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Jean Bamford
R20

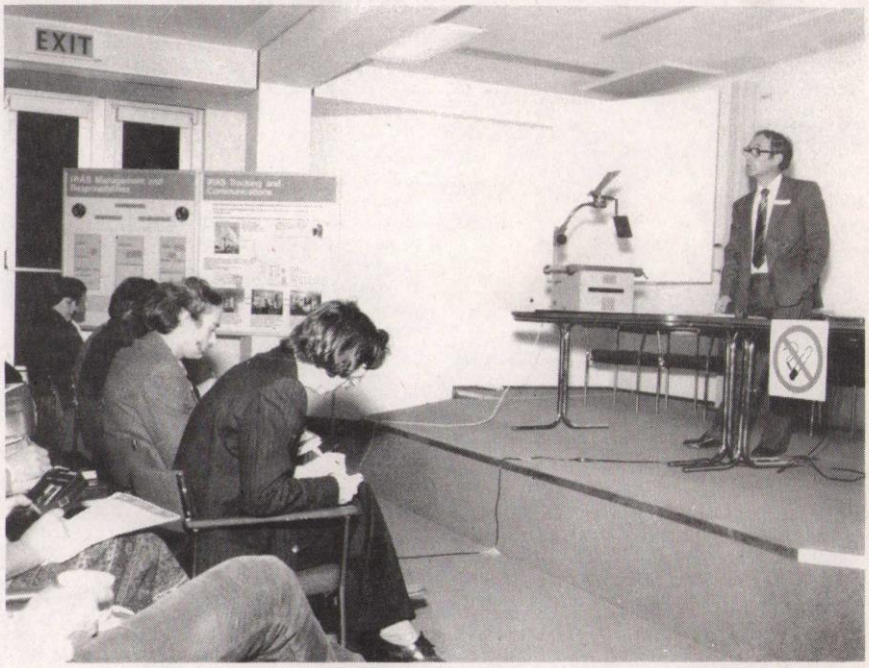
IRAS - So Far, So Very Good

At a press conference held at RAL on Wednesday, 9 November, it was announced that in 287 days the IRAS infra-red satellite had already furnished enough new information on the mysteries of the Universe for the imminent publication of 20 papers dealing with its exciting discoveries; and that the data so far collected would fill 4,000 Bibles and would keep astronomers well occupied for at least the next 10 years.

Representatives from a large cross-section of national and local newspapers and journals heard presentations on the various discoveries by a panel of scientists, all experts in various aspects of the discoveries, and the lively question and answer session following the presentations showed the great interest that had been engendered by the IRAS project.

BBC and Channel 4 camera crews were also on site, as those watching television that evening will know.

"IRAS had been a great scientific success" Director Dr Geoff Manning said in his welcoming address. It had behaved even better than had been predicted, achieving a sensitivity and reliability well in excess of its design specifications.



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Dr Geoff Manning addressing the Press.

The pointing accuracy of the satellite had been exceeded; the lifetime almost doubled; the detectors, which it was thought might suffer radiation damage had not, and the signal-to-noise ratio was high.

It will be difficult to extract all the science from the mass of information we have acquired, he explained. It will take a long while, but so far we have already discovered five comets, a budding "solar" system round Vega, an inter-stellar phenomena christened "Infrared Cirrus", examples of incipient stars, and a series of dust bands within the solar system.

Dr Peter Clegg, of Queen Mary College, RAL's resident Astronomer, began the presentation with a review of the objectives of the IRAS mission and an explanation of how the satellite and the survey had been designed to achieve it. Dr Michael Rowan-Robinson (QMC) spoke on nine particularly interesting unidentified infra-red sources. These may be newly formed stars, dying red giants obscured by dust or more intrigingly star-burst galaxies at the edge of the Universe.

Additional IRAS observations will help to find the answer. Dr Jim Emerson (QMC) turned his attention to the centre of our own galaxy. At infra-red wave-lengths the dust that normally blocks our view is penetrated and a phenomena termed "Infra-red Cirrus" has become visible, believed to be attributable to carbon dust particles rejected from old dying stars and heated by starlight.

Star formation was covered by Professor Phil Marsden (Leeds). IRAS had found numerous small clouds of molecular gas and dust that are sites of formation for stars. Optical observations have shown the formation of giant stars, but from IRAS much can now be learned of the smaller stars - those like the Sun. One object probably like our early Sun has been found within a dark molecular hydrogen cloud called Barnard 5. "The whole complex of Orion, now revealed at infrared as never before will give us plenty to go at and keep us busy for a very long time", he remarked.

Dr John Davies (Leicester) rounded off the review with a report on another unusual member of the solar system, 1983TB, an earth-crossing asteriod of exceptional interest. It passes within 9 million miles of the Sun, closer than any known asteriod. Furthermore, its orbit is exactly the same as that of the Geminid stream of meteorites which are visible as shooting stars in December, and although looking like an asteroid in a telescope, its apparent relation to the Geminids suggest it might actually be a dead comet that having passed so close to the Sun many times, has had all the ice boiled out of it. Observations with photometers and spectrometers may soon clear up the mystery, but without the IRAS data, it would have remained unrecognised.

Obviously, the surface of the knowledge to be extracted from the IRAS data has as yet, been merely scratched and many wonders are yet to be revealed including, maybe, the legendary tenth planet.

Two Visions of the Future

Two Rutherford Appleton Laboratory supported space projects, code named AMPTE and ROSAT, were given added impetus in Bonn last month, when Professor John Kingman, FRS, Chairman of SERC and Dr Hans-Hilger Haunschild, State Secretary of the Federal Ministry for Research and Technology, signed agreements through which UK scientists will participate with Germany and the USA in research areas where they have established international reputations by earlier UK rocket and satellite missions and in European Space Agency projects.

AMPTE

(Active Magnetospheric Particle Tracer Explorers)

Planned and on schedule for launch in August 1984 the AMPTE mission consists of three spacecraft one German, one American and one British which will be launched by a single Thor Delta rocket. These will investigate in a new way the workings of the Earth's magnetosphere; a comet-shaped cavity formed by the geomagnetic field in the solar wind which continuously flows from the Sun into interplanetary space. Two of the most intriguing puzzles concerning the magnetosphere are centred on how some solar-wind ions penetrate the barrier of the geomagnetic field and how they and other particles subsequently become accelerated - in some cases before releasing their energy in the upper atmosphere at high latitudes to produce the Aurorae Borealis and Australis.

To answer these questions, quantities of lithium atoms will be released by the German spacecraft into the solar wind upstream from the Earth. Positive ions arising from these will serve as tracers for later detection by the American satellite patrolling closer to the Earth within the magnetosphere. The function of the UK spacecraft UKS is to extend still further this new approach of using the solar wind and magnetosphere as a plasma physics laboratory. It will work closely with the German spacecraft in studying the wide range of phenomena expected to be initiated as a reaction to the injection of tracer ions. Another release will take place along the flanks of the magnetosphere where a short-lived "comet", visible from the ground, will be produced. (See Bulletin No 18 1981).

UKS, is built around the conical adaptor linking the German and US satellites in the launch configuration. Attached to the cone are 12 sides supporting the solar array and experiment detectors, as shown in the diagram. The UKS is approximately 1m in diameter and weighs 74kg. It has two pairs of deployable booms, one pair carrying the magnetometer and wave-experiment search coil and one pair the electric field experiment pre-amplifiers, the latter being approximately 7m tip-to-tip. The spacecraft will be spin-stabilised with its spin axis normal to the ecliptic plane. Attitude control will be effected by a magnetorquer coil and pressurised nitrogen thrusters guided by data provided by Sun and Earth sensors. The gas thrusters will also be used for station-keeping with the German satellite to maintain a separation of approximately 100km. This task will make use of an on-board radar developed specially for the purpose.

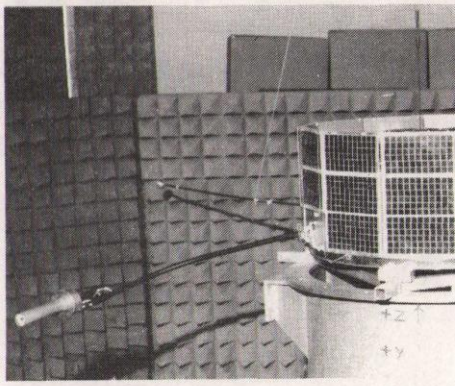
Testing Time

Using experience gained with the engineering model, the flight spacecraft, already checked for electrical and mechanical fit with its German counterpart, is essentially complete and is in the process of undergoing another series of tests. The first took place at British Aerospace, Filton in mid October to ensure that the plasma wave experiment will be unaffected by radiation from other systems in the spacecraft and that the spacecraft is immune from interference from extraneous radio signals. At RAE Farnborough in early November the magnetometers were checked and calibrated, and the magnetic properties of the spacecraft assessed.

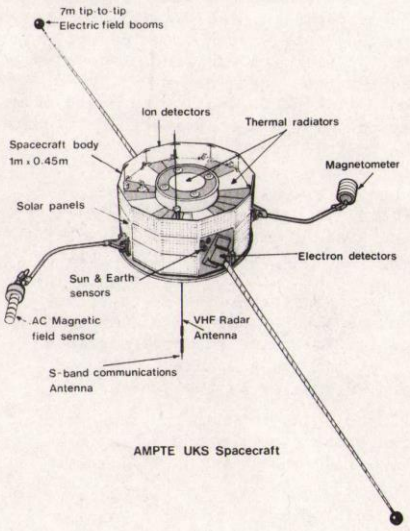
Further tests will involve operating the spacecraft under vacuum at RAE to check the correct functioning of the particle detectors (both electron and ion) and the thermal balance to confirm that it will run at suitable temperatures. A correct balance must be kept between solar heating, power dissipation and radiation into space. In early January the satellite will be sent to Munich for vibration tests with the other two AMPTE spacecraft.

Back in England in the new year, the satellite will then be put through, boom deployment and pyrotechnic tests at RAL; further electromagnetic interference checks at British Aerospace; magnetic calibration at Hartland Magnetic Observatory, Devon; sensor alignment and calibration at the Mullard Space Science Laboratory (MSSL); mass properties and spin balance tests (akin to wheel balancing) at British Aerospace. The series will end with a final callibration and operational tests with the UK Control Centre at RAL. On the 14 May the spacecraft will be on its way to Kennedy Space Center where the preparations for launch on 9 August will begin.

The UKS is being produced as a collaborative effort between RAL and Mullard Space Science Laboratory (MSSL) with experiments provided by groups from Imperial College, MSSL, RAL, Sheffield, Surrey and Sussex Universities and the British Antarctic Survey. Data will be collected for at least 4 hours in each 44-hour orbit via RAL's 26 metre antenna at Chilbolton.



AMPTE under test at Filton



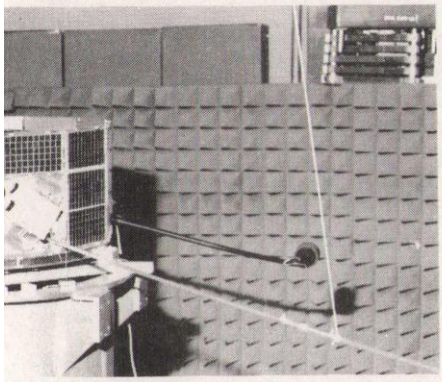
AMPTE UKS Spacecraft

The UKS will be controlled from RAL's ground station at Chilton using the 12 metre "IRAS" dish. On special occasions, such as release experiments, the spacecraft may not be visible from Chilton or Chilbolton and at these times the American Deep Space Network will be used for command and data reception.

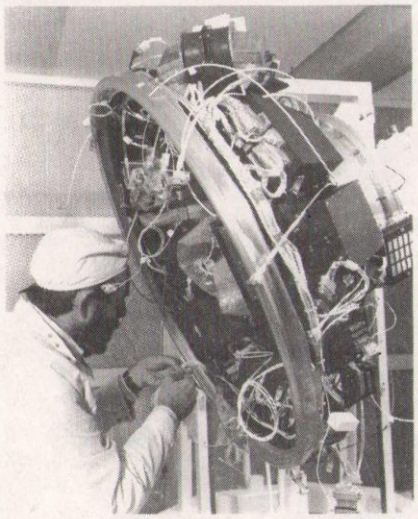
ROSAT

ROSAT is due to be launched by Space Shuttle in 1987. It will carry a German soft X-ray telescope and the UK Wide Field Camera (WFC). The latter is a specialised design of telescope optimised for the wavelengths between soft X-rays and ultraviolet, which will extend the energy band of astronomical observations into new regions (see Bulletin No.8 1982). Between them ROSAT's telescopes will also greatly enhance previous observations.

The whole celestial sky will be surveyed during the first six months in orbit, with a sensitivity which will extend observations 100 times



British Aerospace



and under construction at RAL.

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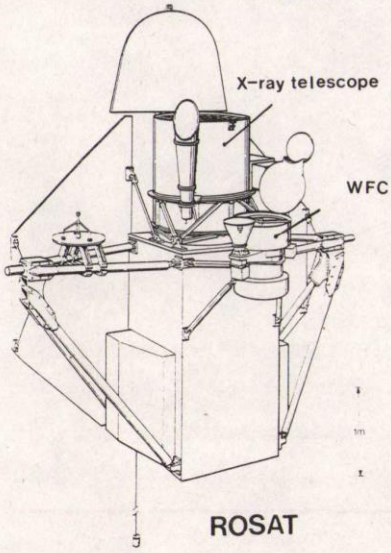

For further information on AMPTE contact Dr Duncan Bryant, Ext. 6515 or Kim Ward, Ext. 6411
For ROSAT contact Dr Martin Courtier, Ext 6410 or Dr Roger Burdett, Ext 6233.

deeper into space than the best existing all-sky surveys. The rest of the satellite's life-time (up to 2½ years) will allow for detailed observations of individual X-ray sources and source-fields using the accurate pointing capabilities of the spacecraft. In this phase the German and British telescopes will be used to obtain accurate X-ray source maps and spectral and timing data which will greatly extend current knowledge of the high temperature and relativistic phenomena in situations as diverse as stellar coronae, supernova remnants, compact accreting binaries, galaxy clusters and quasars with extreme redshift. Data from the WFC will be of particular interest since it covers the extreme ultraviolet (XUV) band, the last, 'unexplored' region of the spectrum, and one that only a few years ago was considered (forever) inaccessible, due to the opacity of the interstellar medium.

The WFC is being developed by a consortium of UK research groups from Birmingham University, Imperial College, Leicester University, the Mullard Space Science Laboratory and RAL. The WCF mirrors are being machined on the Cranfield Unit of Precision Engineering's diamond-tooled lathe which has recently been developed and commissioned for SERC.

Star Tracker

A contract to manufacture a star tracker for the engineering model of the XUV Wide Field Camera has been awarded to Sira Ltd following their successful design study.

The star tracker will track up to 3 stars above magnitude 6 as they cross the field of view while keeping up to 3 more in reserve to "top up" as stars from the first group leave the field of view. The star tracker should enable experimenters on the WFC to know their pointing direction to better than 20 arc seconds during the 6 month all sky survey and in the later pointing phase to about 10 arc seconds.

The heart of the star tracker is a charge coupled device (CCD) produced by GEC at their Hirst Research Laboratory for use on television cameras. These devices can now be produced to a very high level of accuracy and with very low dark current noise. Sira's will be the first European-made star tracker in space using such a device. Sira were however also responsible for the much praised acquisition guidance system on the Anglo-Australian telescope.

The project is being pursued in close collaboration with RAL, who have designed and will manufacture the light-shade and perform the thermal modelling and acceptance testing. Such collaborations offer mutual benefits both in cost sharing and progressive exchanges of ideas.

The ROSAT mission will probably be the only large X-ray telescope in operation during the latter half of the 1980s and its data are expected to have a major impact on astronomy well into the next decade.

RAL Colours

The next lecture in this series will be held on Thursday 8 December at 3.15 p.m. in the Lecture Theatre

THE APPLICATION OF IMAGE PROCESSING TO STUDIES OF THE EARTH AND PLANETS

by

Dr G E Hunt
Imperial College

'In the last few years there has been an explosive growth of scientific data of the atmospheres of the Earth and Planets. Space craft have now explored as far as Saturn and later this decade, detailed observations will be obtained of the more distant planets such as Venus and Neptune. Through the development of image processing facilities, quantitative investigations can now be carried out of the meteorologies of these planets. At Imperial College, we have developed the interactive planetary image processing system that now enables us to investigate the circulations of planetary atmospheres so that we can compare the processes taking place with phenomena we are more familiar with in the terrestrial environment. In this lecture, I will describe the facilities that we have developed at Imperial College and the way it is being applied to investigations of planetary atmospheres. In addition, I will set out the technological requirements for the next decade that are necessary in order for us to fully exploit the further explosive growth of scientific data from space missions in this area of geophysics.'

Internal Events

HEP TECHNIQUES SEMINAR
R61 CONF RM - 1400 hrs

1 Dec M. Edwards, M D Rousseau/RAL
'Report on IEEE Nuclear Science Symposium, San Francisco

ASTROPHYSICS SEMINARS
R61 CONF RM - 1400 hrs

30 Nov Mr Patrick Wallace/RAL
'Experiences with the Anglo-Australian Telescope.

CONDENSED MATTER SEMINARS
R3 CONF ROOM - 1330 hrs

6 Dec BTM Willis/Harwell
'Neutron Diffraction Studies of Single Crystal Si and UO_2

NIMROD SEMINARS
R61 CONF ROOM - 1400 hrs

28 Nov R J Hughes/CERN
'Uniform Acceleration and the Quantum Field Theory Vacuum'

HEP SEMINARS
R61 CONF ROOM - 1100 hrs

30 Nov Dr CJS Damerell/RAL
'Measurement of Charmed Particle Lifetimes in the ACCMOR Spectrometer'

School Visit with a Difference

Recently a group of sixth form science students from Fitzharrys School, Abingdon spent the day at RAL. Differing from the normal visits to the Laboratory, this one was devoted to experiments on the Fluidised Combustor, one of the aims being to give hands on experience of practical work in an industrial environment, running a series of tests on a complex apparatus.

Cooperation, planning and a fair degree of luck enabled all the twenty scheduled runs to be completed and the group went away armed with details, data and charts to complete their analysis. The investigation was into some of the basic physics of the combustion of coal at elevated pressure.

This valuable and apparently enjoyable experience, was made possible by the expertise of Mr J Dennis, Cambridge University who is himself researching the absorbtion of sulphur dioxide in the combustor.

The students taking part in this venture were Graham Hill, Kevin Hughes, Neil Tunley and Philipa Smith under the guidance of their Chemistry teacher Mr J Thorns. It was all in marked contrast to the cloistered calm of the sixth form and we hope that it has given an insight of work in the real world and some encouragement to this group of future scientists and engineers.

P Goodyer

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Exchange Change

Bicester telephone exchange is being replaced by a new electronic type exchange.

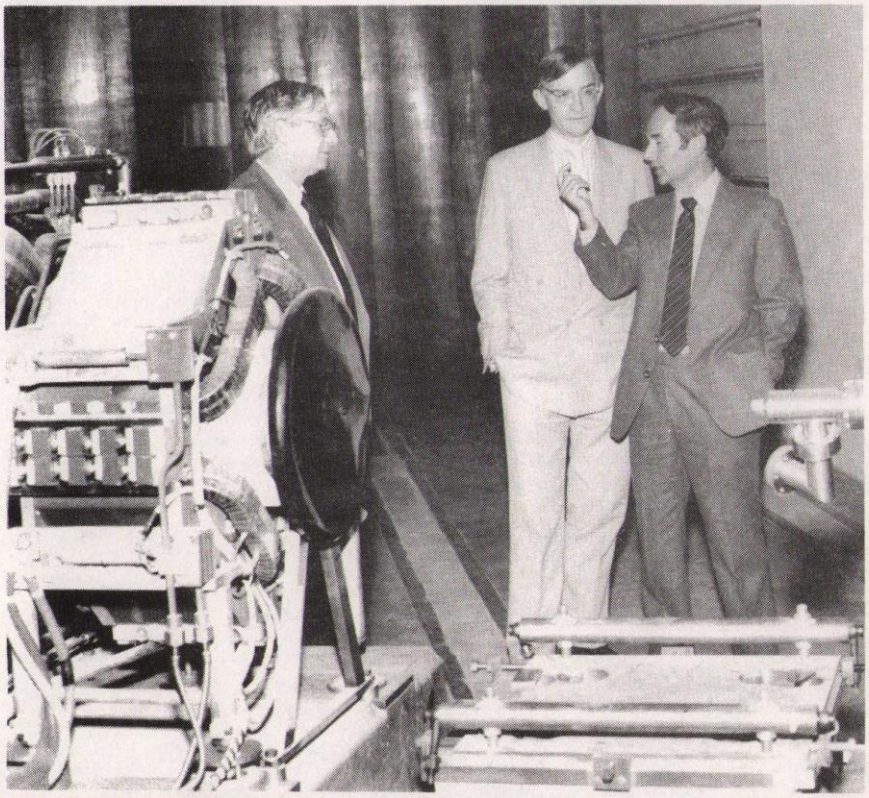
All Bicester telephone numbers will be changed, in the majority of cases by prefixing the existing four figure numbers with 25, and the existing 5 figure numbers with 2, but there are exceptions. In cases of difficulty please consult directory enquiries.

When the new exchange opens it will produce a new dial tone which is significantly different from the present dial tone.

These changes took place on the 28th October 1983.

MP at RAL

Mr Robert Jackson, MP for Wantage, pictured during his visit to RAL on Friday 4 November. Here he is being shown the Magnet Ring by David Gray (left) and Geoff Manning (right). His tour also included IRAS. 83RB5296



Death Benefit

NOMINATION FOR DEATH BENEFIT

Married members of the UKAEA Principal Non-Industrial Superannuation Scheme and the SERC Principal Superannuation Scheme may nominate their husband or wife to receive any lump sum death benefit payable under the schemes. The arrangements for nomination were introduced so that payment of the death benefit can be made ahead of probate being established.

Bereavement is a very distressing time and the distress is often intensified by anxiety about financial commitments. All those eligible who have not already done so are strongly urged to sign a nomination form.

Nomination forms are available from Mrs S Creak, Personnel Group. extension 5600

Bulletin

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