QUEST

Vol 11 No 1

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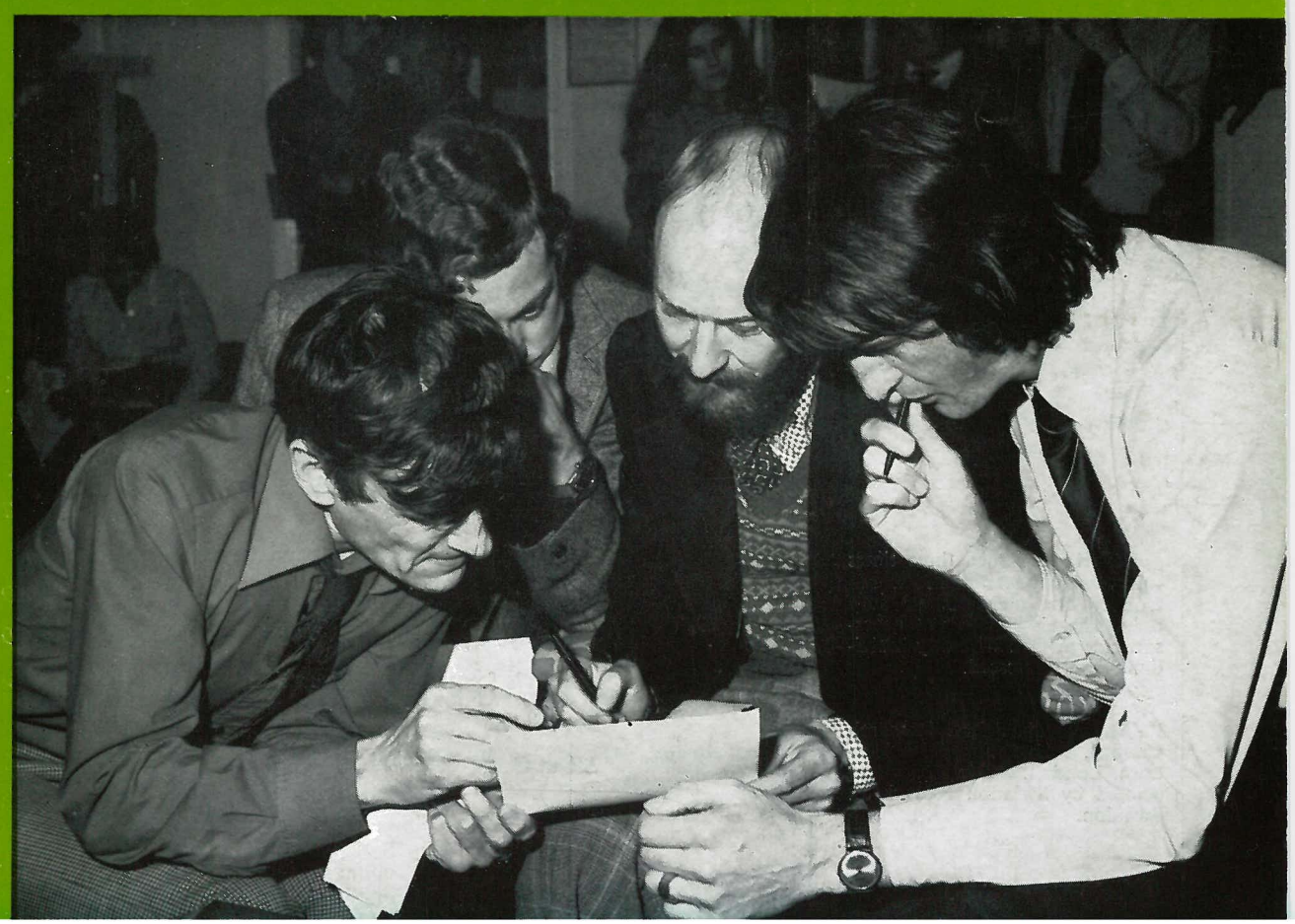
Progress on the SRS

Spacelab 2



QUEST

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Our cover picture shows the winning team in the contest for the Hilda McIntosh trophy at the Advance Office, Swindon. From left: Geoff Strange, Adrian Dent, Peter Davies and Jim Franklin (see inside back cover).

Contents

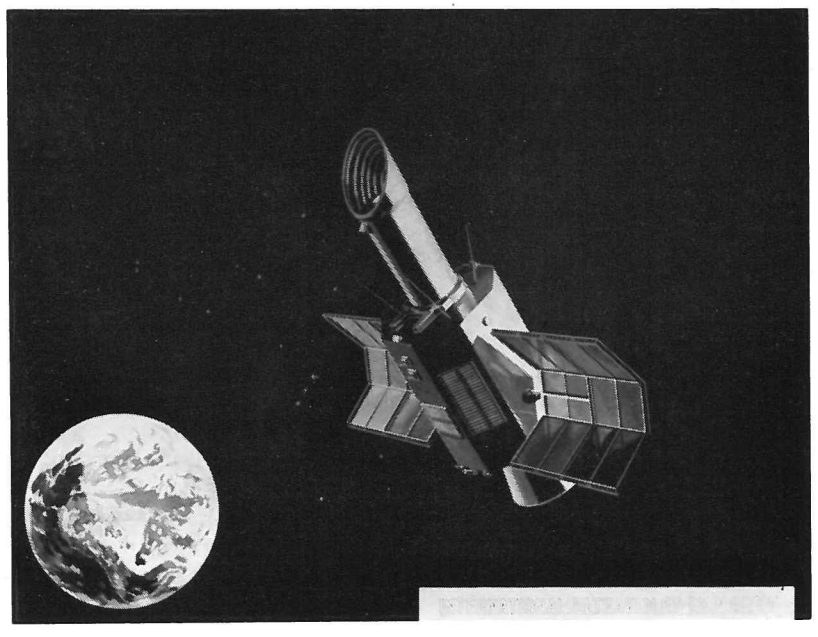
IUE satellite launched

The International Ultra-Violet Explorer (IUE) satellite was successfully launched from Kennedy Space Center, Cape Canaveral, Florida on 26 January 1978.

With a stiff breeze blowing down-range and muffling the roar of the 237 tons of thrust from the Delta 2914, the 116 feet tall launch-vehicle with IUE on board lifted sedately from Pad A, Complex 17 at the US Air Force Eastern Test Range, Cape Canaveral, Florida. As it streaked away, curving eastward, into a brilliant mid-day sky it was just possible to see the nine strap-on boosters fall away, after their 38 second burn, before the Delta disappeared from sight.

Another milestone had been passed on the road which–beginning with the UK proposals to ESRO for the large astronomical satellite (LAS) and later for the Ultra-Violet Astronomical Satellite (UVAS)—an observatory satellite, incorporating a telescope and ultra-violet spectrophotometer, in a geosynchronous orbit. The observatory can be operated from two special ground stations, one in the USA and one in Europe. It is not restricted to night-time viewing and will provide many exciting opportunities for astronomers in Europe, the USA and elsewhere.

After the first tense days of orbital operations, during which engineering commissioning was carried out and the UK-provided UV detector cameras were each successfully turned on, scientific commissioning began. By making astronomical observations of calibration and sample high-priority targets it is currently being confirmed that IUE will indeed provide the planned, complete system for research in UV astronomy.



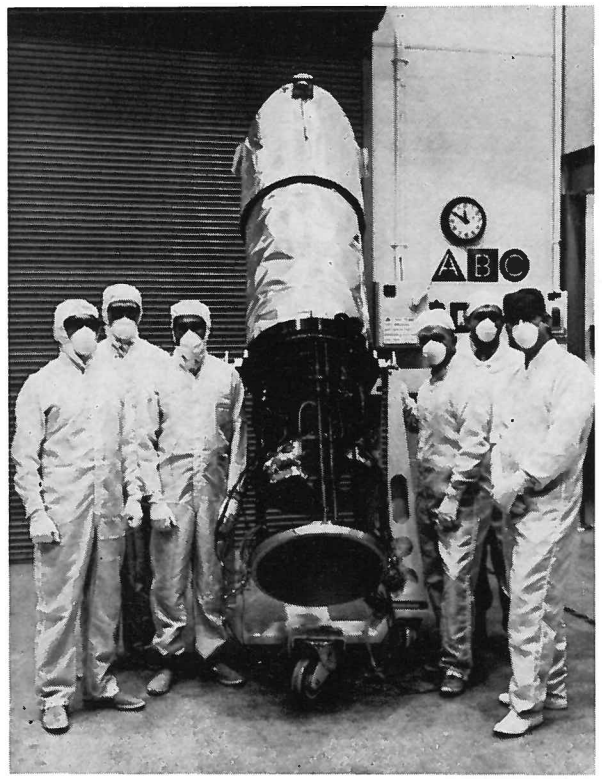
An artist's impression of the IUE. The spacecraft, an octagonal structure with the telescope protruding from the top and a single fixed solar array on each of two opposite sides, is designed to maintain one face towards the Sun when stabilized, with a set of thermal louvres on the dark side of the spacecraft to regulate the satellite's heat loss to space. Total weight, including the apogee boost motor, is 671 kg (1479 lbs). It is 4.3 m (14 ft) tall and with the solar arrays unfolded in space it is 4.3 m (14 ft) wide.

In its geosynchronous orbit 46,000 km (28,000 miles) by 25,000 km (15,700 miles) the spacecraft will appear to drift back and forth over the equator during its expected three-year lifetime, ranging to about latitudes 29° North and South in constant view from the US ground station and for at least 10 hours a day from the Madrid station

a few of us had been pushing along for something like thirteen years. NASA's attention was drawn to the potentialities of the UK's 1968 UVAS concept and key features of UVAS were adopted to form the basis of NASA's IUE project (known at its inception as SAS-D) in which NASA invited the collaboration of the UK and ESRO (now ESA). The achieved aim of the project, which is sponsored by the Council in the UK, NASA in the USA and ESA, was to place

Scientific aims of IUE

Until about 20 years ago when space flight was first achieved, most astronomical discoveries were based on observations from ground-based observatories. Subsequently, by using sounding rockets, high altitude balloons and spacecraft it has become possible to make scientific observations from altitudes above the absorbing effects of the Earth's atmosphere, in the infra-red, ultra-violet (UV), X-ray and gamma-ray



International Ultra-Violet Explorer scientific instrument. The instrument consists of a 45 cm diameter F/15 Ritchey-Chretian telescope, which collects radiation from astronomical sources and directs this to one of the two spectrographs. There a spectrum of the input radiation is recorded by a UV-sensitive television camera and converted to video signals for Telemetering to the ground. There are two UV cameras in each spectrograph—one 'prime' and one 'back-up'

regions of the spectrum. This has expanded enormously our understanding of the universe.

The spectral region which IUE is designed to examine covers the fundamental frequencies of many of the most common elements in the Universe, such as hydrogen, carbon, nitrogen and oxygen. IUE observations are expected to provide basic information about many of the wide range of stars that compose our galaxy, how they are born, the changes that take place during their life-time, and how they die; about the material between these stars—from which the stars themselves are believed to have been formed and are still forming; about many of the strange objects which emit radio waves and X-rays; about the relatively sedate nearby galaxies and the distant, violent quasars; and about our planetary neighbours and their satellites.

Already over 200 scientists from 17 countries have been allocated observing time and their studies will cover most of the major problems in modern astronomy.

Project organization in the UK

In the UK, the project, which is mainly funded by the Council, is a collaboration between Appleton Laboratory and University College London.

Appleton Laboratory is responsible for overall UK technical programme and financial management; and liaison with Goddard Space Flight Center (site of the US ground station/observatory) and ESA. The Laboratory undertook development of image correction and calibration computer programs and management of UK industrial contracts (Marconi Space and Defence Systems Ltd).

University College London, with the assistance of staff seconded from Appleton, undertook detector tube evaluation and optimization of operating parameters, provision of a vacuum-optical calibration facility and operating computer programs, telescope light-baffle efficiency assessment, development and testing of procedures for ground and in-orbit optimization and calibration of cameras, conduct of life tests on detector tubes and scientific support to Goddard Space Flight Center.

UK Project Director: Professor R Wilson CBE, FRS, University College London and Science Research Council
UK Project Manager: Mr Peter Barker, Appleton Laboratory
Deputy Project Manager (Technical): Mr Peter Vaughan, Appleton Laboratory
Deputy Project Manager (Scientific): Mr Michael Sandford, Appleton Laboratory
Image Processing: Dr Barry Martin, Appleton Laboratory.

Council Commentary

October to December 1977

Finance

(i) *Estimates* 1978/79
In November, Council approved a provisional 1978/79 Estimates submission which, updated to 1978/79 prices, will amount to about £145M. This included an additional £2.7M allocated to the Council from a recent £4M increase in the Science Budget. The additional funds will make up for a higher than anticipated CERN subscription, provide for the additional postgraduate studentships awarded in 1977 and supplement new priority programmes being developed by the Engineering and Science Boards.

(*ii*) *Construction Industry Funds*
The Council has been allocated £1.75M for 1978/79 only from the funds the Government has made available to help the construction industry. Since the money must be spent before 31 March 1979, Council in December asked that quick action be taken on appropriate schemes. Most are likely to be in the Council's Establishments but a few will be in academic institutions.

(iii) *Forward Look Guidelines*
In November the Council also approved financial guidelines to be used by Boards in preparing the 1979/80—1983/84 Forward Look. The basic guideline assumes a decline of 1.7% a year in real terms to 1981/82 and a level budget thereafter with the possibility of seeking additional funds in competition with other government programmes. The Council will complete its Forward Look in April 1978, for submission to the Advisory Board for the Research Councils.

Postgraduate Training

(i) *Studentships 1977 and 1978*
The Council planned to make up to 3,600 studentship awards available in 1977. On 3 November, 3,616 studentships were on offer, including 770 CASE studentships; these are provisional figures and it is likely the final take-up will be somewhat below 3,600. Some 350 qualified applicants for SRC studentships had to be rejected in 1977. For 1978 the Council plans to make up to 3,680 studentships available, including at least 810 CASE.

(ii) *Short Duration Collaborative Training Awards*
In December the Council approved an Engineering Board proposal to introduce a short duration collaborative training awards scheme for a trial period of three years. The awards would be for periods of 12-15 months and the project work would be carried out in collaboration with industry—particularly medium sized firms. The projects would include design and manufacturing problems as well as research in engineering science. Students would be expected to gain a masters degree. The scheme will supplement existing successful SRC collaborative training schemes such as CASE where studentships are usually provided for three years. For many collaborative projects three years is too long and the new scheme is designed to meet the need for shorter periods of training particularly in engineering. It is hoped that up to 30 studentships will be available when the new scheme starts this year.

UK Millimetre Wavelength Astronomy Facility

In October the Council approved in principle a proposal to construct a Millimetre Wavelength Astronomy Facility at an estimated cost of about £4M plus in-house expenditure of about £1½M at July 1977 prices. Specific approval was given to the funding of the design and development phase at a cost of £285K plus in-house effort at the Appleton and Rutherford Laboratories. The plans are for a 15 metre diameter telescope capable of operating down to wavelengths of 0.75 mm in order to study the mechanics by which galaxies evolve. The observations will be important because they are the only source of detailed information about the cold material in the universe; they are expected to have an impact on all branches of astronomy. Negotiations for a suitable dry overseas site are continuing.

The Appleton Laboratory will be responsible for the construction of the facility which will take about four years. The Rutherford Laboratory and some

university groups will also be concerned with the project.

International Organisations

In November and December each year Council reviews the work of major international organisations to which SRC subscribes and considers the scale of SRC's contribution. In November, Council discussed recent reports of work at CERN and the Institut Laue-Langevin (ILL). It supported the aim of the UK delegation to secure reductions in future CERN budgets.

Heavy Ion Fusion

In December Council received a report on the evaluation studies of heavy ion fusion being undertaken at the Rutherford Laboratory. It agreed that the evaluation work should be continued under the aegis of the Energy Proposals Committee and that suitable universities should be encouraged to take an interest in the subject.

Superannuation Arrangements

In November the Council adopted a new resolution on superannuation arrangements since it decided to apply to contract out of the new State Scheme because provisions under the SRC and UKAEA schemes are as good as, or better than, under the new scheme.

Grants and Other Financial Approvals

(*i*) *Nuclear Physics Grants*

The Council approved grants to the Film Analysis Centres at Birmingham (up to £506K), Cambridge (up to £253K), Glasgow (up to £527 K), Liverpool (up to £409K) and Oxford (up to £515K) and for nuclear structure research at Oxford (up to £252K).

(*ii*) *EISCAT*

The Council approved a revised SRC contribution of up to £3.32M to the capital costs of the project which will provide a system of radar stations in Northern Scandinavia. The project will produce detailed information about the structure, temperature and dynamics of the ionosphere.

(*iii*) *Mullard Radio Astronomy Observatory* (*MRAO*)

The Council approved an SRC grant contribution of £206K towards the budget of the MRAO, Cambridge for the calendar year 1978.

(*iv*) *Meridian Astronomy*

The Council approved a proposed collaboration between RGO and the University of Copenhagen to establish an advanced observing facility for meridian astronomy on La Palma at a capital cost of up to £160K.

(*v*) *Physico-Chemical Measurements Unit* (*PCMU*)

The Council approved expenditure of up to £180K for the support of PCMU services at Harwell in 1978/79.

(*vi*) *Neutron Beam Programme at AEA*

The Council endorsed the general scale of the SRC contribution of the order of £1280K (at 1977/78 prices) to the joint SRC/AEA neutron beam programme.

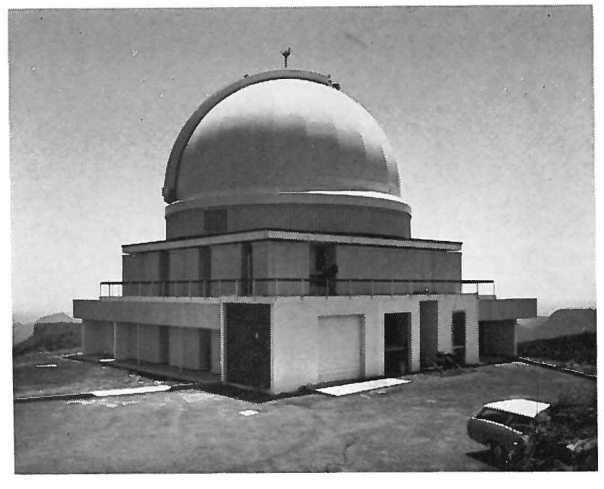
(*vii*) *Laser Studies*

The Council approved a grant of £163K over 3 years to Professor D J Bradley (Imperial College) for studies of coherent radiation and non-linear interactions at short wavelength.

New members of the Local Group of galaxies

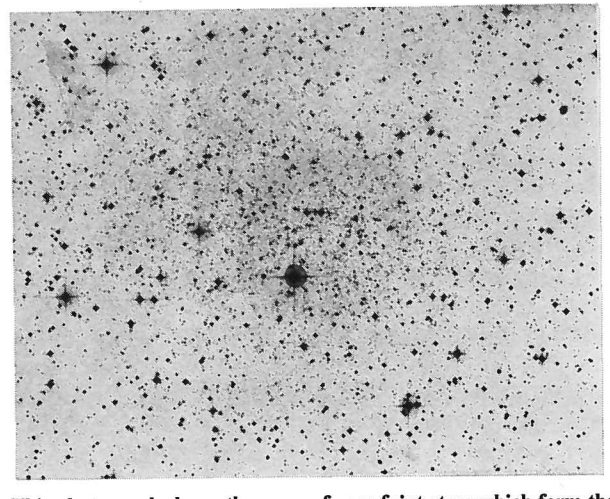
R D CANNON

The UK Schmidt telescope in Australia, which is operated by astronomers from the Royal Observatory, Edinburgh, is engaged on a systematic photographic survey of the southern sky. Because of recent improvements in photographic emulsions and in telescope design, this is the deepest such survey ever carried out for any part of the sky, and naturally most of the interest is in detecting the faintest and most distant objects possible. In particular, counts of faint galaxies and quasars should help us to map out the large-scale structure of the universe, and to understand conditions during the early stages of its development.



UK Schmidt telescope building at the Anglo Australian Observatory

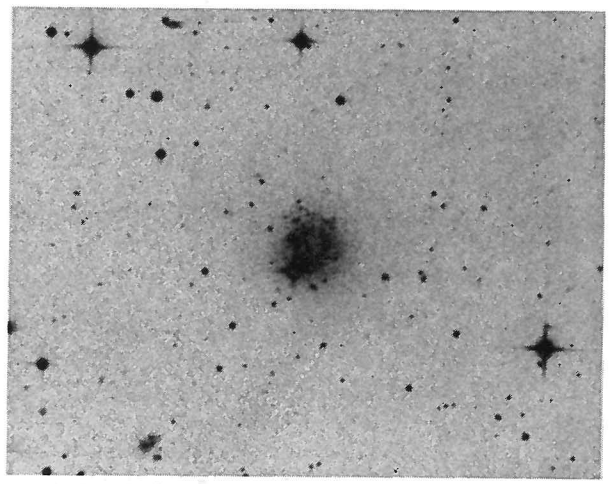
However, not all the new objects found are extremely distant. Some are seen for the first time rather because they are intrinsically very faint. Indeed, because the volume of space within a given distance from us increases as the cube of the distance, the intrinsically faint objects are the hardest to find since we can only hope to see the few which are nearest to us. In the field of galaxies, the very faint end of the range known so far is occupied by a handful of small, tenuous conglomerations of stars known as 'dwarf spheroidal galaxies'. The brightest two were discovered in the 1930s, and four more showed up during the survey of the northern sky by the Palomar 48-inch Schmidt during the early 1950s. All are companions of our own galaxy, which forms the familiar Milky Way, and are among the nearest extra-galactic objects. Although these objects are very small, they could have very great importance for the dynamical stability of groups of galaxies. The reason is that although few are known, they could in fact be widely distributed in space, but with the vast majority too faint to be detected by currently available telescopes. Indeed, they could help to determine whether the universe is going to continue its present expansion for ever, or whether it has sufficient mass that it will eventually fall back on itself under the force of gravity.



This photograph shows the mass of very faint stars which form the new Carina dwarf spheroidal galaxy

Because the sky survey by the UK Schmidt goes fainter than ever before, it was possible that many new dwarf spheroidal galaxies would be found. However, this now seems to be very unlikely. The survey

is already complete for more than three quarters of the Southern sky, and usable photographs have been taken for most of the remainder. For over three years not one new dwarf spheroidal galaxy turned up. Then on 1 March 1977, a faint smudge was noticed on a photograph of part of the constellation Carina. At first this was thought to be a blemish on the plate, but microscopic inspection showed that it was composed of thousands of very faint stars, and further studies have established that it is a new dwarf spheroidal galaxy, one of our galaxy's nearest neighbours (only half a million light years away!).



The Dwarf Irregular Galaxy UKS 2323-326, known as the 'Measles Galaxy', from a 50 minute exposure on Kodak IIIaJ emulsion taken with the UK 1.2 m Schmidt telescope

Since only one new galaxy of this type has been found, it seems that these objects are *not* distributed uniformly throughout space, but are rather concentrated around our own galaxy. If this is correct, their contribution to the total mass of the universe will be negligible. However, the dwarf galaxies remain fascinating objects in their own right; they are the nearest star systems outside the galaxy, close enough for detailed study of individual stars, and the questions of their origin and history are still matters for speculation.

Moving up one step in the galaxy scale, there is a class known as 'dwarf irregular galaxies'. These are systems which begin to show some ill-defined structure, with evidence for dust and gas as well as for stars. Again, a handful of these galaxies are known to be members of our 'local group' of galaxies, of which the dominant members are our galaxy and the Andromeda spiral galaxy, Messier 31. Recently, two new probable members of this group were discovered on UK Schmidt Sky Survey plates. One of these, officially designated UKS 2323–326, is affectionately known as the 'Measles Galaxy' from its spotty appearance. Spectroscopic studies of the brightest spots, using the Anglo-Australian Telescope, suggest that these are individual stars. Neutral hydrogen gas was then looked for and found in this galaxy using the Parkes 64m radio telescope: the very low radial velocity confirms that 'Measles' is a relatively nearby galaxy.

Dr Russell Cannon is Head of the UK Schmidt Telescope Unit of the ROE.

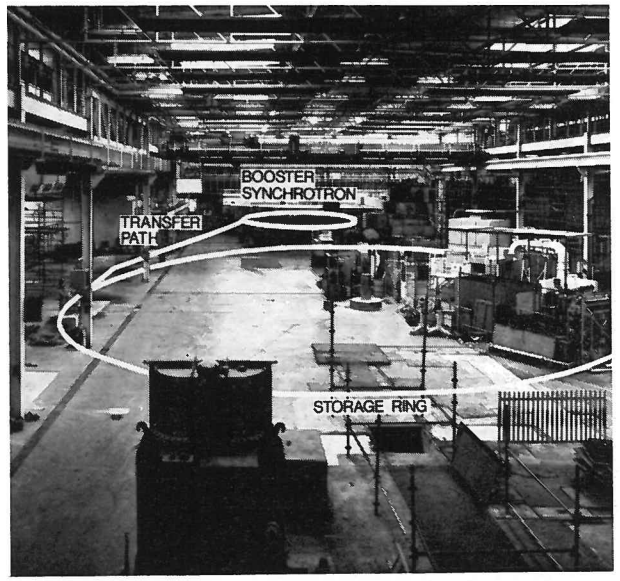
Progress on the SRS

The Synchrotron Radiation Source (SRS) project is now well past the halfway point in its construction programme and with the installation of the linear accelerator, booster synchrotron, and the plinths for the storage ring an observer can see the new facility beginning to take shape. During February this year the various components of the booster synchrotron were brought together and the ring is now mechanically complete. During March the linear accelerator was delivered and April should see electrons being accelerated again at Daresbury – to 15 MeV during testing of the linear accelerator. First injection into the booster synchrotron is planned for May.

All of the equipment for the SRS will be computer controlled, the operators controlling the equipment through purpose built consoles which 'talk' to the specific items through a mini-computer network. The linear accelerator, which has been built by Radiation Dynamics Ltd of Swindon, has none of the usual knobs and meters, and when it was tested at the factory before shipment to Daresbury, a portable console, mini-computer and the necessary interface electronics had to be taken to the factory to carry out the tests.

Since NINA closed down in April 1977 a lot of effort has been concentrated on clearing the equipment from the site of the storage ring in the 'Inner Hall'. This work is now complete with unwanted ducts filled and a new coat of paint over the whole area. The photograph shows the hall during October 1977 with the outline of the electron trajectories superimposed. The beam is injected from the linear accelerator at the top to the right of the booster, is accelerated to 600 MeV in the booster and then injected into the storage ring. Once the storage ring is full the electrons are accelerated to 2 GeV and will be stored there for up to eight hours. The ring of plinths for the storage ring magnets has now been put down in the Inner Hall, and the first item of storage ring equipment is already being commissioned – this is the klystron amplifier which will replace the energy radiated by the electrons.

With the booster nearing completion, design effort is now being concentrated on the components for the storage ring. The magnets and the accelerating cavities

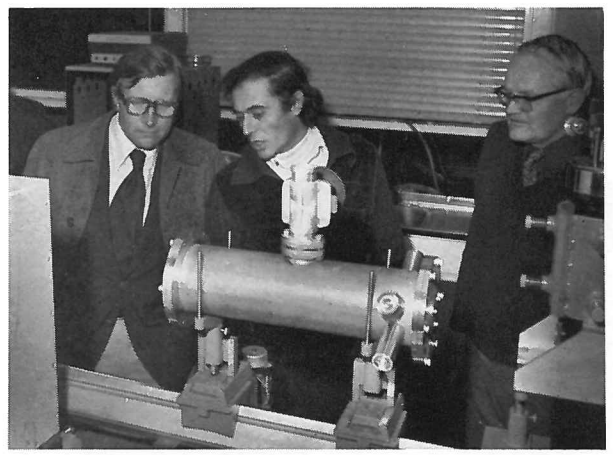


have been designed but a host of other components are still only in the schematic stage. The detailed design of the first beam lines and experiments is also being done.

Full approval for the construction of a superconducting Wiggler magnet was given in Autumn 1977 and work has started at the Rutherford Laboratory where the magnet will be designed, constructed and tested. The aptly named Wiggler magnet will increase the range of experiments that can be done with the SRS by making the electrons travel round a short detour in a very high magnetic field and thereby extending the spectrum of the synchrotron radiation which they emit further into the X-ray region.

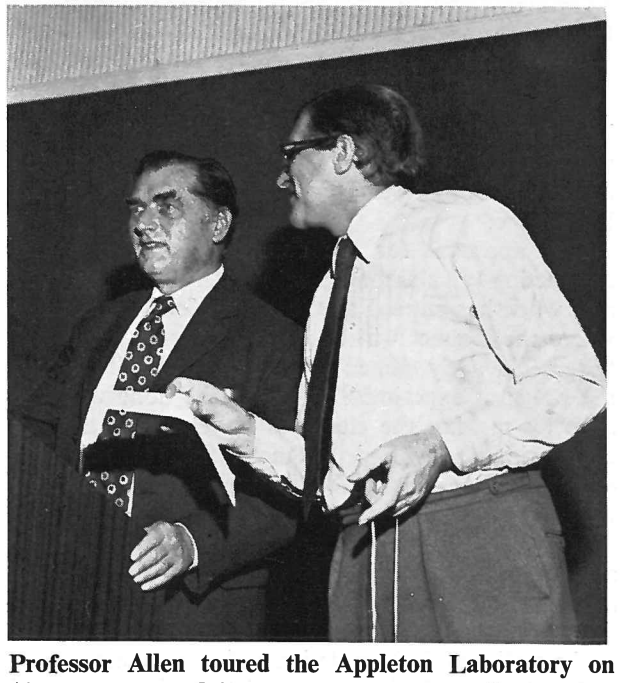
The prospective users are now meeting regularly and are planning their experiments. When they visit the Laboratory during the second half of the construction programme they will see the visible evidence of the earlier backroom design and construction work and will no doubt look forward to their first use of the synchrotron radiation beams which should be available about the end of 1979.

Getting to know us: Chairman's visits

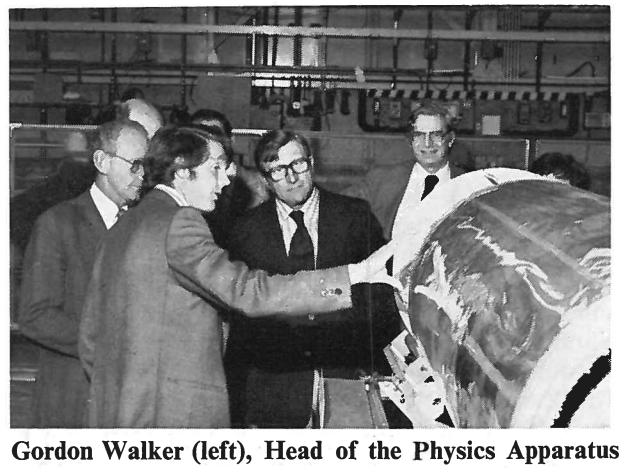


Dr Juan Bordas, who was involved in Synchrotron Radiation Experimental work at Daresbury, explains details of the EXAFS (Extended X-ray Absorption Fine Structure) experiment to the Chairman, Professor Allen during his visit to the laboratory on 9 November. This experiment is in preparation for transfer to EMBL (European Molecular Biology Laboratory) at DESY, Hamburg. Dr P Duke looks on

Dr K F Hartley demonstrating a visual display of a spectrum recorded by the Image Photon Counting System at the Isaac Newton Telescope during a visit by Professor Allen to the Royal Greenwich Observatory on 15 November. From left to right: Dr K F Hartley; Mr D J King; Professor F Graham Smith, Director of the Observatory; Professor Allen and Mr P J Casey



Professor Allen toured the Appleton Laboratory on 13 December and is seen above, with the Laboratory Director, Dr Fred Horner (left) addressing the staff. The following month he saw some of the work being carried out by Appleton's Astrophysics Research Division at the Culham Laboratory



Gordon Walker (left), Head of the Physics Apparatus Group at the Rutherford Laboratory, explains the construction of the single-gap cylindrical multi-wire proportional chamber (one of several constructed for the European Muon Collaboration) to the Chairman during his visit on 14 November. The chamber is a prototype of a 4-gap chamber, now being built for the TASSO collaboration experiment on PETRA at DESY, Hamburg

Chairman has also met staff and seen the work being carried out at the Royal Observatory Edinburgh and at the Advance Office Swindon.

Computational science at Daresbury

A new Division, the Theory and Computational Science Division, came into being at Daresbury Laboratory on 1 October 1977, with Professor P G Burke on a joint appointment with Queen's University, Belfast, as its Head. The Division consists of the existing Theory Group and a new Computational Science Group.

It was in 1976 that the Council decided that support for computing in quantum chemistry, crystallography and atomic and molecular physics would be transferred from the Rutherford to the Daresbury Laboratory, all these being fields connected with experimental work to be carried out with radiation from the Synchrotron Radiation Source (SRS) now under construction at Daresbury. Four members of staff have now made the 'quantum jump' between Rutherford and Daresbury to form the nucleus of the Computational Science Group, the Group being augmented by transfers from within Daresbury and by external recruitment.

The Group is presently involved in four projects: (i) the calculation of precise wavefunctions and energies for bound state molecules, (ii) photoionisation and electron scattering from atoms and molecules, (iii) the SRC Microdensitometer Service to X-ray crystallographers, with associated computational support for X-ray diffraction data analysis, and (iv) the crystal structure search and retrieval program, which provides on-line facilities for the interrogation of all known structural data of organic crystals on the SRC Interactive Computing Facility DEC-10 computer in Edinburgh. In all the above the aim is to provide computational backup to research workers in the universities, and wherever possible to organise the projects in collaboration with university groups. To obtain the right degree of interaction with the academic community, it is anticipated that the Group will organise a number of one-day and weekend meetings covering relevant sectors of physics and chemistry. Indeed one such study weekend has already been organised, held at Daresbury on 10-11 December 1977, on the subject of 'Correlated Wavefunctions', and two one day meetings, one on the subject of 'Lattice and Lattice Defect Energy in Solid State Physics' on 12 January 1978, and another on 'Photoionization of Atoms and Molecules' on 16 February 1978. The primary aim of all these meetings was the discussion of the possibility of collaboration with University Departments in the future development of these fields.

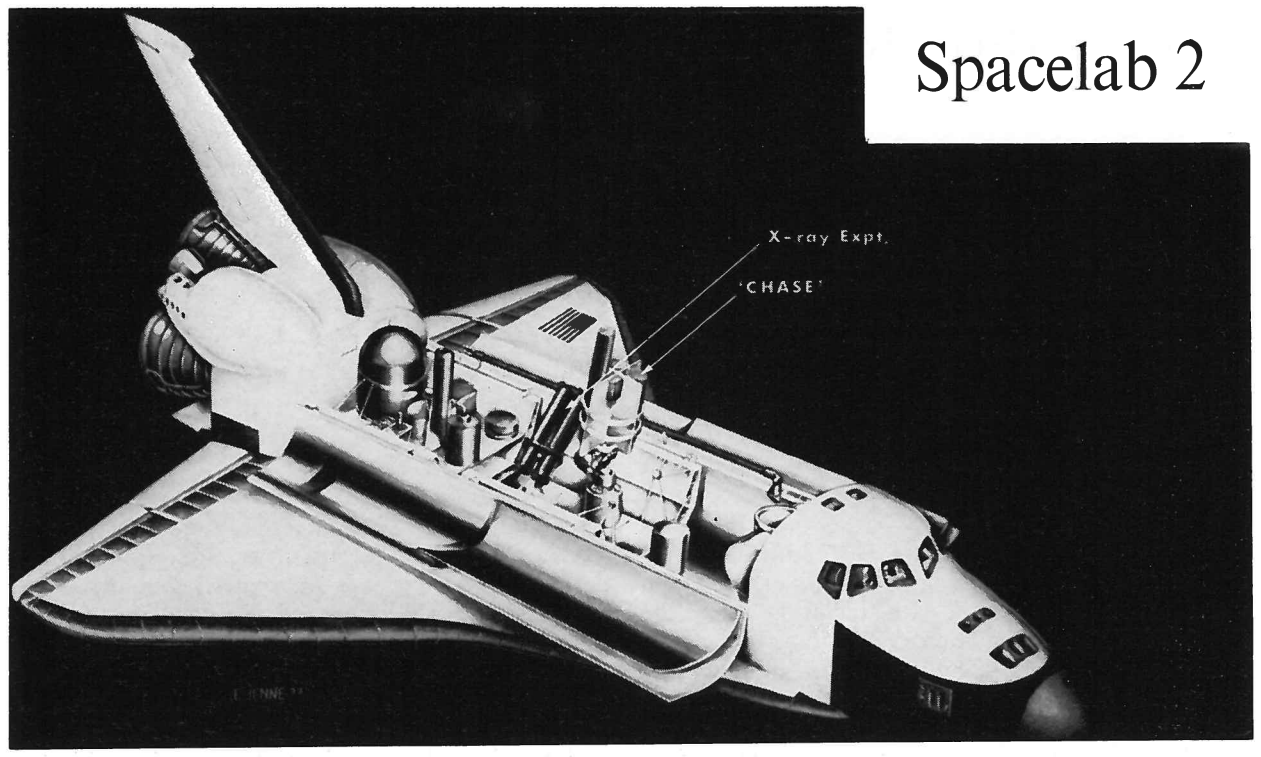
Energy recovery from waste heat

Industrial use accounts for about 40% of the UK's primary energy consumption and much of this energy is eventually dissipated as waste heat. One method of reducing such losses in industrial plant and cutting overall costs is to convert the waste heat into electrical energy to augment the plant electricity supply. Council recently awarded a £27,000 grant to Dr D O'Kelly (Bradford University), Mr G Musgrave and Professor J Sherlock (Brunel University), Dr I K Smith (City University) and Mr S S Wilson (Oxford University) for a two-year project of research into this method of energy recovery.

Ariel-V's fourth year of operation

The extremely successful X-ray astronomy satellite Ariel-V is to be kept in operation for another year. Launched in October 1974, Ariel-V is the fifth scientific satellite in the UK/US collaborative space research programme but the first in this series to be devoted to cosmic X-ray astronomy. This year Ariel-V's programme will include extended observations of selected sources, both galactic and extragalactic, to study time variations more systematically and also to exploit the data in Leicester University's high-latitude catalogue.

Spacelab 2



A model of the proposed Spacelab 2 mission showing CHASE and the Birmingham experiment

A team from the Appleton Laboratory's Astrophysics Research Division at Culham has been successful in obtaining payload space for a major solar experiment to be flown on the second flight of Spacelab in 1981. This experiment was proposed jointly with Dr J L Culhane of University College London, and was one of several hundred bids for the twelve experiments to be flown on this payload.

The Space Shuttle is a new re-usable vehicle developed by NASA as the main space facility for the 1980s. It is launched like a rocket into orbit around the earth, where it remains for periods of seven to fourteen days, carrying out experiments or putting smaller satellites into orbit. On re-entry it behaves like an unpowered aircraft and glides to land on a concrete runway. The European Space Agency (ESA) has developed a modular structure, Spacelab, which can be integrated with a set of experiments and then loaded intact into the Shuttle payload bay for launch. The first flight of Spacelab, planned for 1980, is jointly managed by ESA and NASA and has attracted much publicity over the past year. The second flight is a NASA managed mission, dedicated primarily to astronomy, for which they have offered payload space to international scientific competition.

Of the twelve experiments selected, ten are from the USA and two from Britain – an embarrassing degree of UK success! In addition to the Appleton Laboratory/University College London experiment, Professor A P Willmore of the University of Birmingham will be flying a telescope to study images in hard X-rays of galactic and extra-galactic sources. The remaining payload is made up of three further solar experiments, a cosmic ray experiment, infra-red and ionospheric studies and two biological experiments.

The Appleton Laboratory/University College London solar measurement is called a 'Coronal Helium Abundance Spacelab Experiment' (CHASE). Its prime purpose is to measure the abundance of helium, important not only for understanding the physics of the sun, but having far-reaching implications in cosmology, since this helium is believed to have been produced originally during the 'Big Bang'. CHASE, which will also measure other solar properties, is one of three solar experiments to be mounted on a new fine pointing platform being developed by ESA.

The twelve experiments will be operated in orbit by two Payload Specialists, scientists drawn from among the experiment teams involved. Selection of these is now underway, and there are three Britons in the current short-list of ten.

Dr A H Gabriel, the author of this article, is Head of the Astrophysics Research Division of the Appleton Laboratory at Culham and joint principal investigator for CHASE.

SR at C

This title first appeared in 'Quest' after the SRC had competed in the first inter-departmental offshore race, organised by the Civil Service Sailing Association in 1971. We have entered each year since. In this article Martin Hall gives an account of the 1977 race.

This year we had our best ever boat. 'Festina' is a 32 ft Contessa class. She is well equipped for racing, and we were very pleased with her as soon as we stepped aboard late on the afternoon of Thursday, 29 October at Lymington. This year SRC was represented by Paul Dickinson (AL), John McGraw (RL), Phil Moore (DL), Ken Pavitt (AL), Geoff Stapleton (RL), and myself as skipper.

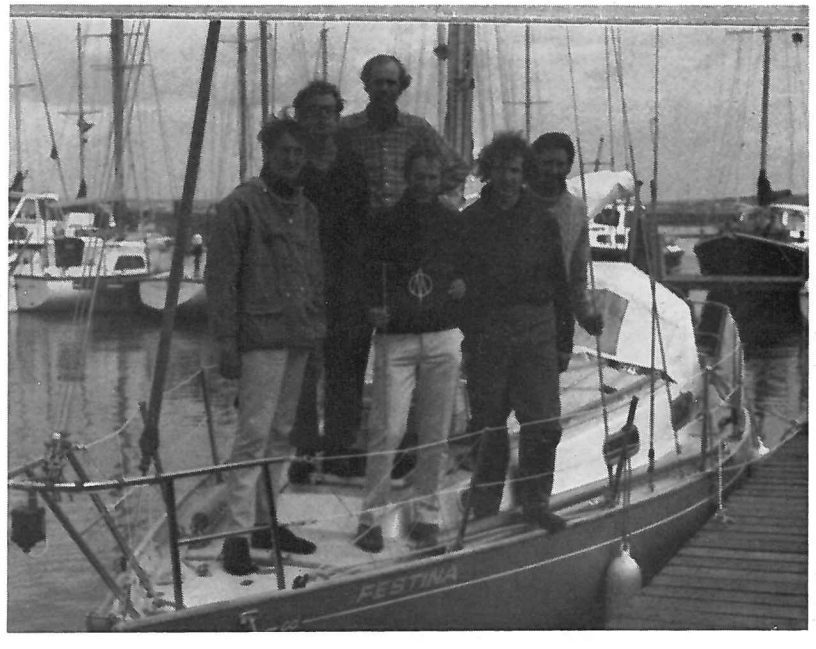
Even on the first evening it was clear that we were in for a bit of a blow as we ran up to Cowes at speed. We soon began to appreciate the potential of the boat, and changed sails two or three times to get the feel of working as a team. After a comfortable night in Cowes we carried on to the start line off Portsmouth, again with a following wind. Gales had been forecast by the Met Office at 0630 that morning and the wind was certainly fresh. With a favourable tide and time to spare, we practised more sail changes, and we were glad to find we could carry the spinnaker with wind well round on the beam despite the wind strength. We would need that later.

At the start line we were disappointed, but not surprised, to find the Cherbourg course replaced by a series of three alternative courses in the Solent. The start is one of the exciting parts of a race as the boats each turn and manoeuvre at some speed for best position in a confined space. Accidents can happen very fast and can be very expensive! There were 18 boats entered, all about 30 ft in length. When the start gun went at 1300 we were not best placed, but out of the main crush and with a free wind.

The first course was only eight miles, though one had to sail considerably further to beat against the wind and find the best tide. After 1 hr 47min 40sec we were across the finishing line, and soon after we were comfortably secured at the main Cowes marina. Later we retired to the Island Sailing Club bar and heard how some competitors would have done so much better but for this or that bad luck which they felt sure would not recur. But in sailing and especially racing there are so many unexpected things to go wrong,

SRC racing flag

At 0630 on the Saturday there were gales forecast in nearly all sea areas, but we still kept on our biggest sails. The first short leg was a run, and our policy was to use the large headsail rather than a spinnaker, and then reef this headsail as



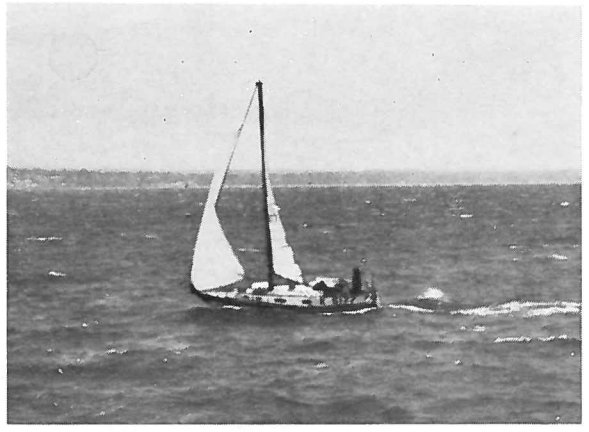
From left to right: Paul Dickinson, Appleton; Ken Pavitt, Appleton; Geoff Stapleton, Rutherford; Martin Hall, Appleton (holding the flag); Phillip Moore, Daresbury and John McGraw, Rutherford

and many of them do! We were quite pleased at this stage to be fourth out of the 15 to finish, and looked forward to the next race. With the now strong winds, we felt glad of the decision not to go to Cherbourg!

necessary for the subsequent beats. Since the bad weather courses that we were sailing were somewhat impromptu, the arrangement was for us on 'Festina' to give the start signals by foghorn to a given time sequence. It is little comfort to know

that few other boats heard our standard commercial 'foghorn' but certainly we got a good start, being first across the line a few seconds after 0900! Soon we were being slowly overtaken by those chancing a spinnaker, but they had the problems of sail change after a short run and we did not regret our plans. There was then a long beat against tide and each crew made their choice as to where to find the least waves, best wind and least tide without running aground. Towards the end of this tedious and tiring beating we had had to change down our headsail and reef the main as the wind rose. We then saw several big boats running under spinnaker in the opposite direction to ours, and saw others on our course being blown almost flat onto the water by the heavy squalls. In the worst of these we recorded a wind speed of 50 knots (Force 9/10) and saw the spinnakers in various states of disarray. In one case the mast had given way before the sail did! After rounding the windward mark we decided not to carry a spinnaker, and having split our No 1 (biggest) headsail we attempted to goose-wing our No 2 headsail in the unsteady wind and seas. We romped home, trying not to gybe with so little sea room between us and the land. At the end of 5hr 28min 33sec sailing, we were disappointed to be ninth out of the 13 to finish this 17 mile course, and tried to think how to do better next day. After lengthy sail repairs, there was again much chat over beer at the Island Sailing Club.

On Sunday, remembering the previous day's 'foghorn' fiasco, our competitors seemed to use 'Festina' as part of the start line and kept close until we sounded the start, again at 0900. The course was much the same as for the previous day, but having a slightly longer run after the start we used the spinnaker with advantage. This year we hoisted the spinnaker stopped up in rubber bands to avoid the upsets and irritations of the sail opening its own not-so-good way. The rubber bands broke in turn as the sail opened to the wind and we were pleased with



Festina in splendid isolation before the race

the technique. Although the wind was slightly less than on the previous two days, we were content to stay with our No 2 headsail whilst beating to the windward mark. At that stage we took a risk! The wind had picked up somewhat, but we flew the spinnaker again and pulled an impressive bow wave through the water alongside us. This sort of sailing is most exhilarating and although the tiller had too much force to control at times and we 'broached' right round off course with the sails pulling down onto the water, we made up a lot of time and after 3hr 31min 35sec, came fifth in this race of the 13 to finish.

Overall in the series of three races we came fifth of the 17 boats entered from 11 departments. Naturally we should have liked SRC to have come first. Since we were so pleased with 'Festina', we have already booked her (slightly better) sister ship for a full week next year so as to get more practice as a crew. It may seem pedantic to quote race times to seconds, but even after many hours racing it is often a few seconds that count.

So far 25 people have represented SRC in these races. If we can enter two boats in the 1978 race I for one shall be delighted. I am sorry that we always have to disappoint some of those who apply to come. Really this year we had only one regret – that there was no means of flying the SRC burgee at the masthead!

Martin Hall is a leader of the Chilbolton radar group at the Appleton Laboratory. Anyone interested in sailing for the SRC is invited to contact him at the Lab (ext 328). The 1978 race will start on Friday 29 September.

Newsfront

New Year Honours

Our congratulations to Professor W E J Farvis, Professor R Wilson FRS and Dr W F Watson who were awarded the CBE and Mr R Rivers who was awarded an MBE.

Professor W E J Farvis is a Council member and a member of the Engineering Board and of the Polytechnics Committee.

Professor R Wilson FRS is IUE Project Director, a former member of the Astronomy, Space and Radio Board and former Head of the SRC Astrophysics Research Unit, Culham.

Dr W F Watson is a former member of the Materials Science and Technology Committee and of the Polymer Engineering Management Committee.

Mr R Rivers is a Higher Executive Officer at London Office.

Arthur Pickett

At the unusual (for him) end of a camera just before Christmas was Principal Photographer of Daresbury Laboratory, Arthur Pickett. Arthur, who is well known to many in the Council from his days in the Atomic Energy Authority at Culcheth, Dounreay and Winfrith as well as since 1965 when he joined Daresbury, was being snapped at a farewell presentation before taking up voluntary premature retirement. During his time at Daresbury, Arthur has created a very valuable photographic history of the work of the Laboratory and has provided an excellent service to both Laboratory Staff and University Users. A presentation of a clock and a bumper card of snapshots was made by the Director, Professor A Ashmore.

Pictured right Mr Mike Reordan who was awarded the MBE in the Birthday Honours List. With him at Buckingham Palace are his wife and daughter Glenys.
Mr Reordan worked at London Office until his untimely death in March
Photo: Feature Press

Mr John Smith, Appleton Laboratory, who was awarded the OBE in the Birthday Honours List is pictured after his investiture at Buckingham Palace in December, with his wife Joan and sons Graham and Adrian
Photo: Feature Press

From left, Professor Ashmore, Arthur Pickett and Bill Jones (Head of Engineering Services)

Ken Tarry

Someone else from Daresbury who has retired and was well known elsewhere in the Council, particularly at the Rutherford Laboratory, was Ken Tarry. Ken served in a number of public service organisations—the GPO, TRE Malvern, AERE Harwell—before joining what was to become the Rutherford Laboratory to work first on the PLA and then on Nimrod. Whilst still at Rutherford he joined the team which designed the radio-frequency acceleration system for NINA and has worked at Daresbury throughout the Laboratory's existence. Once NINA was successfully operational, Ken assumed responsibility for the operation and development of the linear accelerator. In recent years he has directed a section designing and commissioning the rf equipment which forms a major part of the SRS project.

Ken Tarry in a characteristic pose at a farewell presentation before Christmas

£ £ £ £ £ £ £ £ £ £ £ £ £ £ £

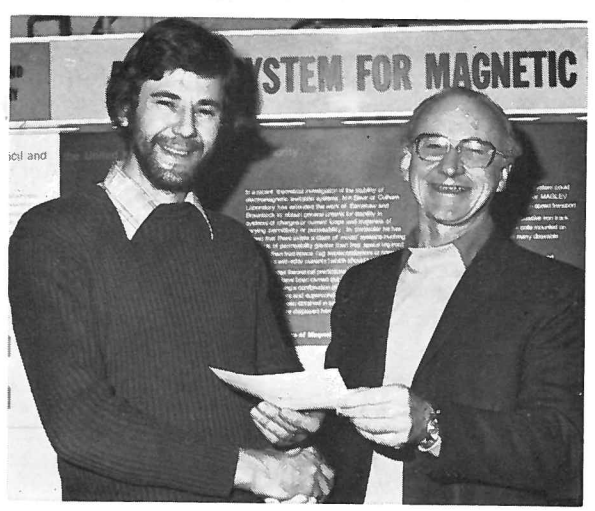
Winning Suggestions

The following awards were made by the London Office Awards Committee at its last meeting: £50 to Miss J M Duncan for a new file tracer card; £5 to Mr D H Brooks for a suggestion to include imprint numbers on forms; £5 to Mr P D N Tomsen who suggested combining an individual's advanced course and research studentship files thus avoiding duplication of personal information.

RGO has awarded £25 to Mr M F Spooner, who suggested a way of rectifying a fault on the stand-by alternator which both saved money and protected the Time Service by keeping the plant in service; £5 to Mr M Dermody for a suggestion to include the 6-inch Cooke telescope in the Public Exhibition; and £5 to Dr R J Bingham and colleagues who suggested alternative night heating in emergency in the Physics Building.

Among the other awards made: £100 to Mr John Spencer, Rutherford for a suggestion in connection with the fibre glass strips for the muon drift-chamber; £175 to Mr M J Athawes, Rutherford again for a suggestion concerned with the muon chambers; and £250 to Mr John Carr, formerly of Rutherford's Electronics Section.

Dr G H Stafford, Director, Rutherford Lab (far right) presents a cheque for £600 (the highest award made since the introduction of the scheme in 1971), to Mr Dave Price (left) and Mr Terry Wickens. This award was for their suggestion to improve trimming of the printed circuits used in the construction of the 12 large drift chambers which are part of the UK's contribution to the European Muon Collaboration Project at CERN



Mr Eddie Towndrow (left), a craftsman in Rutherford's Technology Division, receives a cheque for £190 for his suggestion for a suitable container to hold the material to be used with the Deuteron Target

FR 80 makes a film of the book

Members of the Atlas Computing Division of the Rutherford Laboratory successfully carried out a feasibility study last Spring to determine whether the FR80 could be used for high quality printing of scientific data.

They did this using bibliographic entries (including chemical formulae) from the data base of molecular structures maintained by the Cambridge Crystallographic Data Centre. The Centre accumulates references to organic crystal structures—mainly from periodicals—and each year publishes a book of the entries for that year.

To be of use to the research community, the book has to be printed quickly which means that conventional printing methods cannot be used because of the difficulty of proof reading thousands of very similar complex chemical names and formulae.

Computers are used to produce five different types of index (main bibliography, author, formula, permuted formula and compound name) from the one set of data and do the typesetting.

The magnetic tapes carrying the information for 1976 which were sent to the Rutherford staff early last year contained 2762 references and 1313 cross references, listed in five different formats. The printers added 20 introductory pages to the 817 produced at Rutherford from these references and the book was published last Summer.

Encouraged by the success of the first book made using the FR80, the Centre began work on a larger cumulative volume (15,993 citations in six types of index) containing all the references published in the previous eight volumes. This second book was processed at Rutherford in the Summer and published in December 1977.

Rutherford staff are now busy with the 1977 volume.

33.26 **Piperidine hydrochloride**
$C_5H_{12}N^+ Cl^-$
J K Dattagupta N N Saha J Cryst Mol Struct., 5, 177 1975

33.27 **bis(Isonicotinato) magnesium tetrahydrate**
$2C_6H_4NO_2^- Mg^{2+} 4H_2O$
M B Cingi A C Villa C Guastini D Viterbo
Gazz Chim Ital. 104, 1087 1974

33.28 **4 - Cyano - pyridine - N - oxide**
$C_6H_4N_2O$
N I Hardcastle M J Laing T J McGauley C F Lehner
J Cryst Mol Struct., 4, 305, 1974

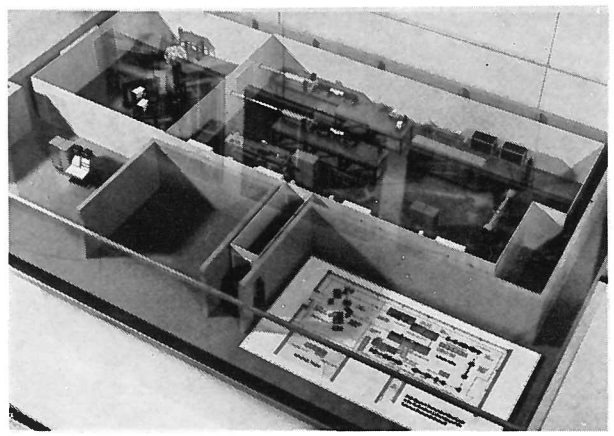
33.29 **Isonicotinic acid**
$C_6H_5NO_2$
F Takusagawa A Shimada
Acta Crystallogr. Sect B, 32, 1925, 1976

33.30 **Piperidino - thiosemicarbazide**
$C_6H_{13}N_3S$
C H Koo H S Kim C H Chang
J Korean Chem Soc (Daehan Hwahak Hwoejee 19, 85 1975
Also classified in 8

An extract from the first book to be made using the Rutherford Lab's FR80, a precision microfilm recorder

Laser Exhibition

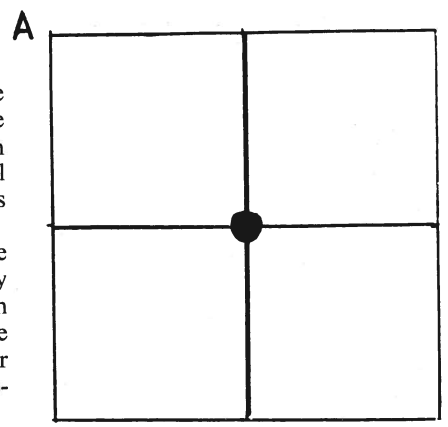
A special Laser Exhibition was held at the Science Museum, London from 1 November until 31 January to show the many applications of lasers in the fields of science, commerce, defence, communications and even entertainment. Rutherford's contribution was a model of the Central Laser Facility – the highest power laser (in an unclassified laboratory) in Western Europe. The model, shown right, is a scale 1/15 replica of the installation, and shows the laser source, the target area and control room.

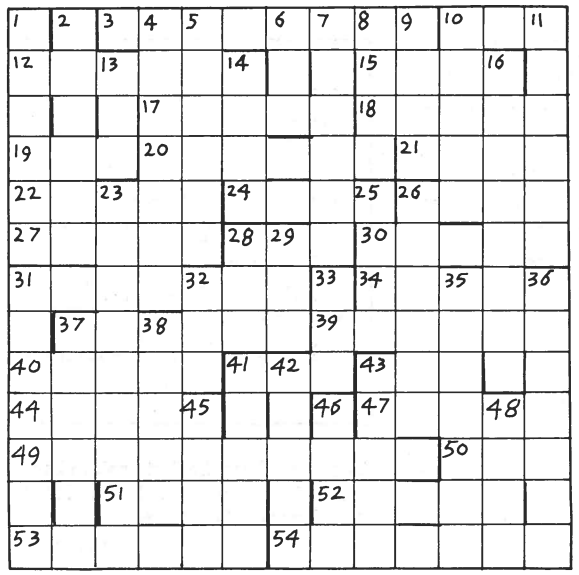


NUTCRACKER 26

A drunkard has found his way to the top of a half-finished building, where there is a network of concrete beams. Before a last swig reduced him to a state of utter confusion, he had reached the junction marked at A (see diagram right). From A he now walks along the beams, at each intersection (including his starting point) choosing his direction (left, right, forwards or back) at random. If he chooses a direction where there is no beam, he will fall to his death, but if he manages to reach the centre of the network he will find a safe platform and a ladder down (which even in his befuddled state he will certainly take). What are his chances of reaching safety?

The prize will be awarded to the first correct entry drawn on 1 May Entries to the Editor, 'Quest', Room 1532, State House. Please state whether you would prefer a book or record token. The solution will appear in the next issue.





MAXIM 16

MAXIM 16

Eight farm animals have been removed from the asterisked positions and placed in the pens at the centre of the diagram.

Clues

ACROSS

3. Friend replaced – what's wrongly implied (8)
*10. How to get up road's slope, including leftwards (7)
12. He's surrounding observatory with brave types (6)
15. F got by dropping C from vapour (4)
17. Western beers are consumed here! (5)
18. Drilled – and how one feels after too much drill (5)
19. Tidal movement reverses in Caribbean (3)
*20. List in the wrong order, have a go at a clue (9)
*21. Very powerful service I have (7)
*22. Out of tune, ill, be in very good spirits (9)
24. *Pen*
26. Turn around and around – what helps the wheels go round (4)
27. Alexander's and yours initially (5)
28. *Pen*
*30. Shy about protegé, left, avoiding danger to self (8)
31. Buddy of 44, left with small houses (7)
*34. Follow arts man with a twitch – that's highly orthodox (8)
37. What Henry wanted stiffened if French came to all points (6)
39. Bent tube, so thick (6)
40. Wine a chap drinks in company (5)
41. *Pen*
43. Presumably collected by Japanese numismatists (3)
44. Hellish hot, as he was one of a trio (5)
47. Taking an article from 19th century battlefield is against the law (5)
49. Haggle with Iris and somehow she'll give you a cup of tea, etc (6, 4)
50. In the south-east, one of these is China (3)
51. Tidy way of drinking, with no splash (4)
52. Speech of Hannibal at Interlaken? (5)
53. Capture the attention of English given time (6)
54. Ceremonial dress that's worn unceremonially about work (3, 4)

DOWN

1. Set her off in groups they say are crowded (6)
2. Rabies raging in part of Yugoslavia now (6)
* 4. Occasionally the present is present with the past (3, 3, 4)
5. See a rarer metal replaced by iron in old-fashioned loyalty (6)
6. Source of whisky in Sussex (3)
7. What happened in the end? The lustre was lost (6)
8. Something that flows in Heidelberg and further north (4)
9. When temper's raised, a fatal end's produced (4)
10. Strange! – American leaves something in an antique shop (5)
11. Roughly and cruelly ruled over capital of Yemen (6)
13. What burglar's out to do, and Bobby (3)
14. Type who's likely to throw something at Stetchford end (4)
16. Vile dish served – really bad (8)
23. It's somehow nicer to be on best part of pivot – very satisfying! (9)
25. *Pen*
26. Boxer in a hole (6)
28. *Pen*
29. *Pen*
31. British champers? It's enough to make a man go in for exercise! (7)
32. *Pen*
33. *Pen*
35. Where men dress in a djellabah, or in a suit (7)
36. Foods harvested several times, by the sound of it (7)
37. Clothes a teenager has are probably not made from this old-fashioned stuff (6)
38. A circle that's associated with nose, and with neck (5)
41. Rider won't win this by finishing jump behind time (5)
42. Product of melting other metals (5)
43. Throw away in gently rising trajectories (5)
45. Tobacco provided by 49 (4)
46. Think I love using metric unit shopping? (4)
*48. Colour of US agents in coal mine (7)

The prize will be awarded to the first correct entry drawn on 1 May .... Please send your entry to the Editor, 'Quest', Room 1532 at State House and state whether you would prefer a book or record token. The solution will appear in the next issue.

The Brain of SRC?

Twenty teams from the Swindon Advance Office took part in a quiz competition organised by the Sports and Social Club for the title 'The Brain of SRC'. Competition was tough and it says much for the skill of questionmaster Wally Bray that his decisions were accepted without too much mayhem.

Some of the team names chosen by the participants demonstrated an admirable grasp of the finer points of job description and included Contracts Indians who soon knocked out Contract Chiefs only—inevitably to be brought to book by the Financial Wizards. The Training Idiots were eliminated by Manpower Academicals who in their turn were crushed by Secretariat Allstars. Salary Allsorts went down to Superannuation which met Engine Hearing in the final.

Chairman Geoff Allen presented the Hilda McIntosh Trophy to the winning Engineering team. Some in the audience thought they detected some satisfaction on his part. Could the fact that he had been Chairman of the Engineering Board have had anything to do with it?

Hilda McIntosh who worked in the London Office of the Council for seven years until her untimely death in 1977 had asked that any money donated for flowers should instead be given to the Imperial Cancer Fund. It was decided that a little money should be spent on a permanent memorial. The Shield has been presented to the Sports and Social Club to put up as a prize for this annual competition.

We understand that certain colleagues in the London Office think they could give Engineers a run for their money anytime.

From left: Wally Bray (Chairman), John Cima (one of the contest organisers), Liz Foley, George Rankin (Chairman of the Sports & Social Club), and Janet Orme

Misprint of the year?

17th Premature Retirement Working Party Meeting

The briefing, which will begin at 10.30 a.m., will now be held in toom 52 here at the Swindon Office.

Telex message sent in by Sid Mullineux, RGO.

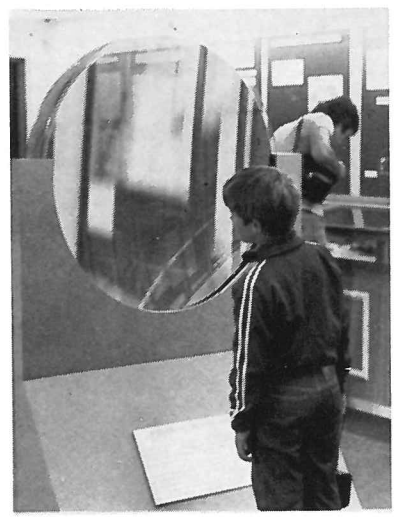


Photo above shows a young visitor to the Public Exhibition at the Royal Greenwich Observatory. Over 45,000 visitors saw the exhibition in 1977

Stop press

Our congratulations to Dr Alan Gibson, Head of the Laser Facility at Rutherford and Professor Phil Burke, Head of Theory and Computational Science Group at Daresbury, who have been elected Fellows of the Royal Society.

Solution to Maxim 15

The winner was Dr D R S Boyd (Rutherford Laboratory) who wins a £2 book token.

Solution to Nutcracker 24

The solution is Distig the 15th of February. The winner was L Naylor (Daresbury Laboratory) who wins a £2 book token.