amateur radio space scientists, was successfully launched by NASA Delta rocket from the Western Test Range, Vandenberg on Thursday 1 March.

As secondary payload with the Landsat-5 satellite, UOSAT-2 (University of Surrey Satellite), carries as RAL's contribution to the project, four particle detectors. An invitation in October 1983 to the magnetospheric plasma section of G and R division to provide the detectors followed naturally from previous work done for UOSAT-2 (see Bulletin No 19 2 Nov 81) and the RAL packages were completed in 5 months.

Built by the Department of Electronic and Electrical Engineering of the University of Surrey at Guildford (Project manager Dr Martin Sweeting), UOSAT-2 carries scientific and engineering experiments for use by professional scientists and radio-amateurs together with educational experiments for schools and colleges. The Universities of Sussex and Kent are also involved as are the UK, USA and Canadian branches of the International Amateur Satellite Corporation (AMSAT).



The crowds came,

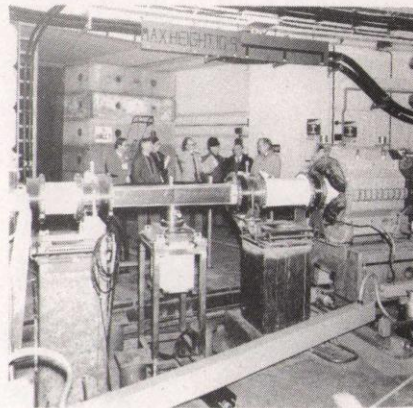
those interested in the reasons for stressing in concrete to how a 'flu virus is structured. The programme to be pursued will naturally be of real scientific interest, but immediately of real practical interest.

Recent successes with injection of beam, followed by several hundred orbits of the completed synchrotron magnet ring at first attempt, augur well for the next phases of



were fascinated

commissioning. The schedule for acceleration and transport of the beam to the target, the completion of the target station and the neutron scattering instruments, will leave little time for visits. An Open-day at this juncture, before final run-in to neutron production, seemed opportune, allowing guests to see not only the SNS hardware, but also something of the development programme being pursued.



and informed.

A random questioning of a few of our councillor guests, showed that they had been impressed by the scope of the work of RAL and a request that other aspects of our programme should be presented to them at a future date was welcomed by the Director. Several very appreciative letters have been received.

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Launched into sun synchronous polar orbit at a height of 700 km, the spacecraft takes about 99 minutes to complete one orbit. From the UK it is 'visible' above the horizon for three successive orbits, morning and evening (0900 & 2100 hrs) for a maximum of 14 minutes on each orbit. UOSAT's planned working life is about three years during which time it will be controlled from Surrey University with a back up station operated by AMSAT-USA.

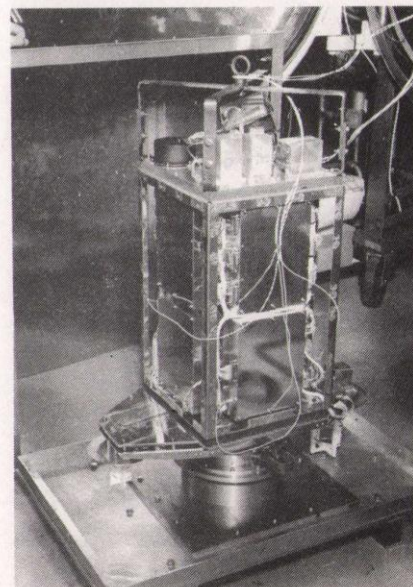
RAL Experiments

The four RAL electron detectors will, between them, provide invaluable information on the state of activity of the magnetosphere including its effect on the magnetic field in the auroral zone at the time of maximum auroral activity - 2100 hours local time. They will also allow the variable boundary between "closed" geomagnetic field lines and those stretching into the tail of the magnetosphere to be located and the rates of input of energy to the different regions of the ionosphere to be evaluated for comparison with effects recorded by EISCAT; the incoherent scatter radar in northern Scandinavia, for which RAL processes and distributes data to users in the UK.

The data from the particle detectors will be analysed primarily by the Universities of Lancaster and Sussex. The University of Lancaster will supplement the UOSAT data with data available from ground-based riometers and EISCAT. The outputs from electron sensor will also be used by the University of Sussex as input to their on-board experiment which is to measure the modulations imparted to particles as a result of wave-particle interactions in the magnetosphere.

The basis of three of the high energy detectors are Geiger-Muller tubes, designed to measure fluxes of electrons above threshold energies between 60 keV and 100 keV. The other detector - an electron spectrometer - is identical to those being used on the AMPTE UKS. This will serve as a near-earth reference for the magnetospheric studies to be performed concurrently with the AMPTE mission, due to be launched in August and the Swedish VIKING mission due for launch in early 1985; both of these missions carrying RAL experiments.

For further detailed information, on the RAL detectors please contact Hari Shah Ext 5688.



UOSAT 2 being prepared for thermal tests at RAL. The detectors are clustered on the top. Photo. AVAU Surrey.

Goodbye to Ken



Ken (left) and David admire the cruet.

After 37 years Ken Moye had more or less come to be regarded as a permanent fixture of the Harwell/NIRNS/RAL site -but all good things must eventually come to an end and so on Tues 28 February Ken's many friends and colleagues gathered together to wish him well and thank him for his comradeship and service.

Ken's association with Harwell began as far back as the war years when at one time he was stationed at Harwell as an air gunner. In 1947 he joined AERE and transferred to RAL (or NIRNS as it then was) in 1961 where he became Clerk of Works, having responsibility for cranes, lifts, etc and of providing support to the vacuum group. Atlas claimed him in 1970 to provide service maintenance for the computer systems. Moving to SNS he was involved with the SNS target (at one time the model he made was all there was of the target station), and the remote handling cell.

As David Gray remarked as he presented Ken with gifts of a set of bowls (the biased kind) and a stainless steel cruet made in the SNS workshop, "Ken has wide experience throughout SNS and indeed throughout RAL. We thank him for his many years of good work and wish him all the best for the future".

"How can I say thanks", Ken opened his speech of reply. I appreciate very much your kind words and generous gifts. I hope I can do the right thing with the woods. Thank you all so very much".

RecSoc Membership

RecSoc members are reminded that they should carry their membership cards when using any RecSoc facilities or participating in any RecSoc event. The current '83-'84 cards are yellow. The new green '84-'85' cards will be issued with your P45 annual pay statements, by Personnel in May.

The RecSoc committee will be carrying out frequent checks in R58 during the coming months to prevent use of the Clubhouse facilities by non-members.

If you have lost your card or wish to join, please contact T Morgan, R18

Tennis Club AGM

All members are invited to attend our first AGM on Wednesday 28 March at 12.30pm in the R68 (Watson-Watt) conference room. Please make every effort to attend this formative meeting.

Prospective members will also be very welcome but will not be entitled to vote.

As 1 April is the start of the new playing year, why not bring your subscription for instant membership. Enquiries to: Derek Jones, R20 Ext 5466.

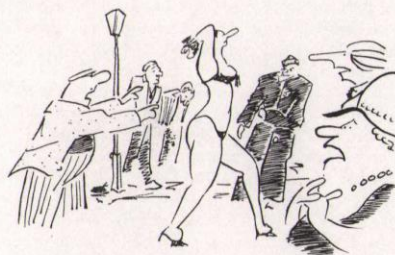
The Harlequin Players (ADC)
Present

Fur Coat and No Knickers

an adult comedy
by

Mike Harding

5th-7th April
AERE Social Club



tickets £150
from: Pam Coulthard Ext 6622

Two free-tickets to the play, to the person who comes up with the most appropriate caption to this advertisement!

Entries to Pam Coulthard, Ext 6622 - in writing please, by 3 April.

RAL Cricket Club

This year we plan to run an evening 6-a-side competition. It will be called the 'Dave Craddock Cup'. The competition is open to RAL employees only, who must be RecSoc members. Will anyone wishing to enter a team please contact R Newman.

We have also arranged a 4-day cricket tour over the holiday 26-29 May. We plan to play 3 one-day games against Daresbury Laboratory and some local sides. The total cost will be in the region of £25 each, plus 'beer' money. Anyone wishing to go, please send your name to R Newman, R2 Ext 5538. First come, first served.

'GCHQ' Meeting

At a meeting held on Tuesday 28 February in the R22 Lecture Theatre, the motion "This meeting wholeheartedly condemns the Governments' action at GCHQ in unilaterally withdrawing the right of an individual to belong to a Trade Union", was passed unopposed. Two hundred and fifty people, both union members and non-union members attended.

It was also resolved to notify all local MPs and Press and to send a petition to HM the Queen. A report of the meeting appeared in the Oxford Mail on Wednesday 29 February and the petition raised over 350 signatures.

Jan Szechi (Chairman, IPCS RAL Section)

RAL has a total staff of 1565.

Sales to Employees

The sale of scrap metal and plastics will take place (subject to the usual conditions) on 30 March and on 13 and 27 April in the R40 scrap compound from 1200-1230 hrs.

Film Badge Notice

It is period 4. Colour strip RED. Please check you are wearing the correct dosimeter, and that all old ones are returned.

NEXT FILM ISSUE

Monday 23 April

Editor: Jean Banford
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Deadline for insertions:

Friday 30 March

Bulletin

INTERNAL Events

NIMROD LECTURE SERIES

To be held each Monday in R61 Conference Room 3,
commencing at 2.00 (unless otherwise stated)

Monday 2 April

K Stelle
(Imperial)

"Finite theories in supersymmetry"

Monday 9 April

A Segar
(Oxford)

"Two jet signal and parton angular distributions at the ISR"

Monday 16 April

G Heath
(Westfield)

"Measurement of the pion charge radius"

Monday 30 April

"Dynamical rescaling and lepton scattering from nuclei" F Close
(RAL)

HEP SEMINARS

To be held each week in R61 conference Room 3,
each Wednesday commencing at 11.00 am, (Unless
otherwise stated)

Wednesday 4 April

J Hoek
(RAL)

"Hadron spectrum of lattice QCD near strong coupling"

Wednesday 11 April

T Bowcock
(QMC)

"Jets and Structure Functions from UA1"

Wednesday 18 April

J Smit
(Amsterdam)

"Flavor interpretation of staggered fermions at
weak coupling"

Wednesday 25 April

N Booth
(Oxford)

"Tackling the solar neutrino problem"

The editor apologises for the unorthodox presentation of this material -
due to circumstances beyond her control.

Sir John Adams

The obituary notice which appeared in The Times on 8 March 1984 is reprinted below.

Sir John Adams, CMG, FRS, who died aged 63 at his home near Geneva, designed and built high energy particle accelerators for nuclear physics research; played a leading role in building up CERN (Centre Européen pour la Recherche Nucléaire) at Geneva, the world's first international research establishment; and was a central figure in European engineering physics for 30 years.

John Bertram Adams was born on May 25 1920 and educated at Eltham College, London. From school he joined the Siemens Research Laboratories at Woolwich, working there until it was destroyed by enemy action. He was then directed to work at the government's wartime radar development laboratory at Swanage and then at Malvern.

There his work on short wavelength systems caught attention and he moved to Harwell in 1945 as a founding member of H.B.W. Skinner's general physics division. Under the project leadership of Gerald Pickavance, Adams engineered and brought into operation in 1949 Europe's first major post-war accelerator, the 180MeV cyclotron at Harwell, which operated successfully for 30 years.

It was here that his all-round mastery of the physics and engineering of complicated devices became apparent. He had a thorough grasp of all the details, and yet preserved a balanced view of the whole. Moreover, an artistic talent gave his work elegance. With Frank Goward and Mervyn Hine he turned to the design of larger, higher-energy circular accelerators; and moved to Geneva to join CERN in 1953.

The pioneering of this the first-ever international research laboratory was a major task shared between many colleagues. Adams was appointed Director of Proton Synchrotron Division in 1954, thus taking full responsibility for CERN's main apparatus. The 25 GeV proton synchrotron was the first high energy accelerator to incorporate the new strong-focussing principle invented in the USA.

Adams and his group brought this novel and very difficult machine successfully into operation in 1959, not only to cost and programme as forecast, but with a margin of performance which enabled the machine comfortably to exceed its design specification. It is still in operation. This achievement established both his own and CERN's reputation for good management; and provided the proven example of successful international cooperation on difficult scientific projects.

In 1960 he was appointed Director-General of CERN, but shortly afterwards was invited by the UKAEA and Lord Hailsham back to the UK to be Director of the newly-established Laboratory at Culham, for research on Controlled Nuclear Fusion, a post he was able to take up full-time in 1961. His skill as an engineer and planner completed the Culham Laboratory by the end of 1964 (again to cost and time) and it was opened, with a major international conference, by C. P. Snow in his ministerial capacity in 1965.

Unlike other UKAEA laboratories, Culham was designed as an open site with no classified work and a maximum of international cooperation: it rapidly became an important centre for research scientists on controlled nuclear fusion, from all over the world.

Adams was amongst the scientists and engineers who were harnessed by the Labour Government of 1964 to advise on major changes in the structure and objectives of government research laboratories. Adams was appointed (part-time) controller of the newly formed Ministry of Technology, and in 1966 Member for Research of the UKAEA, through which many of the applications to industry were inaugurated. With extensions made by Lord Rothschild, many of these features of the UK science structures remain today.

Adams's reputation and experience were of great value to the UK in overseas relations, especially with the Soviet Union which he visited with Mr Wilson, then Prime Minister, to set up the

Anglo-Soviet agreement on scientific and technical cooperation. As Academician Artsimovitch remarked after a successful piece of Anglo-Soviet scientific cooperation, "the good Lord has especially created Adams so that mankind may be provided with high energy particle accelerators".

Adams returned to Geneva in 1969 to lead his last great accelerator project, the 450GeV super-proton-synchrotron, brought into operation in 1976. This too proved an outstanding success, and still serves European researchers working on the ultimate nature of particulate matter. He served a second time as Director General of CERN from 1976-1980.

Adams was honoured with a CMG and a knighthood for his work as an architect of international scientific cooperation and for his engineering and scientific contribution to knowledge for which he was elected FRS. He was also awarded the Faraday Medal of IEE, and medals from Institute of Physics. His only degrees were honorary ones (Universities of Milan, Geneva, Surrey, Strathclyde and Birmingham).

He is survived by his wife Renie whom he married in 1943 at Malvern, and three children.

Sir John Adams never actually worked in the Rutherford Laboratory although he had strong connections with it. He was one of its founding fathers and remained, to the end of his life, a personal friend of many of us.

The connection started with the relationship - mentioned in The Times - between John Adams and Gerald Pickavance in the construction of the Harwell cyclotron during late 1940s. Discussions on a machine for university use led finally to the setting up of the National Institute for Research in Nuclear Science, the founding of the Rutherford High Energy Laboratory and the construction of Nimrod. Pickavance became the first Director of the Rutherford Laboratory in 1957. Adams had moved to CERN in 1953 but on his return to this country in 1960 he became a member of the NIRNS Board and remained one until 1964.