QUEST

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QUEST

House Journal of the Science Research Council

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Vol. 5 No. 3

contents

P–J Violation

Cover picture: *A young and clearly enlightened audience at the Daresbury Laboratory's Open Day. While their parents looked at exhibits showing the part played in the nuclear physics programme by interacting particles, the children watched some violent interaction between Punch and Judy. This show, and other entertainment, was put on by the Laboratory's Sports and Social Association. Family Day was the last of the Laboratory's Open Days, which opened with a visit from the Council, see page 2. Photo Arthur Pickett, DNPL.*

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retirement

Dr William Francis CBE

On 31 July William Francis will retire after more than seven years as Secretary of the SRC and thirty-two years in the public service, mostly in DSIR.

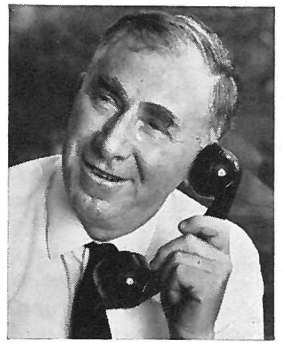
He will be missed not only for all the work he does but for his quiet tenacity which enables those that would be deaf to hear, for his dry sense of humour which often helps to resolve tense situations, for his happy knack of putting things in perspective and for his friendly readiness to help all-comers.

Like Chaucer's Clerke of Oxenford (although he attended a different University) "gladly wolde he lerne and gladly teche". His perception and philosophic detachment make him an eager listener, a sharp analyst and a gentle debunker of accepted truth. These qualities, coupled with his constructive spirit and commonsense have enabled him to contribute both to the advancement of knowledge and to its useful application. In particular, he is due much credit for Government policies towards the encouragement of collaboration between research establishments, universities and industry.

In recent years his main contributions have been to ensure the smooth flow of Council business and its coordination with other Government activity; to give successive Chairmen the particular kind of support each asked for; and to guide and help his colleagues in carrying out policies and schemes for which they were executively responsible. His standing both in the SRC and other organisations is reflected in the way colleagues seek his help and advice. His standing with the Council is clear from the way in which members have made him the de facto Deputy Chairman.

(An account of his early career appeared in Quest Vol. 3 No. 2, p. 1. Ed.)

appointment



Mr. R. St. J. Walker CBE succeeds Dr Francis as Secretary of the Council. Previously Director of Administration, Mr Walker has been with the SRC and the former Department of Scientific and Industrial Research since 1962. His earlier Civil Service career was spent in the Ministry of Supply, later Ministry of Aviation, and included three years as Secretary to successive Ministers (Mr Strauss and Mr Sandys).

Earlier, he read chemistry at Oxford but was saved from completing his degree by the outbreak of war. His war service was spent in the Anti-Tank Regiment, Royal Artillery, and, after a Technical Staff course, in the Proof and Experimental Establishment.

Mr Walker is married with three sons and his chief recreation, shared by his family, is sailing.

we won !

One of Dr Francis' most recent duties was to preside at the SRC Sports Day and Mrs Margaret Francis presented the prizes. Dr Francis is seen sitting at left of picture watching Geoff Cox of Daresbury 'A' team receive the football winners' cup from Mrs Francis (right). — A trophy worth getting it seems! Photo J C Beach DNPL.

More pictures of Sports Day in **next** issue of Quest.

1. Members of the Council, the Council Secretariat and Daresbury Laboratory at the Daresbury Open Day 'Introductory Exhibition' — see 'the first ten years' on opposite page.
Front row (left to right): Mr R St J Walker CBE (the new Secretary to the Council), Mr M J Moore OBE (DNPL Group Leader, Engineering Services), Dr D L Johns and Miss F Jenkins (both of Secretariat), Mr C Jolliffe CBE (Director of Science), Sir Brian Flowers FRS (Chairman of the Council).

£1M A YEAR FOR ATOMS MOLECULES AND PLASMAS ++ BEST DATA YET FROM SKYLARK SPACE PROBE IN SOLAR ULTRA-VIOLET SPECTRUM ++ SYMPOSIUM ON ELECTRON AND PHOTO INTERACT ++ £59,000 HARDWARE FOR MULTI ACCESS COMPUTER SYSTEM ++ BRITISH EXPERIMENT IN OR ING SOLAR OBSERVATORY OSO-G ++ FIRST LUNAR SAMPLES FOR BRITAIN ARRIVE AT SRC ++ FOR CONTROL ENGINEERING RESEARCH ++ ANGLO-AUSTRALIAN TELESCOPE CONSIDERABLE CONTI BUTION TOWARDS SCIENTIFIC DISCOVERY ++ RSRS PARTICIPATES IN UK4 SATELLITE TO MEA INTENSITIES OF ELECTROMAGNETIC RADIATION ++ DEVELOPMENT IN ANALYSIS OF BUBBLE CH BER PHOTOGRAPHS BY SWEEPNIK AIDED BY SRC GRANT OF £40,473 ++ SUCCESSFUL LAUNCH O

council commentary

march

the future in nuclear physics

Prior to its consideration of the Forward Look in April the Council had a preliminary discussion of the Nuclear Physics Programme. Professor Gunn, the Board Chairman, explained that the intention was to give priority to the CERN programme and both the Rutherford and Daresbury Laboratories had an important part to play in its support. In the domestic programme he said the Board felt that work on the Nimrod and NINA accelerators was at its peak and of the highest scientific standard. Both accelerators should certainly run for another five years but thereafter the restrictions on manpower and money would make it almost impossible for both to continue. No decision on which should be closed could be taken on scientific grounds alone, but from staff management considerations the Board felt that the best solution might be for NINA to close down at the end of 1977, in phase with the likely build-up of the proposed Nuclear Structure Facility and the High Flux Beam Reactor, and the phasing in of the new CERN facilities. The Council noted that the Nuclear Physics Board had decided not to include construction of the NINA booster in its future programme.

more support for Cambridge computer group

The Council approved a grant of £109K over 3 years to Cambridge University to enable Professor M V Wilkes to continue research in computing science on machine organisation and programming systems. The Cambridge group was amongst the first to command support on a substantial scale from the Computing Science Committee and their research on machine organisation has achieved a high standard internationally. The group designed and implemented the successful multi-access system for the Titan computer and more recently work has included organisation processes within the computer, systems for solving algebraic equations and computer aided design. The work of the group is of industrial relevance and ICL are interested in its possible applications.

Approval was given for continuation of the programme of short courses, organised for the Council by the Careers Research Advisory Centre, aimed at giving university research students some knowledge of the challenges and problems that exist in industry and central and local government and some insight into the underlying principles upon which work in these sectors are based. The courses are proving extremely popular with the students and there is every indication that they are useful in helping those attending to make more informed decisions about their future careers. Seven courses are being held in 1972 and there will be an increase of one each year over the next three years.

CRAC courses

the first ten years

In May this year the Daresbury Laboratory held Open Days to mark the tenth anniversary of the date when the (then) Minister for Science gave approval to build a nuclear physics laboratory and a 5 GeV electron synchrotron at Daresbury in Cheshire. The Council and Council Secretariat were the first visitors, followed by a press day, a public day and a family day (see cover picture).

Construction of the laboratory began in 1963 and four years later it was officially opened by the Rt Hon Harold Wilson, then Prime Minister. An application to build a Synchrotron Radiation Facility

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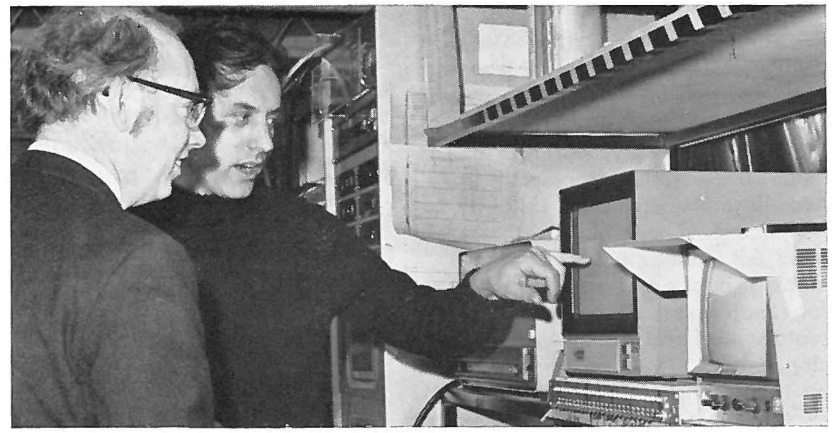
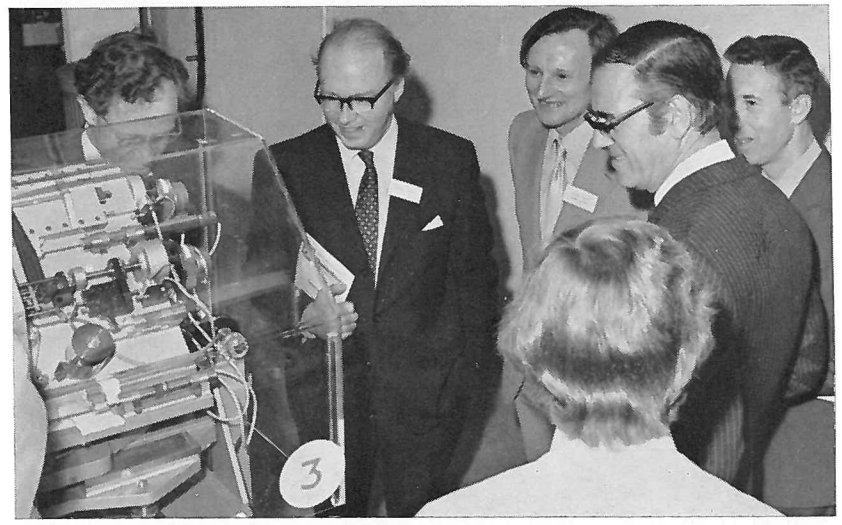


2. Dr Robin Marshall (DNPL) showing the LAMP (Large Aperture Magnet Project) experiment on-line data display to Professor H L Kornberg FRS (Chairman of Science Board).

3. The Diamond Target which contains a large single crystal diamond used to produce a polarised beam for photoproduction experiments. The exhibit showed the control mechanism and an explanatory display.
Interested onlookers (l to r) are: Mr Jolliffe (as 1), Professor Kornberg (as 2), Professor A Ashmore (Director DNPL), Sir Brian Flowers (as 1) and Dr B Zacharov (DNPL Group Leader, Computing and Electronics).



april

forward look to 1978

The main item discussed was the Forward Look for 1973-78. Council decided to prepare its future plans on the basis of the provisional allocations already notified for 1973-75, which allow an average growth rate of about 2½% pa, and a 4% pa growth rate thereafter.

Within these overall figures, the Council proposes to keep the total funds devoted to nuclear physics approximately constant. Construction of the Nuclear Structure Facility is included, but plans are on the basis that one of the NP Laboratory accelerators will cease to operate at the end of the Forward Look period. At the March meeting, the NP Board recommended that NINA should not be used for high energy physics from 1977, but the Council has still to consider the matter in detail and take its decision. The present priority for university research in engineering will continue, but Council asked the Engineering Board to review the need for a high growth rate after 1976/77. There is substantial provision in the Forward Look for the neutron beam programme, which would create considerable in-house activity, and in astronomy future plans include the Mark VA radio telescope and the Northern Hemisphere Observatory. The Atlas Laboratory programme includes a new large computer. How far these plans can be implemented will depend on the funds actually made available and there is already an indication that the growth rate beyond 1974/75 is unlikely to exceed 3½% pa. A further major uncertainty is that a Government decision has yet to be taken on whether, as the Council hopes, the High Flux Beam Reactor can be built.

new library for Rutherford

The Council approved construction of a new library building at

council commentary continued

the Rutherford Laboratory. When the Laboratory was opened it was planned that the library needs would primarily be met by the main AERE library, but this has never been satisfactory and the two libraries are now quite independant. There is a growing need for adequate space for the stock of books and pre-prints, and for reading and study by the Laboratory staff and the many university visitors. The new library will be in the form of a bridge connecting two of the Laboratory buildings. Approval was also given to expenditure by the Radio and Space Research Station for an increase in the core store of the 1906A computer by 32K and for an additional exchangeable disc transport to handle large data files. These additions are needed in connection with the control centre for the UK-5 satellite now being set up at RSRS – the first time a satellite in the Ariel series will be controlled from the UK.

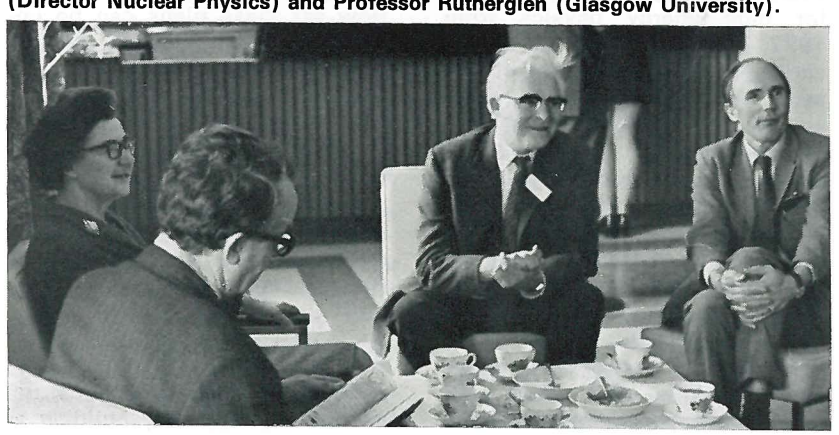
The research grants approved included one of up to £105,000 over one year to Cambridge University for support of the Institute of Astronomy. The Institute has recently been formed by the university merging the Cambridge Observatories and the Institute of Theoretical Astronomy (IOTA). The grant is to cover a transition period until proposals are prepared for later years.

visit to Daresbury

The Council usually holds its May meeting at one of the Establishments and this year the visit was to the Daresbury Nuclear Physics Laboratory. The meeting was preceded by a tour of the Laboratory which included some of the exhibits prepared for the Open Day held immediately after the Council's visit. Council members have commented that they were impressed by the enthusiasm of the Laboratory staff, and the standard of the scientific programme, and said how enjoyable the visit was.

4. (l to r) Dr R G P Voss (Deputy Director DNPL), Professor J C Gunn (Chairman Nuclear Physics Board) and Professor A Donnachie (DNPL Group Leader, HE Physics and Synchrotron Radiation Facility).

5. (l to r) Mrs Pickavance, Mr M J Moore (as 1), Dr T G Pickavance CBE (Director Nuclear Physics) and Professor Rutherglen (Glasgow University).



may

The Council received the report of the joint SRC/SSRC Committee on "broader" training. The Working Group on Manpower for Scientific Growth under Professor Swann, which reported in 1968, pointed to the need to encourage those studying science disciplines to continue their training in areas broader than are provided by the traditional PhD, and the joint SRC/SSRC Committee was set

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ten years continued from p. 3

was the next big step forward, and this received approval two years ago *(as reported in Quest Vol 4 No 2 p 1).* The facility will become available later this year.

The latest project linked with the laboratory is the proposed very large tandem Van de Graff accelerator. This has been discussed for some years and a design study is now being carried out with a view to building it if the project is finally accepted, on the Daresbury site. One of the Open Day exhibits showed prototype and test equipment for the design study.

We offer congratulations to the staff of the Laboratory for a very well thought out exhibition, of both general and expert interest, and for their smooth organisation of tours of exhibits, lunches and buses. A special mention goes to the exhibitors who answered all sorts of questions at many different levels.

Pictures show moments during the Council's visit, all taken by Arthur Pickett, photographer at Daresbury Laboratory.

SRC INTERNATIONAL

A supplement that features some projects abroad and our collaboration with research teams from other European countries.

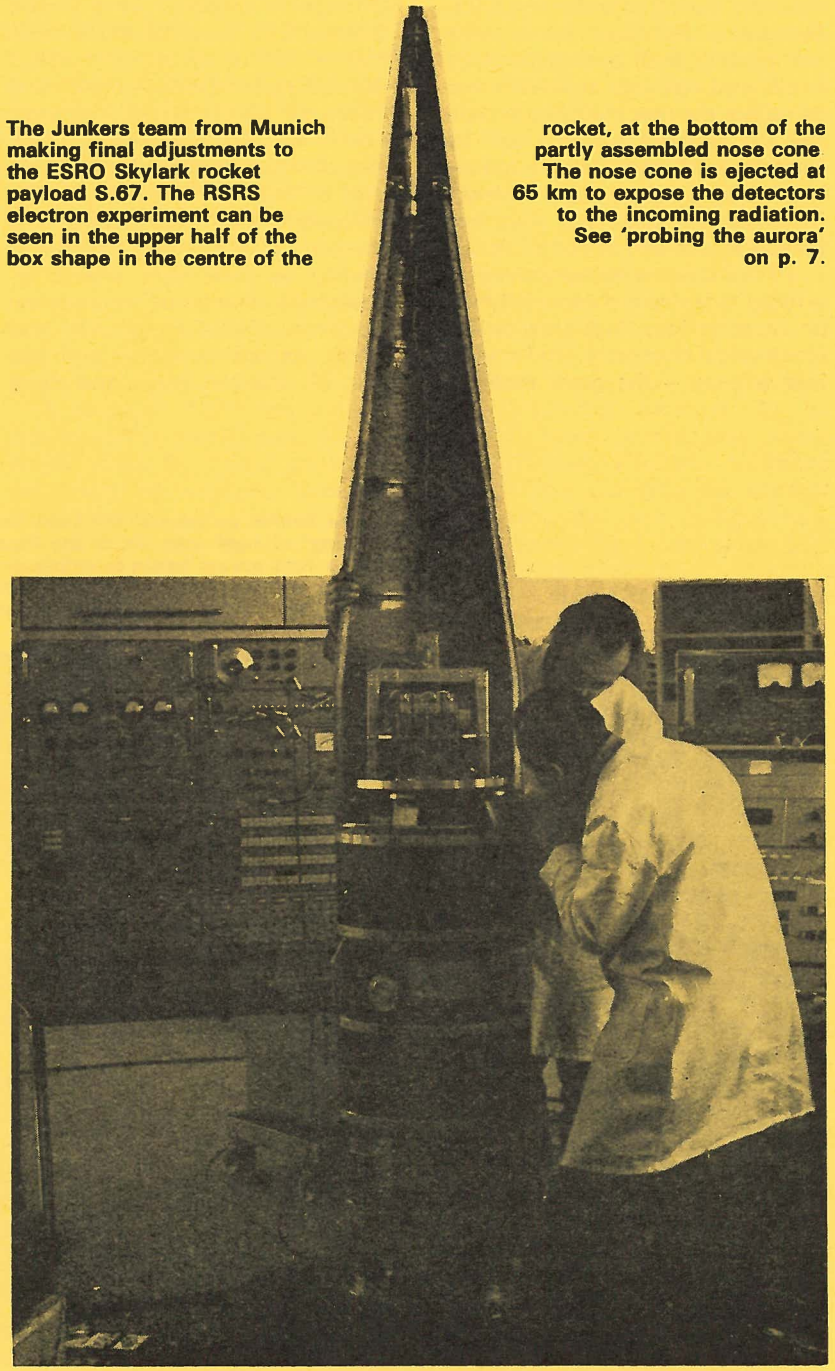
into Europe

Brian Flowers

Whatever the future brings it seems unlikely that the Treaty of Rome will prove simply to have been another scrap of paper. The most important issues are, of course, the economic and political ones on which scientists have nothing more to contribute than any other intelligent citizen. But science has received scant attention and even technology has only been touched on to bolster up economic argument. The likely effects of joining the EEC upon the advancement of science in this country and in Europe have as yet been scarcely considered.

The two basic elements of international science have always been the free exchange of information and movement of scientists across national frontiers. This has been so from Egyptian papyri to Gutenberg's press, to the modern international scientific journals. There would be little point in trying to explain the British climate using purely British data, or to control locusts and plague on a xenophobic basis. And so we have the World Weather Watch and the World Health Organisation.

Nations as well as universities and other institutions have already realised that they must coordinate their activities in order to share limited funds to the best advantage and to afford facilities to which they can no longer singly aspire. Cooperation already encompasses nuclear physics, CERN solid state physics (ILL Grenoble), space research (ELDO, ESRO), astronomy (ESO), molecular biology (EMBO), atomic energy (Euratom). Large new scientific projects will increas-



The Junkers team from Munich making final adjustments to the ESRO Skylark rocket payload S.67. The RSRS electron experiment can be seen in the upper half of the box shape in the centre of the rocket, at the bottom of the partly assembled nose cone. The nose cone is ejected at 65 km to expose the detectors to the incoming radiation. **See 'probing the aurora' on p. 7.**

into Europe continued

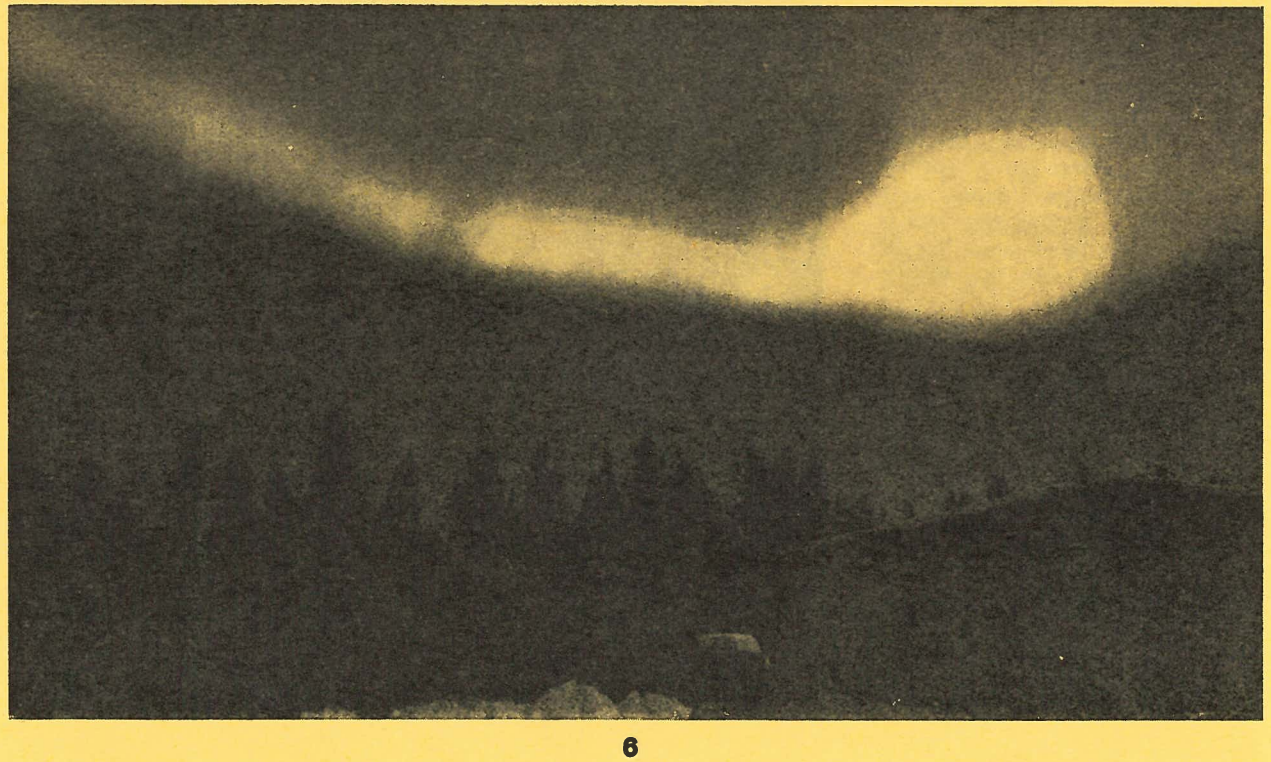
ingly have to be judged and financed on a European, not a national basis, and we should welcome this even if it means that decisions may take a little longer and negotiations may be a little more difficult. At the same time, we shall have to beware of undertaking scientific or technological ventures for purely political reasons, merely in order to appear European. Building up a new Europe is indeed a worthy end in itself, and one that scientists just as others may be ready to accept. But we and our partners will be foolish to forget that however high our purpose bad science leads to bad politics, and bad technology to bad economics.

Of the science-based industries – those that depend especially upon automation, instrumentation, electronics chemistry, and materials science – the great majority have much to gain from the enlargement of the Common Market. If the heavy R & D overheads are to be covered, a home market of 50 million is insufficient as an export base; 250 million is nearer the mark.

There are thus strong practical reasons for international cooperation in science and technology, which reinforce the idealistic view that knowledge about the world belongs to mankind as a whole. But the EEC must be much more than a club in which rich nations can sell each other more and more consumer goods. Science is sedition at its best, and new discoveries can and should alter our concept of the world. The increasing complexity of technology and science provide added impetus to change as their side effects increasingly recognize no national frontiers. Pollution of air and water, excessive use of soil and sea, all make it more and more necessary – in our own self-interest – to cooperate internationally, when necessary beyond Europe, because in the end we prosper or suffer together. Already an international institute for the management of technology has been proposed, and the EEC intends to extend the work of the International Commission for Rhine Pollution Control to protect the North Sea as well as the whole of the Rhine basin.

Society demands satisfaction from its investments in science, and increasingly, a better quality of life. Technology no longer has licence to intrude in unwelcome ways. But to avoid and control the intrusion of noise, filth and poison we require more research, not less. To achieve this Europe will have to share the costs: to operate the subsequent controls, Europe will have to act in concert, and recognise its place in the world as a whole.

Picture below: an auroral arc seen from Kiruna in Sweden. The nearly vertical 'curtains' of light rays lie in the local direction of the earth's magnetic field. After a time waves begin to ripple along the curtains and they break up into a chaos of swirling and darting shafts of light that seem to fill the whole sky. See 'probing the aurora' opposite by Dr Duncan Bryant of RSRS.



probing the aurora

Sounding rocket experiments in Norway and Sweden by a group from the Radio and Space Research Station.

Duncan Bryant

No one who has the good fortune to see an auroral display in the heart of the auroral zone (in Europe this is the North of Norway and Sweden) can fail to be impressed by the sheer scale of the phenomenon and its highly varied nature. Usually an event begins with a bright band of light extending across the night sky from east to west. It appears first in the northern part of the sky and then begins to move south. After an hour or so, when it is directly overhead, one can see that it is composed of several thin curtains of light which are not quite vertical but are aligned along the local direction of the earth's magnetic field. After a time, waves begin to ripple along these curtains and the hitherto stable pattern breaks up into a chaos of swirling and darting shafts of light that seem to fill the whole sky. This settles down eventually to a widespread and fairly uniform glow, though even this can be patchy and its brightness often pulsates.

The immediate cause of the aurora is well understood. Streams of charged particles – mainly electrons with energies of a few keV – guided by the earth's magnetic field, enter the atmosphere from outside and make it glow like the gas in a fluorescent lamp. The light that is produced is somewhat incidental to the more important effects of ionization and heating of the upper atmosphere in the region 90 – 120 km.

The origin of the charged particles is still a mystery. It is clear that the energy which 'drives' the aurora comes ultimately from the sun, and it is carried to the earth by the constant stream of charged particles evaporating from the sun and forming what is known as the solar wind. It appears that some of this energy is captured and stored for a while in the magnetic fields and charged particles that surround the earth. The stored energy is redistributed every few hours in explosive events, one of the results of which is the aurora. It is not just the details of these processes that are unknown but even their very nature. One process that may play a large part in the redistribution of stored energy is the dissipation of magnetic energy, a process that occurs on the sun and probably on other stars. We have to resolve these questions both in order to understand the earth's environment, and in order to learn about basic physical processes that are as yet unknown in the laboratory.

A group at RSRS has studied the incoming auroral particles for some years by flying detectors on sounding rockets launched from Norway and Sweden. Most of the flights have been part of the ESRO rocket programme, some have been within the UK National programme and some in collaboration with the Norwegian Defence Research Establishment. So far we have used five different types of rocket, ranging from Petrel which reaches an altitude of 160 km, to Skylark which reaches 240 km. Each rocket carries several different but closely related experiments. A typical ESRO Skylark payload might carry experiments prepared by research groups from several different countries – to measure light intensity, ionization density, electric fields, and particle intensities. The preparation of such a payload requires a lot of co-operation between the experimenters, the authority responsible for the flight and (usually) a contractor appointed to assemble the various experiments into a working payload. In this way we have now worked with scientists and engineers from almost every country in Western Europe. We value this collaboration not only for the exchange of scientific and technical data and ideas, but also for the lessons to be learned from the different approaches to getting jobs done and completed on time.

The detectors we use are geiger counters and channel electron multipliers. The geiger counter detects a charged particle by amplifying the trail of ionization in gas. The channel electron multiplier amplifies the emission of secondary electrons from a surface. The geiger counter is easier to use but insensitive to the low-energy electrons that predominate and carry the bulk of the incoming energy. In order to isolate and compare particles of different energies, we deflect the incoming particles in an electric field before they reach the channel electron multiplier where they are detected. Several detectors are used in each payload depending on the exact purpose of the flight.

The launchings take place from Andenes, a fishing port on an island off the northern coast of Norway, and Kiruna, an iron-mining town in the heart of the Swedish part of Lapland. In spite of the extreme arctic cold our experiments have to be restricted to the winter months when the sky is dark enough for the aurora to be seen. Once everything has been checked and the rocket is ready to fire, there is usually a long wait through many nights before conditions are right. The wind must not be too strong, the sky must be clear, and the chosen type of aurora must lie in the flight path. The nominal trajectory of the rocket is predetermined: the rocket is set to be launched nearly vertically and, after about 8 minutes flight, to fall within a target area down range.

The decision to fire is the most critical moment of all because, although it is highly variable and unpredictable, the aurora can be studied systematically by

SRMU

The Space Research Management Unit (SRMU) was transferred to the Radio and Space Research Station on February 1, 1972. The unit originated in a small group on secondment to the Physics department at University College, London, under Sir Harry Massey, and was formed into a recognised Unit in 1963 when it became formally responsible for the Scientific space programmes carried out with rockets and satellites, acting on behalf of the Royal Society's British National Committee for Space Research.

In 1965 when the Science Research Council was formed, the Unit became part of the SRC's Astronomy Space and Radio Division (ASR) and also looked after Space Research grants and the Space Policy and Grants Committee (SPGC) and its working groups. When the Unit transferred to RSRS, the grants and committee secretariat duties remained behind with ASR.

SRMU contains three groups. The satellite project group is responsible for the overall management of the British space research programme carried out on the 'Ariel' series of satellites (Called 'UK' before launch). The satellites are launched by the United States National Aeronautics and Space Administration (NASA). Ariels I and II were American Satellites carrying British experiments, Ariel III was the first of the series built entirely in this country and Ariel IV launched last December, also contained an American experiment for the first time. The next one, UK 5, will be launched from the Italian San Marco platform off the coast of Kenya in 1973 (See John Smith's article in Quest Vol 5, No 2, p.11). The responsibilities of the Satellite group cover co-ordination of the requirements of experimenters, purchase of the spacecraft, through the Ministry of Defence Procurement Executive (MOD-PE), through to post-launch control and data processing, all in liaison with NASA.

The Skylark rocket group has similar responsibilities within the British national rocket programme. Skylark is a 17-inch sounding rocket which has been improved over several years for payload capacity, height and reliability. A sun-pointing attitude stabilised version has been available for some time and a star-pointing version is now being developed. Skylarks are mostly fired from Woomera, Australia, through the agency of the MOD-PE, but have also been launched in the ESRO programme from the Sardinia (Italy) and Kiruna (Sweden) ranges. A national campaign is now being planned for Andoya (Norway). The payloads carried study all aspects of space science – from, say, x-ray astronomy to upper atmosphere winds – and have contained experiments from several SRC establishments as well as many universities.

Recently the group has added balloon launched experiments to its activities, and it is planned to increase this programme. The solar experiments launched by balloon in New Mexico by the Queen's University Belfast and the Astrophysics Research Unit were described by G W Ackland in Quest Vol. 5, 1 p7.

The third group looks after the Petrel and Skua rocket projects and the Commonwealth Collaborative programmes. The Petrel rocket (7.5 inch diameter) has been developed from the Skua (5 inch diameter) meteorological rocket. Both are suitable for small, light and more quickly prepared payloads carried to lower altitudes of 150 km or so, compared with 250 km for Skylark. Most SRC experiments have been launched from the Royal Artillery range at South Uist in the Outer Hebrides. Some have been launched in collaborative programmes from the Sonmiani (Pakistan) and Thumba (India) ranges. High latitude experiments concerned with auroral phenomena have been sent up from the Kiruna range in Sweden and the first such campaign from Andoya in Norway following amalgamation of these ranges within the ESRO Special Project is to be held later in 1972. Nearly all of them have measured ionospheric or neutral atmosphere phenomena.

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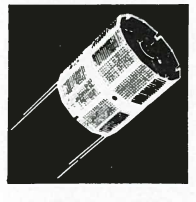
probing the aurora continued

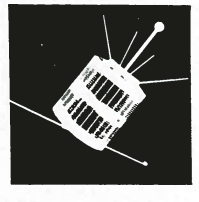
careful selection of launch conditions. The decision is also of course irrevocable. Once the rocket is fired we can only hope that the data we want will begin to pour back from the transmitter it carries. By these methods we have so far been able to identify the process responsible for the glow-type aurora, locate the origin of the pulsating aurora, and we have begun to establish the origin of auroral bands or arcs.

International co-operation in this field of study has recently received a setback with the closing of the ESRO rocket programme. We hope though that much of this can be regained in the UK National programme. At present there are plans for a series of Petrel launchings from Andenes this autumn, and for combined Skylark and Petrel launchings, also from Andenes, in the autumn of 1973. These rockets will carry experiments provided by eight research groups in the UK.

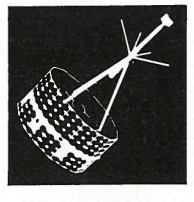
ESRO's scientific satellites



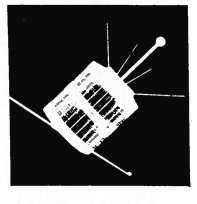
ESRO-II/IRIS
Study of solar and galactic cosmic rays and particles



ESRO-I/AURORAE
Study of polar ionosphere and auroral phenomena



HEOS-I
Study of interplanetary magnetic field and solar particles



ESRO-I/BOREAS
Study of polar ionosphere and auroral phenomena

ESRO and the SRC

From the early days of space research it was recognised that one of the dominant factors would be its cost. To share this, ten states in Europe joined together to form the European Space Research Organisation (ESRO), formally constituted in March 1964. The UK was a founder member and when the SRC was formed in 1965 we became responsible for UK participation in ESRO. We still have responsibility for the scientific side, but with the recent addition to ESRO's activities of a rapidly expanding 'Applications' programme, UK responsibility for this part has fallen to the Department of Trade and Industry.

In its early years ESRO launched a series of scientific satellites starting with modest size projects not dissimilar to SRC's own highly successful Ariel series. There was also a steadily expanding sounding rocket programme that provided European scientists with considerable opportunities in this field. Unfortunately this programme is now about to be terminated.

The satellite part of the programme was initiated with the launch of ESRO II in 1968 followed by another five satellites. The most recent and the largest of these was launched in March of this year. This latest satellite known as TD-1A weighs some half a ton and cost over £20 million sterling. It is clear that for the smaller countries of Europe the cost in finance and manpower of such a large project would be excessive, and even for the larger countries such as Germany, France and the United Kingdom it would be very expensive and could only be undertaken alone at rare intervals.

The six ESRO satellites have conducted a wide variety of extremely interesting experiments. The first two, ESRO I and ESRO II, were relatively small and entered orbit fairly close to the earth. The third, HEOS, entered a very different orbit, in fact it travelled to a distance of about a quarter of a million kilometers from the earth, or the greater part of the distance to the moon. Like the others it carried UK experiments, in this case to study particles occurring in deep space and the behaviour of the magnetic field which is found there. Experiments on board from other member states included a German one that released a large amount of barium deep in space which formed a cloud clearly visible from earth.

The TD-IA satellite launched early this year was put up to scan the sky in the ultra-violet, to study the radiation from the stars which we cannot see with our eyes. As this invisible radiation does not penetrate through the earth's atmosphere, these studies cannot be undertaken from the ground. Out in space where there is no atmosphere the satellite's telescope can see freely and can study large numbers of stars in the very interesting ultra-violet region. TD-1A has already produced a lot of fundamental information which our scientists are now analysing.

Of the seven experiments on board, the largest is the 12 inch ultra-violet reflecting telescope 'S2/68' with four photo-multiplier detector channels, constructed by the Science Research Council and the Liège Institute of Astrophysics to carry out multi-colour celestial scanning in the range 1000 - 3000 Å. The experiment began as a joint project of the Royal Observatory Edinburgh and the Liège Institute, then three more of the SRC's seven research establishments became involved: ARU, ACL and RHEL.

The Centre D'Etudes Nucleaires de Saclay has two spectrometry experiments on TD 1A, studying primary charged particles and celestial x-rays in the 3 - 30KeV range; Utrecht University Observatory is studying UV stellar spectroscopy in three wavelength bands between 2000 and 3000 Å and solar x-rays in the 20 - 300 MeV range. Milan University are looking at solar gamma rays in the 50 - 300 MeV range and are taking part in a joint experiment with the Max Planck Institute, Garching, and the Saclay Centre to scan for celestial gamma rays in the 70 - 300 MeV range.

Future ESRO plans include a large satellite to study cosmic rays which will be launched either late in 1974 or early 1975. This is a very large and costly project, although simple in concept in that it contains only one experiment. This will consist of a very large

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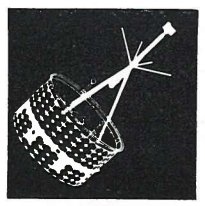
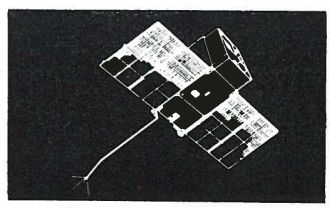
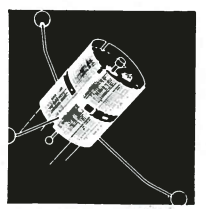


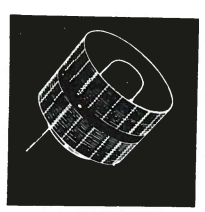
HEOS-A2
Study of interplanetary magnetic field and solar particles



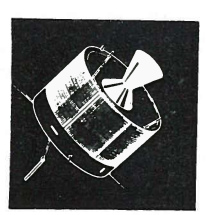
TD1-A
Astronomical, solar and cosmic ray research



ESRO-IV
Study of the ionosphere and solar particles



COS-B
Study of cosmic rays from the galaxy



GEOS
Investigation of particle fluxes, electric and magnetic fields

ESRO and the SRC continued

chamber and associated instruments, designed to study the very high energy gamma-rays which come from various parts of the universe. One hopes they will tell us much about the interior processes of stars or their creation or perhaps both.

Another project under active study that, if finally approved, would be launched in 1975 or 1976, is the large geostationary satellite known as GEOS. This would be placed in a geostationary orbit so as to rotate at the same speed as the earth and appear to remain stationary over a selected point on the equator. The satellite would send down to earth a continuous stream of information concerning particles and fields in space and these would be correlated with observations of high-latitude terrestrial phenomena made on the ground by a number of observatories scattered around or near the arctic circle. This is already a good example of the wide international collaboration which is one of ESRO's primary aims.

As mentioned before, the original ESRO programme consisted of both satellites and sounding rockets. Towards the end of last year the member states agreed that the organisation should no longer remain exclusively a scientific research organisation but should interest itself more in the applications satellites which promise so much benefit to mankind. Since funds are not unlimited some sacrifices were inevitable, and one of these was the termination of the sounding rocket programme. This programme provided opportunities for experimenters both here and on the continent to fly experiments on rockets which either did not justify the cost and effort of using a satellite, or were simply not suitable. The first one flown was a British Skylark rocket, launched in July 1964. This was followed by more Skylarks and the corresponding French rockets Centaure, until a total of 171 launches had taken place by the end of last year. This programme has been invaluable in assisting European laboratories to obtain data and develop their expertise in space techniques. Many of these laboratories have graduated from sounding rockets to complicated satellite payloads with great success. Indeed it may be said that the sounding rocket is the beginner's way into space.

Now that the sounding rockets programme is to end ESRO will concentrate on the scientific satellites on the one hand and on the applications satellites on the other.

What are 'applications' satellites? We have all sat and watched scenes from distant countries relayed to us on our television screens by means of satellites. This is one example, and the one most familiar to us, but behind the television broadcasts lies a complex network of ground stations and orbiting satellites built for telephone, telex and similar uses and they are the ones used, when required, for television purposes. Another familiar example is the use of satellites to photograph clouds and relay the photographs to the ground by means of radio transmissions. These help meteorologists to understand more about our atmosphere and the weather it inflicts upon us. Although the use of satellites for meteorology has only just begun it is already possible to detect and follow the progress of hurricanes as they near the coast and threaten cities and ports. Another type of satellite which is claimed to have great benefits for mankind is the 'Earth Resources Satellite'. This examines the earth and detects changes in vegetation and in geophysical properties, such as where areas of crops have been subject to blight or where warm water flows into a cold sea, or vice versa. Or it can assess which areas of a mountainside are covered by snow or how big is the real extent of a desert.

ESRO has firm plans for some of these activities and is conducting studies for others. A programme has been agreed for an European communications satellite which will last several years and which should lay the foundations for future communications services for the whole of our continent. Negotiations are being undertaken with the Americans for a satellite which will test a method proposed for control of air traffic over the North Atlantic. This method should enable aircraft to fly closer together but still more safely across the congested North Atlantic routes, and should enable traffic to grow and continue to grow over many years to come. Another programme on which decision is expected during 1972 is the European Meteorological programme which aims to place a single experimental satellite into a geostationary orbit and use it to test various types of instruments and to provide the basis for a more complex operational system which may be used in future years.

Responsibility within the UK for these new 'applications' activities which Europe is undertaking rests with DTI. SRC continues to be responsible on behalf of the UK for ESRO's scientific programme. Those of us who have been associated with this work over the years have found it stimulating and rewarding and the continuous contact with our European colleagues has demonstrated to us that, where there is a common will, there is usually a common way ahead to goals which none of us would willingly face alone.

inside information

The rumour that London Office is to move to Swindon so that the staff can receive their copies of *Quest* on time have not yet been officially denied.

Staff at RGO have been given a firm promise by Management that they will be consulted before any further amendment is made to the Greenwich Time Signal.

the next telescope

By 1969 the Science Research Council found that applications for observing time on the Isaac Newton Telescope (INT) had increased to four times more than we could accommodate. The building of the British 48 inch Schmidt telescope and the 150 inch Anglo-Australian telescope in the southern hemisphere, due to become operational in 1973 and 1975 respectively were expected to cater for some of the increasing demand. Nevertheless it was clear that a new observatory would be needed in the northern hemisphere so design studies and site tests were put in hand.

Current financial resources for optical and radio astronomy were already assigned to several new projects, in addition to the continuing maintenance and improvement of existing facilities. So it was planned to have the northern hemisphere studies completed and ready to be considered as soon as resources became available.

The new projects, now all well advanced, include the two southern hemisphere optical telescopes mentioned above, the 5km radio telescope at Cambridge, modifications to the Jodrell Bank Mark I radio telescope, design work on the proposed 375 foot Mark VA Radio Telescope, construction of the 60 inch infra-red flux collector at Tenerife and the design study for a larger infra-red instrument.

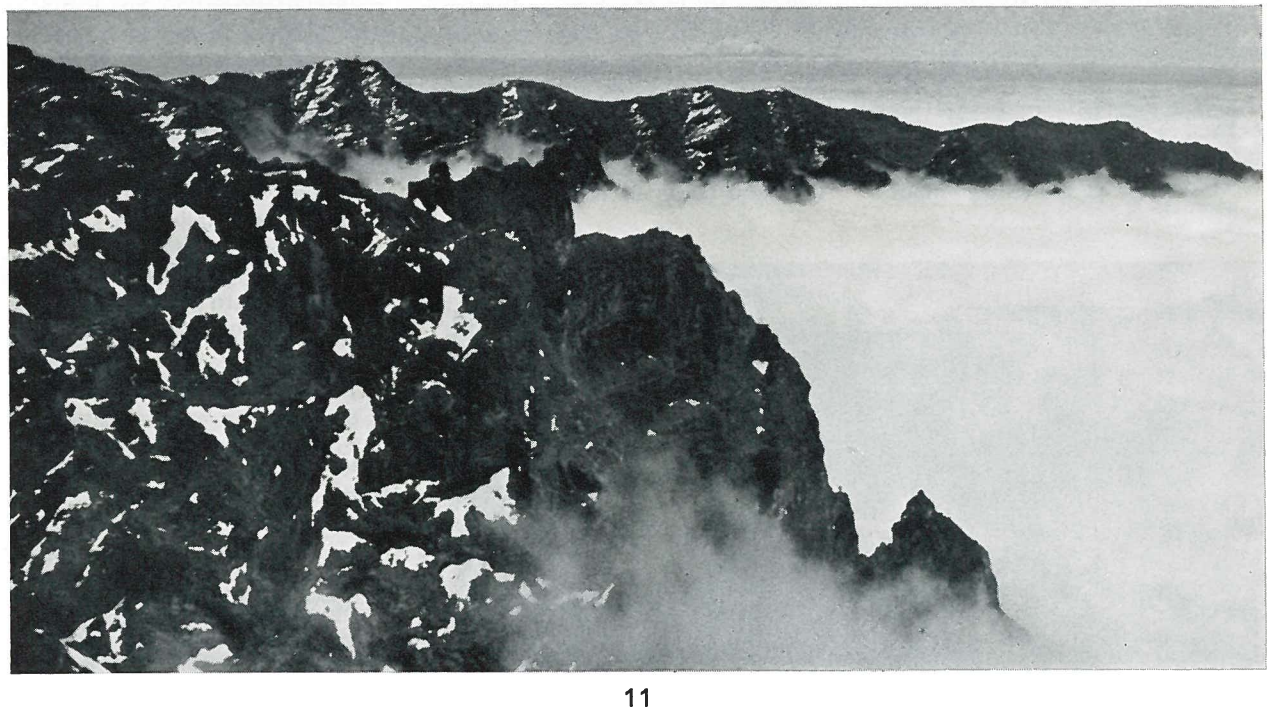
In the first of the following articles, John Alexander of the Royal Greenwich Observatory describes some of the things an astronomer looks for in selecting a really good site for a telescope. He is a Senior Scientific Officer, engaged on problems of stellar spectroscopy and photometry. He was involved in the early stages of the NHO site testing.

The second article is an account by the project leader of the Site Testing now being carried out by the Royal Observatory Edinburgh for a new Northern Hemisphere Observatory. Bennett McInnes is a Senior Scientific Officer. He also leads the Satellite Tracking Section at Edinburgh and acts as Public Relations Officer. When the site testing project was added to his other duties he had to resign his position of Staff Side Secretary to the Local Whitley Committee.

where to look

John Alexander

The meteorological climate of the British Isles is not ideal for optical astronomy. The observations of John Goodricke, James Bradley, William Herschel, the Earl of Rosse and William Huggins were made very much in spite of the British weather, and although much serious astronomical research can still be done with an instrument of moderate size even in a poor climate, it is essential for many programmes to use a large telescope in a good climate. As more large telescopes are being built in the world, the incentive to find a really good site becomes that much greater. First one looks for a site with a large number of hours at night when there is little or no cloud,



Picture: La Palma Island in the Canaries showing the island's highest point, above the clouds, looking towards Tenerife, 80 miles away. Photo J Alexander.

where to look continued

preferably distributed evenly throughout the year. There is a general tendency for cloud to decrease as one moves from the latitude of Britain to that of southern Europe; and even less is found in parts of the trade wind belts — from high ground in the Canary Islands off North West Africa for instance. It is therefore to southerly latitudes that we look for sites for new large telescopes.

In spite of the vast amount of meteorological data available, an accurate assessment of the amount of clear sky to be expected at a possible observatory site is rarely obtainable, because the nearest meteorological station is often far from the site and at a much lower altitude. Moreover, meteorological records often do not refer to cloud cover at night. Although some of these difficulties can be partially overcome using data from weather satellites, there is no real substitute for observations made on the site itself.

Secondly, for many photometric programmes the sky above the site must not contain any large number of suspended particles of dust, water, salt, etc. Both man-made pollution and natural phenomena can cause problems. Dust blown from the deserts of North Africa, for instance, is sometimes seen in the skies of southern Europe, the Canary Islands and the Cape Verde Islands, and occasionally as far away as Britain.

Thirdly, it is extremely important that the so-called "seeing" is good. Because of small temperature irregularities in the earth's atmosphere, the amount by which the light from a star is refracted varies rapidly with time, and in a small telescope its image will dance around because of this. In a large telescope, the main effect is to blur the image into a fuzzy ball of light much larger than the minimum size imposed by the optical properties of the telescope. This ball of light is called the "seeing disc". Really good seeing usually occurs with great frequency only at certain mountain locations which are above many of the layers of air that cause optical turbulence. At Herstmonceux the diameter of the seeing disc is typically about three seconds of arc and very occasionally as good as one. On the other hand, on a really good mountain site, one second of arc will be quite common.

The advantage of having good seeing can be demonstrated, for example, where the seeing disc of a star is focussed on the slit of a spectrograph in order to analyse its light. It is not usually possible to design a conventional spectrograph for a large telescope that will give good resolution of the spectrum and also have a slit wide enough to admit the whole seeing disc of the star, and much of the light must therefore be wasted. However, when the seeing is good, and the light is therefore more concentrated at the slit, a greater proportion will pass through. Other things being equal, the time taken to obtain a spectrum of a star with a conventional spectrograph is proportional to the diameter of the seeing disc divided by the aperture of the telescope, so a 50-inch telescope taking a spectrum with a seeing disc of one second of arc is about as powerful as one of 150-inch aperture working with a seeing disc of three seconds of arc. Since the cost of a telescope varies roughly as the square of the aperture, finding a site with really good seeing is extremely important.

Fourthly, for some programmes the sky must be "dark". In addition to the natural sources of light from galaxies, stars and the upper atmosphere, any extra contribution from man-made sources can be a great hindrance when observing faint celestial objects. In a recent survey in California it was estimated that one had to be some 170 kilometres away from a city of 2½ million inhabitants to have a sky sufficiently dark for a large telescope. Much of Europe is too near cities and towns to have a really dark sky.

The four observing conditions mentioned above are the main ones to be considered but other factors such as wind velocity and the temperature range throughout the night are also important. Even when one has found a site with excellent observing conditions it may not be a practical one because of problems of access. The requirement of a dark sky means that any good site will be reasonably remote from towns, and the construction of a few miles of new road can be extremely expensive, espcially in rugged mountainous country.

In selecting possible sites for a new northern hemisphere telescope, British astronomers were able to consult the findings of other European astronomers who had already carried out site testing in the Mediterranean area and in the Canary Islands. After a study of their results and of meteorological and geographical conditions, it was possible to select three areas which appeared to be most promising for the British site testing programme – Italy, South-East Spain and the Canary Islands.

In the Spring of 1971, the writer and Alan Penny (also from RGO) visited two of the potential areas. During our observations on the snow-covered mountain of Calar Alto in Spain, standing in a 60 mph gale and a temperature of –7°C, we could not help recalling the farewell advice from Herstmonceux 'Southern Spain will be very warm. Don't forget your bathing costume!'

The 60 mph gale was but a breeze though compared with the 120 mph winds that have blown round the team on Tenerife this year. It is perhaps just as well that they did not take up the suggestion made by an economist in State House and sleep the team in tents.

There were other moments of exhilaration. When we were looking for possible sites on the mountains of La Palma in the Canaries, we walked up through the clouds and into the sunshine on the pine clad slopes of the Caldera. From the highest point on the island we had a magnificent view of the mountains and cloud below and, away to the south-east, we could see clearly the snow covered peaks of Tenerife, 80 miles away.

photo B McInnes

photo B McInnes

Pictures

(Left) Site testers in Italy . . . up early or late to bed?

(opposite) Frost on the Polaris Trail Telescope at Izaña in Tenerife. Pico del Teide in the background, is a 'still-warm' volcano – but not warm enough to keep the snow from its slopes.

it's a matter of 'seeing'. . .

Bennet McInnes

The 'Northern Hemisphere Observatory Site Testing Project' — a name that evokes a variety of pictures, depending on the factor that springs most to mind.

money

SRC Projects depend first of all on money. In terms of pounds sterling our project originally meant 40K (as they put it) spread over two years. It is now beginning to look more like 45K spread over three years.

In 1970, when the project began to take shape, there seemed to be general agreement that the best astronomical site in the northern hemisphere occupied so far by an observatory was in California. There seemed to be widespread *dis*agreement about the likelihood of comparable sites nearer to Britain. The aim of the project was to study this question and, hopefully, to find a definite answer. Three general regions were suggested: southern Italy, south-eastern Spain, and the Canary Islands. The choice of sites within these regions was not yet decided.

Attention then turned to the instruments to be used. The Royal

it's a matter of seeing continued

Observatory, Edinburgh, was charged with the preparation of three sets of suitable equipment. For the measurement of 'stellar extinction' and of night sky brightness, the Instrumentation Division designed and built

instruments

a tripod-mounted photo-electric photometer. Stellar extinction is the dimming of starlight by the atmosphere and particularly by 'impurities' such as dust and moisture. Other things being equal, a high site will be better than a low one as regards extinction because it has less air above it. Dimming due to the natural brightness of the night sky is worse when the brightness is increased by artificial light scattered back from the atmosphere above the site. City lights are the worst offenders in this and the only satisfactory way to assess the effect of a nearby city on a site is to take measurements on the spot.

For many types of astronomical observation an important property of a site is the "seeing". The image of a star produced by a telescope moves and blurs as irregularities in the atmosphere pass through the light beam. The nature of the degradation depends on the instrument being used and, although the subject has been under discussion for many years, astronomers still disagree about the means of measuring it and many different instruments have been used to determine the seeing of potential sites.

For our project we decided to adopt the instrument used in the California Site Survey of 1965-1967, a Polaris Trail Telescope. This is a fixed telescope camera which takes an exposure (lasting ten minutes or so) at high magnification of the Pole Star. The resulting trail shows wobbling and blurring which can be measured and interpreted in terms of the quality of seeing as it would affect a large-aperture telescope. The design of the British PTT was based on the American one. Three PTT's and three sets of simple meteorological instruments were made or bought during the summer of 1970 and carefully calibrated against one another so that the results from the different sites would be strictly comparable.

people

Originally the project was to be a joint effort of the two Royal Observatories and the first reconnaissance work was done by John Alexander and Alan Penny of the Royal Greenwich Observatory, who visited Spain and the Canary Islands in March and April 1971. Shortly after that, the whole of the project became the responsibility of the Royal Observatory, Edinburgh, under the direction of the Astronomer Royal for Scotland, and the writer (or, more properly, a large fraction of him) became Project Leader. Not counting the many other fractions of people at the ROE who contribute to the project, the staff consists of four Scientific Officers from the complement of the ROE and six Assistant Scientific Officers recruited on a short-term basis.

Three of the SOs were allocated to the three regions as team leaders; the fourth was to assist with the reduction of observations in Edinburgh. In the summer of 1971 they were very busy visiting their regions, choosing the precise sites for the three Observing Stations, planning the ideal Station layout, working out the details of the observing schedule, and trying to extract from the Observatory Secretariat information about Foreign Service Allowance and other financial matters. Among the ideas considered and (fortunately) rejected was one that the team on each site should live in a caravan. Instead it was agreed that each station should be built around a prefabricated aluminium hut providing living quarters for the observers and storage space for the portable instruments. The Polaris Trail Telescope required a solidly built mounting, with walls for wind protection. For transport a Land Rover seemed to be the right vehicle.

More than fifty people applied for the six ASO posts. It had been decided that the special demands of the observing situation ruled out women and the advertisement was worded accordingly. But that did not deter some young ladies, including the one who said (I hope she will not mind if I quote her) "I believe in total equality of the sexes, and I think that my overland expedition to India has proved that I am just as hardy as any male (if not more so)."

Anyway by August the vacancies were filled (by men) and a Site Testing Training Course was held at Edinburgh, this included practice in driving a Land Rover and mixing and laying concrete! During the course the teams and the team leaders more or less chose one another (though some changes have been made since) and by the beginning of September one team was in the Canary Islands busy buying tools and clearing the ground for erection of the Station (hut).

places

The Canary Islands Station is in the island of Tenerife, on the Izaña mountain ridge, in the grounds of a Spanish observatory, Observatorio del Teide. The Station lies between the Imperial College London 60-inch infra-red flux collector (see Quest Vol. 5, 2 p. 6) and zodiacal light observing station. A vehicle accident and other difficulties made the setting up of our station into an arduous task but by the end of 1971 regular observing had started. For ROE people it was a resumption of earlier work begun in 1856 when the second Astronomer Royal for Scotland, Charles Piazzi Smyth, set up one of the earliest site testing stations ever on Tenerife. Instead of a Land Rover he had mules and manpower, his Station was a tent and his wife was the cook but he even managed to do some infra-red observations as well.

In Italy things moved very slowly. It took till October to find a suitable site and obtain permission to occupy it. Then bad weather made the access road impassable for vehicles. But the problems were overcome and regular observations began in February 1972. The Station is not far from an Italian site testing station, the probable site of the Italian National Astronomical Observatory. According to the British Consul-General at Napoli, the team there has "fitted into the bucolic Italian life with great success."

As far as Spain is concerned we are still waiting for permission to set up the station. We have selected our spot and we have our team raring to go; as soon as we get clearance things will begin to move.

results

The observations made at the site are sent to Edinburgh as quickly as possible and turned into lengths of punched paper tape which can be processed in the Observatory's computer to produce an answer to any (reasonable) question. A preliminary presentation of the observations is being made in a series of Reports which are being produced from duplicator stencils made on a tape-controlled typewriter.

Which Station is on the best astronomical site and how do these sites compare with California? So that we can answer the second question to everyone's satisfaction, the Tenerife team has one of the American Polaris Trail Telescopes on loan and they are making simultaneous observations with both instruments. It is not yet possible to give an answer, however: please ask us again in a few month's time.

thankyou Atlas!

Quest is grateful to the people at the Atlas Laboratory who replied to a recent readers' survey and made some very good suggestions.

magic squares solution

The puzzle appeared in the April issue on p. 24.

The 3 X 3 magic square is

2 9 4
7 5 3
6 1 8

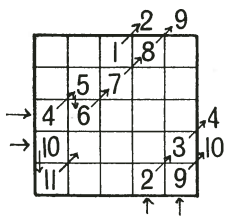
It can be derived logically if you note that the numbers add up to 15 in eight different ways (3 rows, 3 columns, 2 diagonals) and there are exactly eight ways of choosing three numbers from the integers 1 to 9 to produce this total. 9 appears in two of these (9 + 5 + 1 and 9 + 2 +4) so it follows that 9 must be in the middle of one side of the square: if it were not it would get counted in more than twice. Continuing, 5 must be in the middle (so as to be counted four times) and so on. The fact that the number of ways of making 15 is exactly the same as the number needed for the square shows that the problem has a unique solution. One can in fact write the square in eight different ways (it can be turned upside down, changed left for right or rotated, to produce patterns which look different) but they are fundamentally equivalent.

In a 4 × 4 magic square the four middle squares and the four corner squares always add up to the magic number. The squares shown below, however, are 'Super-Magic' because *all* blocks of four numbers add to 34. If you imagine it curved round into a cylinder so that opposite sides touch this is still true. The two squares are 'complementary' meaning that the corresponding numbers always add to 17 (the fact that this is half the magic number is not significant).

1	12	7	14
8	13	2	11
10	3	16	5
15	6	9	4

16	5	10	3
9	4	15	6
7	14	1	12
2	11	8	13

There are a number of ways of drawing 'odd-order' magic squares (3 × 3, 5 × 5 and so on) without having to resort to trial and error. In one of these, the numbers are inserted in sequence, starting with 1 and moving upwards diagonally and to the right. When you come to the edge of the diagram you imagine it curved into a cylinder and continue on using the same rule. If at any time the next square is already filled, you put the next number in the square directly below the last number you inserted. The number 1 must be put in the middle of the top row. For a 5 ×5 square it works as follows:



and so on. The proper place for 16 takes a little finding but if you follow the rules precisely you'll see why it appears where it does.

If you would like to know more about magic squares write to Paul Dickinson at RSRS, who has published some notes on them in the *Station Newsletter.*

LO through the looking glass

'I'm glad we're not playing any more', said Christopher Robin. 'Every time the music stops, there are more chairs and fewer players.'

'I know 'said Father William,' and those two were not even in it a moment ago. I wish the Mad Hatter would stop playing "Flowers are bloomin' in Kensington".'

Sir March Hare drove off down the line in his shiny new telescope. 'Poop-poop' he murmured as he drew up beside Henry the Navigator, who had just dropped anchor in the harbour and was lowering Auntie Joan's new spinnaker, ably assisted by first mate Jimmy-the-one.

a new city state

a look at the European Centre for Nuclear Research — 'CERN' The part played in CERN by the Rutherford and Daresbury laboratories will be the subject of a further article

Peter Casey

CERN is not so much an organisation, more a city state. To appreciate its size you need to see it from a height – either coming in to land at Geneva Airport (if the wind is in the right direction), or from the viewing gallery of the new water tower – which recently earned its keep by cooling the accelerator magnets when a power cut stopped the electric pumps. The site covers nearly a third of a square mile, and has its own fire service, bank, travel agency, post office, two restaurants and several shops. When the land for the SPS (super proton synchrotron) is acquired, the site will extend to well over 2 square miles, and because the machine is to be built underground it will include a large tract of agricultural land.

The staff are also very much citizens of CERN. They do not pay income tax to any state, and they enjoy privileges very similar to those of visiting diplomats. They are recruited from all twelve member states, with a sprinkling of other nationalities, but it is said that when anyone has been there a while, his nationality becomes "Cernois". And the Cernois are a very welcoming people. The scientists and engineers all show a tremendous enthusiasm for their work, which is understandable since most of them have left their own countries to pursue it. They are always willing to explain what is going on, to any visitor – much more so, it appears, than our own laboratories.

Approaching from ground level, however, the impression of a city state is formed more slowly. From Geneva itself, you drive out along the St. Genis road, past the airport, still surrounded with barbed wire for protection from hijackers and saboteurs, but with the Swiss army now withdrawn.

Driving through the entrance, where you will not be stopped, you reach the main administration building, and enter it, passing between the bank and the travel agency. It is at this point that most people wonder whether they have arrived in a strange holiday camp, for in front and slightly to the right, past the newsagent and tobacconist, is the main canteen/restaurant, which, at whatever hour you visit it, always appears full.

Besides the main eating area, there are two lounges, in each of which groups of people can be seen drinking coffee or beer, chatting or arguing. One glass wall gives onto a small ornamental pool, with a few fragments of ancient columns beside it. At Christmas, a large tree is set up in the centre of the pool, with an illuminated revolving star. Passing through the restaurant, you reach an open area with tables, chairs, large coloured umbrellas, and a magnificent view of the mountains which enclose the Geneva valley. If the weather permits, more people will be eating, drinking and talking here. To one side is a strange piece of modern sculpture, which on closer examination turns out to be the body of an early bubble chamber.

I have dwelt on these early impressions of CERN because they are lasting ones and because they seem fundamentally true. The "feel" of CERN is of confidence and enthusiasm. CERN has worked, and the Cernois know it. They have built two big machines, the proton synchrotron (PS) and the intersecting storage rings (ISR), which have been great technological successes, and now work is under way on the SPS. Staff are represented by a Staff Association, and relations with them are good, because the administration, free from commercial pressures or concern for a national economy, can operate in a benevolent paternalistic style.

Nevertheless, CERN has its problems. Some of these arise from being controlled by 12 Member States. Inevitably there will be disagreements and pressures, usually financial. In particular, there is now a squeeze on Laboratory I, part of the price to be paid for the new SPS. Other problems arise from relations with the surrounding population. Although CERN may be a kind of city-state, it cannot be isolated from its neighbourhood. CERN personnel have to be housed — currently a great problem in Geneva. CERN is a great employer of local labour, and lorries delivering to its site must use French and Swiss roads. Fortunately, the great co-operation of the French and Swiss authorities has meant that most such problems have been solved relatively quickly.

You will gather from what I have written so far that I am pro-CERN. In the year and a half since I began attending meetings of its Finance Committee, I have become, and remained, impressed with its confidence, enthusiasm, and technical ability, occasionally with the ability of its administration to run rings round delegations, but above all with its openness.

I have not said much about the technical side of CERN, the big machines, the bubble chambers, and the experiments, and this is deliberate, because the information is there for anyone who wants it in CERN's many publications. Instead I have tried to give the "feel" of an extraordinary place and community — the city state of CERN.

SUMMER 1972

Oh! Where is the sun?
Obscured perhaps
By man's intransigence
The skies pour forth their tears,
Awaiting the sweet air of reason
To usher in a cloudless golden day.

Nona "Midsummer" Day, 1972

links with Chilbolton

The Canadian National Research Council and the Radio and Space Research Station have got together over a radio astronomy project. The idea is to link the RSRS 25 metre aerial at Chilbolton with the Canadian 40 metre aerial in Algonquin Park, Ontario, to study Quasars at a wavelength of 2.8 cm. The two aerials are operated as one interferometer with a baseline (the distance between the two) of 5,700 km. This should enable observers to detect angular sizes down to 0.0001 arc seconds, which is equivalent to measuring a line 0.5 cm long (or about the size of a pea) 6000 km away.

Another experiment in which Chilbolton is already taking part is a unique ionospheric study known as multistatic incoherent scatter. The experiment is centred on the Royal Radar Establishment (RRE) at Malvern and makes use of the Chilbolton aerial and the Mark III (36 x 25m) aerial at Manchester University's Jodrell Bank Laboratory at Wardle, Cheshire. A group from the University of Aberystwyth led by Phil Williams is also taking part with a set of 25 x 12m trough aerials (salvaged from a defunct Cambridge radio telescope) at Capel Dewi, near Aberystwyth. Peter McPherson of RSRS is at present working at Malvern on this project, with three RRE staff temporarily seconded to RSRS – Nick Taylor, Robin Rick and George King.

To observe ionospheric incoherent scatter, one must use a radio frequency sufficiently high to make ordinary, mirror-like "total reflection" from the atmosphere impossible and to cut out as much as possible of the "partial reflection" from irregularities in the atmosphere. The basic idea dates back to an article published in 1958 by W E Gordon of Cornell University. The first experiment was made by K L Bowles in the USA in 1959. There are now eight installations: in Peru, Puerto Rico, Maryland, Massachusetts, Alaska, France, Russia and England. The radio frequencies used range from 50 MHz (at Jicamarca, Peru) to 1300 MHz (at Millstone Hill, Mass. and Chatanika, Alaska).

Two of the systems, the French one at S. Santin-Nançay and ours, transmit continuous waves instead of pulses. This has advantages for measuring the spectrum of the scattered signal but it is necessary to use separate transmitting and receiving aerials. The transmitter at Malvern emits 40kW power at 400 MHz (using the same aerial as the pulsed system). The Chilbolton, Jodrell Bank and Capel Dewi aerials are receivers. The complete system was first used in March 1972 although observations at Chilbolton and Jodrell Bank started the previous summer. The object of our experiment is to determine temperatures and winds in the ionosphere at heights of 100-400km.

Henry Rishbeth of RSRS has written a more detailed description of the system for the station newsletter. (Copies available from Geoff Gardiner). We hope to hear something about the results later.

RC's meet and talk

W L Francis

In November 1969 I accompanied the Chairman and Mr Jolliffe on a visit to the Centre National de la Recherche Scientifique (CNRS) in Paris. CNRS is the nearest French equivalent of the Science Research Council, but is mainly concerned with pure science – with most Government support for engineering, applied science and technology coming through the Delegation Generale de la Recherche Technologique (DGRST).

We were received by Monsieur Curien, the Director-General of CNRS, and other senior staff. At this first meeting we mainly exchanged information about our respective organisations. CNRS were particularly interested in the various SRC schemes to achieve closer liaison between universities and industry. We discussed the possibility of collaboration between SRC and CNRS and it was generally agreed that a greater interchange of information between the two organisations was desirable, and that we should make a start by each seconding staff to the other for 2-3 weeks at a time. Mr Walsh of SRC's central training section subsequently spent three weeks at CNRS in June 1970 and a further week in December 1970 and Monsieur Zahn of CNRS came to SRC for two weeks in January 1971. Both visits were most successful and useful. *(John Walsh wrote about his visit in Quest, Vol. 4, 2 p7).*

In June of the following year the Director-General and other representatives of CNRS visited this country. In addition to talks at State House, they visited the Physics and Engineering Departments at Imperial College, London, the Astrophysics Research Unit, Culham, and the Nuclear Physics and Clarendon Laboratories at Oxford. One outcome of our talks was an agreement to encourage collaboration between research workers in British and French universities supported respectively by SRC and CNRS. The visitors were also interested in the discussions SRC were having with the French-German neutron beam team at Grenoble.

In July 1971 the Chairman, Mr Walker and Mr Jolliffe visited CNRS at Toulouse and amongst the subjects discussed were

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Dr Francis retires from the post of Secretary to the Council this year — see page 1.

RC's meet and talk continued

the encouragement of collaborative research, common research themes, neutron beam research and astronomical research, They also visited the three CNRS Laboratories at Toulouse: the Laboratory for Automation and its applications in Space, the Electronic Optics Laboratory and the Solar Furnace at Odeillo.

These contacts were followed in November 1971 by a visit made by the Chairman, Mr Jolliffe and myself to West Germany to see how that country organised scientific research. The States of the German Federal Republic are largely responsible for education, but responsibility for the support of research is shared between the States and Federal Government with the latter carrying the greater responsibility for finance and coordination. A great deal of research is carried out in research institutes, especially those of the Max Planck Gessellschaft which has fifty five, many in the Munich area. These institutions receive substantial support from the States and Federal Government. Although we heard a great deal about them, we were only able to visit one, the Radio Astronomy Institute of Bonn, where we saw their new 100 metre radio telescope. This was not yet fully operational, but the instrument and surrounding buildings looked most impressive. Further visits to the research institutes of the Max Planck Gessellschaft are planned for late 1972 or early 1973.

We also met Professor Speer, the President, and Dr Schiel, the Director-General of the Deutsche Forschungsgemeinschaft (DFG). This is a body largely financed by government funds, but independent of the government, which provides 10-20% of the cost of university research in the physical and life sciences, medicine, engineering, social science and the humanities.

The DFG works closely with the Max Planck Gessellschaft, holding three or four joint meetings a year to discuss plans. The general programme and priorities of the DFG are decided by a Senate of thirty three scientists who receive proposals from specialist groups and then from bodies with a wider scope (comparable with the SRC Council, Committees and Boards). But priorities are not decided purely on scientific grounds: political and social factors must of course be taken into account.

interest in the high flux beam reactor

In April M. Aude (Director External Relations), Professor Chabal (a Scientific Director) and M. Creyssel (Director Administration and Finance) of CNRS visited London to discuss techniques of establishing collaborative projects with SRC. Talks will be held later in the year with DFG. Discussions continue with the French and German authorities on possible collaboration in neutron beam research and this country's taking a share in use of the Institut Laue Langevin reactor at Grenoble. Later France and Germany might make use of the High Flux Beam Reactor which the SRC are hoping to build.

In February of this year I was one of the UK delegates to a Conference of West European Councils held in Denmark. The other UK delegates from the SRC were the Chairman and Professor Kornberg (a member of Council and Chairman of the Science Board). All the main West European countries were represented, with the exception of Greece, Portugal and Luxembourg, and a late entrant was Yugoslavia.

On the first day the conference analysed the activities of research councils or equivalent bodies and we were questioned on the Green Paper on R & D and the Rothschild and Dainton Reports. The Scandinavian countries who admire the UK research council system and had modelled their own on it, were puzzled that it was apparently under attack. Sir Brian explained the origin and scope of the exercise and led the discussion back to the relations between Government Departments, industry, the scientific community and universities.

The next day delegates from Germany, France and the UK (Professor Kornberg) described their national methods of supporting university research. Then the Conference discussed research councils and the community and spoke of the difficulty in getting universities and research councils to do applied research.

The most important session of the Conference took place on the last day when the subject discussed was "Collaboration among West European Research Councils". To promote such collaboration, the Conference agreed that each Research Council should nominate a Foreign Liaison Officer (FLO), who would be a focus for the exchange of information on proposals for, or problems which would benefit from, international collaboration. There will be a meeting of FLOs in the autumn of 1972 to consider what actions should be taken. These might include a further Conference of West European Research Councils. If it is held, the UK has offered to act as host.

Quest Quarterly Quote

Apollo 12 dust shows a higher overall albedo than *Apollo 11* dust due to its higher plagioclase and lower ilmenite content. The observed lunar albedo is lower than either and could be approached but not reached by mechanical roughening of the dust layer before measurement. This emphasises that the lunar surface must have in general a 'fairy castle' structure.

from the 1969/70 Space Research report

Non-scientists do appreciate any attempt to explain things on a more credible level but this time the scientific mortals seem to have overshot their mark and wandered off into other realms which many of us are not altogether sure about.

to South Africa with the SRC

Sandy Powell

photos Alan Powell

My trip on the boat was very nice, it was called the SA Vaal. I think I am very lucky to travel on a boat like that one. It was very easy to get lost on such a very big boat. When we landed at the Cape me and my parents went into a Café, much to my surprise we were served by a black person. I then bought a packet of mint imperials. I turned it over and saw a different name on the other side, little did I know it was Afrikaans. But I found out later on.

I am sad about leaving my brother in England as my parents think he will be better educated in England. I miss the snow and television and my friends at school, my grandparents, aunts, uncles and cousins. These are some of the facts why I don't like South Africa. I did not like changing schools and having all new teachers and friends.

The school I go to is DSG, it is a very posh school and is private and you wear uniform and it is a girls' school. The school in England was not very posh and was a government school and we did not wear uniform and it was a mixed school. I think school work is much harder in Africa than in England.

I don't think the Afrikaans children who only speak Afrikaans are very nice to the English. They call us names and throw stones at us when we come past them.

I think the Bantu are made to work too hard and they should be cared after more. I have seen them being badly treated. They should have big houses and schools and be treated just like the white people.

Most of the people at the Observatory nearby are friendly and are willing to help you. The Observatory pool is great and lots of people enjoy it very much as well as me and my friends.

There are lots of lovely sights to see in South Africa. We have seen the Drakensberg Mountains, the Golden Gates, Table Mountain and many other mountains. We have also seen Ostrich Farms, Caves, Waterfalls, game reserves and camping sites. The sea is very dangerous and the waves are very big and I was nearly drowned at Port Elizabeth. The sand is soft and silver on the beaches, and they are not very crowded. They go for miles and miles.

The towns are not very big and they are not very clean either. There are lots of miles between towns in South Africa but in England they are nearly all together. The picnic spots have papers and milk cartons and food all thrown down and it is very filthy. My dad is always making fires in South Africa to clean up all the rubbish.

The pictures here are very different. They have a big screen at the front and the cars drive in and park, you sit in your cars all the time but everyone can see because the screen is very big. If it rains everybody has to go back home because the screen goes all funny. We don't have drive-in cinemas in England because it is too cold.

We have a maid, who is Anna, and a gardener who is Ben which is very useful but makes us very lazy. They are very good at cleaning things and Anna has a special interest in the oven. She irons very nicely too. I think my parents are kind to them.

Sandy is the 9 year old daughter of Dr Alan Powell who is at the Radcliffe Observatory. As far as we know he is employed to look through telescopes, not as a fire raiser.

nutcracker suite

We cannot please everybody all of the time it seems, though goodness knows we do try. To put it right for one group, the nutcrackers, who sometimes tell us the posers are too simple and, occasionally, too hard, here are three new ones graded easy, middling and *very* difficult.

Your local correspondent has the answers.

7 top draw

It is a well known fact in London Office that no one ever hears anything officially. So when the six future Heads of Divisions sat down to lunch, they had a fine collection of rumours about the impending moves. "I hear you're going to Science", said Hourmetal to Cotton. "I didn't know" Cotton replied, "but I have heard that Edgar is definitely not going to NP or ASR". "Yes, I've heard I'm for Finance", said Edgar. At this point Overton joined in "My CO tells me that Jones won't be getting an operating division", he said. "Well, all I've heard is that Hourmetal's taking ASR," said Jones. "And for what it's worth, I hear that Overton's getting Engineering," added Morley.

In fact, only four of these rumours were correct. The two people destined for Establishments and Finance had picked up false information, probably through being too close to a powerful source of interference. So who goes where?

Note: E and F are not operating divisions.

8 - sin et lumiere

middling

The Roman Ludi Florales, in honour of the goddess Flora, were celebrated on April 28 with indecent plays. When the custom was revived in London Office this year, six Divisions competed for the three prizes offered in each of five categories. As it happens, each won a different number of prizes, but none took more than one 1st prize.

The first prize for Best Actress went to Miss Colonne, of Engineering, which won more prizes overall than Science Division, but less than ASR. Cary Steepe of Nuclear Physics came second in the Best Actor competition, for his energetic portrayal of a worker in 'Up the Linac'. This was the only second prize won by NP. Establishments were very disappointed not to win first prize in this category for Wat Stanton's performance as a train ticket to Swindon in 'All Quiet on the Y Front'. First prize in the Best Satirical Attack on the Chairman category went to Dr Quill of Finance Division, but the Division failed to win any acting prizes, and could only manage 3rd place in the Walker Trophy for Most Convincing Reason for a Production Overspend. Needless to say, this Trophy was won by ASR.

The Division which came second in the Walker Trophy also took 3rd place in the Best Satirical Attack on the Chairman competition, and the Division which came 3rd in the Most Obscene Script competition came second in Best Actress.

Given that no Division can win more than one prize in any category, who came second in the Most Obscene Script Competition?

9 - musical chairs

good luck!

There are precisely five chairs of Environmental Chemistry in Britain, currently occupied by Professors Bison, Gabriel, Paten, Trout, and Wilbur-Didymus. Every three years they exchange chairs, each moving to a chair he has not previously occupied. They are now about to make their second such exchange.

Trout is moving to the chair held by the man whose previous chair Wilbur-Didymus now holds. Paten now holds the chair to which the man who holds Bison's previous chair is moving. Gabriel is moving to the chair now held by the man to whose old chair the previous holder of Bison's chair is moving. Paten is not moving to the chair previously held by Wilbur-Didymus, and no two professors are swapping chairs.

So who previously held the chair now occupied by Gabriel?

Hint. Whose old chair does Wilbur-Didymus now hold?

Peter Casey

Competition

Not so long ago it seemed that a well-educated man always had a phrase from one of the dead languages to impress (or confuse) the hoi polloi. Alas, this is no longer so. In an attempt to halt this decline of traditional values we invite readers to devise suitably learned mottoes for the various constituent parts of SRC. (The alternative—of sending more scientists to Oxford for their education—is far too dreadful to contemplate.)

Some examples which we have devised ourselves (and think tremendously good) are:

Fiat lux[1]—Synchrotron Radiation Facility

Errare humanum est[2]—LO Administration

De minimus curamus[3]—NP Division, Finance Division or any Establishment canteen.

On second thoughts we will also (in accordance with the Zeitgeist) accept entries in modern European languages including those spoken (or at least uttered) in our northern outposts.

1. *Let there be light.*
2. *To err is human.*
3. *We are concerned with trifles.*

Headlines we missed seeing (p 22)

FLOWERS SEEKS FRESH FIELDS

IC Takeover Bid BRANCHES OUT

Sir Brian to head IMPCOL

TOP MAN GOES WEST

promotion

Mr Robert Dalziel is promoted to Deputy Chief Scientific Officer and takes up the newly created post at the Radio and Space Research Station.

Mr Dalziel joined RSRS in 1961 as leader (SPSO) of the division now known as Space Science (A) and Space Management Services, which is concerned with a wide range of investigations carried out by experiments flown on rockets and satellites. He is the project scientist for the Aeriel IV satellite experiments, launched last December.

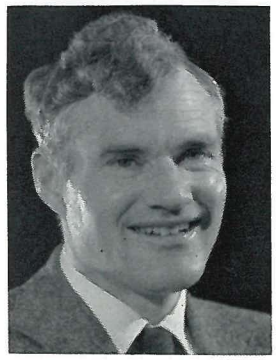
His career began with a first-class honours degree at the University of Glasgow in 1941. Then, like many others, he was influenced by the war to turn from the theoretical to the practical and joined the Signals Research and Development Establishment. His work there (until 1961) included the application of electronic techniques to means of defence and, later on, to highly specialised military communications systems.

Dr Henry Rishbeth also of RSRS is promoted to Senior Principal Scientific Officer on individual merit. Born in 1931 into a family that has many associations with Cambridge, he entered Christ's College in 1951 after two years' service with the Royal Air Force. Postgraduate research into ionospheric phenomena at the Cavendish Laboratory under Mr Ratcliffe was followed by radio-astronomical studies at the Radiophysics Laboratory, Sydney, then a return to work at Cambridge.

Dr Rishbeth joined RSRS in 1960 as a Senior Research Fellow, spent two years at the Central Radio Propagation Laboratory at Boulder, USA, as a consultant and returned to RSRS in 1965.

He has an international reputation as an expert in the theory of

continued on p. 22



council commentary continued from p. 4

up in 1968 to advise on the provision of postgraduate training in cross-discipline areas. Each year both Councils set aside a number of studentships for this purpose. The joint Committee's report, which was introduced by the Chairman, Professor Kay, describes the innovations in postgraduate training already underway and recommends a five year programme in broader based education in a small number of selected universities. The recommendations were endorsed by the SRC and the Committee's report will be published shortly.

boost for rocket telemetry and tracking systems

Two major items approved will help to increase the scientific return from the national sounding rocket programme. The telemetry system (type 465) used in Skylark, and subsequently in Petrel and Skua rockets, since the start of the national programme in 1957 falls short of the experimenters' present and future requirements and a new pulse code modulated system is to be introduced. This will be considerably more adaptable and increase the information rate some sixfold over the present system. Prototype flight units will be prepared for trials in 1973 before full production is started. The second item approved was for tracking of Petrel and Skua rockets. At the South Uist range, tracking relies on radar provided by the Meteorological Office, which is not fully satisfactory for our purposes, and a new slant range measurement system is to be introduced. This is based on comparison of the phase of a 39K Hz signal generated in the rocket with that of a signal of the same frequency generated on the ground, the slant range being deduced from the change in phase difference as the rocket ascends.

better committee structure for engineering

On a recommendation from the Engineering Board, the Council agreed that from October 1972, the existing Committees dealing with Mechanical and Production Engineering, Aeronautical and Civil Engineering and Transport should be replaced by three new Committees covering Aeronautical and Mechanical Engineering, Manufacturing Technology and Civil Engineering and Transport. The aim is to fit the Committee structure more closely to areas where special emphasis is required, to even out the Committee work load and to reduce the number of research grant applications referred to more than one Committee.

improved superannuation

The Council also agreed to proposals for substantial improvements in the SRC's superannuation scheme. These follow the changes to the Civil Service superannuation arrangements and the effect will be to bring the Council's scheme up to modern standards, with better family protection. The Council is also to adopt the revised arrangements being introduced into the Civil Service for early retirement of employees in appropriate circumstances.

promotion continued

the ionospheric F region and is currently working on the multistatic incoherent scatter experiment described on page 17. He has written many papers on the subject and is co-author with Professor Owen Garriott of the book "Introduction to Ionospheric Physics". In 1971 his work gained him the ScD of the University of Cambridge.

Dr Erwin Gabathuler of Daresbury Laboratory is promoted to Senior Principal Scientific Officer. He is team leader of a resident group who carry out experiments on quantum electrodynamics, rare decay of vector mesons and rhoomega interference. At present he is investigating the possibility of a T violation in electromagnetic interactions and is looking at the possibilities of studying electromagnetic interactions at CERN Laboratory II.

Dr Gabathuler graduated at Queens University Belfast, then gained his PhD working on the 300 MeV synchrotron at Glasgow. After a post doctoral fellowship at Cornell University he joined Daresbury to work on the NINA experimental physics programme.

Dr Philip Duke from Rutherford Laboratory is promoted to Senior Principal Scientific Officer to fill the second vacancy in the High Energy Physics Group at Daresbury (see also Dr Gabathuler). Dr Duke has been a high energy physicist at Rutherford since the early 1960's, and has spent much of his time studying the Pi-nucleon interaction using a polarised proton target. He was one of the first members of the Rutherford Laboratory and one of those seconded to Brookhaven to gain US accelerator experience. In 1965 he spent six months at the Moscow Institute of Experimental and Theoretical Studies on an exchange visit.

Dr Duke has also worked on experiments at CERN and at present, in his Daresbury appointment, he is engaged in a joint Daresbury — Liverpool — Queen Mary College — Rutherford experiment studying anti-proton-proton interaction off a polarised target. One disappointment due to the move is that he had to give up his joint appointment as a Lecturer at Warwick University. He enjoys giving lectures and had previously given some at Bristol and Reading. Last winter at the Laboratory he gave a very successful course of lectures on elementary particles for non-specialists.

The Chairman, Sir Brian Flowers FRS has accepted the appointment of Rector of the Imperial College of Science and Technology, University of London, from October 1973 following the retirement of Lord Penney OM KBE FRS. The Secretary of State for Education and Science, Mrs Thatcher, had offered Sir Brian a further term of office from September 1972, at the end of his five year appointment. In accepting this he had resigned his chair at Manchester, where he was Langworthy Professor of Physics (on unpaid leave while with SRC), but said at the time that he hoped to return to academic life eventually.

Sir Brian's earlier career was spent with the Anglo-Canadian Montreal and Chalk River Atomic Energy project (1944-6) and the Harwell Atomic Energy Research Establishment, where he became Chief Scientist. He joined Manchester University in 1958.

Rollo Swively and the great Quest theft

(with apologies to Michael Frayn)

'You know, Mike,' said top P R man Rollo Swively as he stared morosely into his Lo-Cal gin and tonic, 'I think I'm beginning to lose my grip. You remember my telling you about the job I was taking on for a little magazine called Quest? *Well, frankly, things haven't been going too well for them lately—circulation dropping and people cancelling their subscriptions: that's pretty bad when it's given away free anyway.*

'Well, Mike, I decided to use ploy number five in the PR man's handbook. I'm sure you must have heard of it in one form or another. Letting the golden eagle escape when attendances fall off at the Zoo is one of my own variations. That's right, Mike, you've got it. In the right hands "Zoo loses Bird" can produce more column inches in certain Sundays than "Boy loses Girl". Then I follow up with "Zoo finds Bird", "Zoo can't catch Bird", and "Call of the wild" and before you can say Snowdon they're trooping through the aviary in their thousands.

'Frankly, Mike, you can take it from me that this one is almost unbeatable. In this case, the Quest *one I mean, I arranged for one of the batches of the magazine to get delayed en route, and then spread rumours about the supposedly seditious nature of the contents. Now normally I'd have expected an incredible demand to have built up within 48 hours, but absolutely nothing happened. So next I let it be delivered but removed it again before it could be distributed. Get the picture? Great mystery! Where is the missing mag? Who is the mystery Miss X? No luck again. So finally I threw the lot in. THEY had suppressed the edition. The Establishment strikes again. Now that one, Mike, is guaranteed to produce a sit-down, sit-in or walk-out at any school, university, or factory anywhere in the country. And what happened here? Absolutely nothing, Mike. I've come to the conclusion that either I'm slipping or these people just aren't interested in* Quest *whatever happens to it. Still, there's a chance yet. I'm just off to have lunch with Rupert Murdoch's PR man. Cheers, Mike.'*

timetable of 1972/73 training courses

The Central Training Section runs courses for all grades of staff from clerical officer to senior principal scientific officer, and equivalent grades. Brief descriptions of the courses and future dates are given below; some are residential. Managers who are considering the courses for their staff can get further information from local training officers or Central Training Section, London office.

Scheduled Dates

Induction Course
for all new staff.

The course gives information on the formation and organisation of SRC and its work in the various scientific fields, and on conditions of service and staff associations.

1972 October 10-11, 12-13
1973 March 6-7, 8-9; May 15-16, 17-18

Course A

for clerical officers with at least one year's experience in the grade.

The course covers basic statistics, estimates and accounts, basic organisation and methods, communications and effective writing.

1972 November 7-10
1973 February 20-23

Course I

for scientific officers, executive officers, and equivalent grades, under age 28.

The course looks at communications, work-team relationships, basic managerial responsibilities, O & M, networking for projects and decision analysis.

1973 Jan 30 - Feb 2; June 12-15

Course II

for senior scientific officers, executive/higher executive officers, and equivalent grades, over age 28.

The course explores delegation, motivation, leadership, planning and forecasting techniques, staff reporting and interviewing.

1973 April 3 - 6

Course III

for principal scientific officers, senior executive officers and equivalent grades.

The course will consider the analytical and sociological approaches to management.

1973 March 19 - 23

Course IV

for senior principal scientific officers and equivalent grades.

The course will look at leadership, communications and interviewing.

1972 September 26 - 28

Remember ! If you wish to undertake an external course of serious study, you may be eligible for a training concession. Ask your local Training Officer for details.

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after Chaucer

Did you know that the annual Civil Service Poetry Competition is open to members of SRC. The publishers of the *Anthology of Civil Service Poetry* (20p) offer a prize of £25 and this year the Post Office Corporation are also offering £10. The standard is usually high. Many entrants get published regularly in magazines and literary journals.

Perhaps you could beat them. If so remember that poems entered must be your own work, not published or about to be published, and not previously winners in this or any other competition, not longer than 24 lines, typed on A5 paper — each entry on a separate sheet. Give your full name, private address and official address (section and establishment) and post to the Civil Service Council for Further Education 11 Belgrave Road, London SW1V 1RB **before December 31.** The CSCFE will send you a copy of the rules, on request.

newsfront

from observatory sources

Mrs E Margaret Burbidge FRS the new Director of the Royal Greenwich Observatory took up the appointment on July 12 1972.

Professor D. Lynden-Bell of the Royal Greenwich Observatory has been elected Professor of Astrophysics at the University of Cambridge. He will succeed R. O. Redman who retires on September 30, 1972. The Observatories at Cambridge are going to be merged with the Institute of Theoretical Astronomy into a new Institute of Astronomy. This will be directed by the Professors of the Institute in rotation.

Professor Sir Martin Ryle FRS a member of the Astronomy, Space and Radio Board and Chairman of the Royal Greenwich Observatory Committee is appointed Astronomer Royal. He is Professor of Radio Astronomy at Cambridge University, in charge of the new 5km radio telescope now being built at Lord's Bridge.

Professor H A Brück CBE, Astronomer Royal for Scotland has received an honorary Degree of DSc from the National University of Ireland. Professor Brück spent ten years in Dublin (1947-57) when he re-established Dunsink Observatory as an astrophysical research centre under the Dublin Institute for Advanced Studies. (Dunsink was once the Observatory of Trinity College Dublin but closed in 1922.) In 1957 he took up his present post as Director of ROE and Regius Professor of Astronomy of the University of Edinburgh, Department of Astronomy (both are under one roof at ROE). He is also a member of the Board of Governors of the Armagh Observatory in Northern Ireland.

Dr S V M Clube of the Royal Greenwich Observatory has been appointed Senior Principal Scientific Officer in Charge of the Astrophysics Division at the Royal Observatory Edinburgh. He will take up the post on his return from the Lick Observatory where he holds the Alexander F. Morrison Research Fellowship, from May 1 to July 31.

changed at the top

The retirement of the Secretary to the Council *(see p. 1)* and the appointment of Mr R St J Walker as his successor is closely followed by the retirement of Mr C Jolliffe CBE, Director of Science, Mr J Clemow, Division Head — Nuclear Physics, and Dr B G Pressey, Section Head — Space and Radio. As a result there will be a number of changes at the top level in London office and at the same time some changes in the structure of the organisation.

Up to July 31 London Office had five Directors who worked with the Chairman and Secretary at the top administration level (in addition to the Directors of the seven SRC establishments) representing these main branches of the work:
Administration (of SRC)
Astronomy, Space and Radio
Engineering
Nuclear Physics
Science

Following reorganisation, from August 1, the top 'Cabinet' level now consists of three Directors with a second level comprising six Heads of Division. The table below shows the new organisation and the people who will fill the posts. Some new names appear and the three who retire during the next two months are not shown. The new names are not new to SRC – Mr M O Robins was in SRMU *(see p. 8)* in 1965-8, Mr R Edmonds has been on secondment to the Department of Education and Science from Science Division, Dr H H Atkinson was seconded to the Cabinet Office from Rutherford Laboratory and Mr A J Egginton comes from Daresbury Laboratory. Details of the appointments are in Circular 41/72.

Chairman
Sir Brian Flowers FRS

Secretary
R St J Walker CBE

Directors

Director
M O Robins

Director
Dr A W Lines

Director
J F Hosie CBE

Heads of Division

Astronomy, Space and Radio
Dr H H Atkinson

Science
Mrs J O Paton

Engineering
A J Egginton

Nuclear Physics
I A Learmouth

Establishments
R Edmonds

Finance
L S Smith

The subject of this year's Herstmonceux Conference was Cosmic X-ray sources, by Dr K. A. Pounds on Dr F. Pancini on pulsar models of X-ray sources, by Dr K. A. Pounds on recent work at Leicester on X-ray astronomy and by Dr D. W. Sciama on X-ray emission from the neighbourhood of galaxies.

birthday honour

We congratulate **Mr J F Hosie** OBE who receives a CBE. Formerly Director of Astronomy, Space and Radio, Mr Hosie succeeds Mr Walker as Director Administration. See above.

will they have to go?

A unique building now threatened with demolition is the home of the Civil Service Riding Club. This is one of the very few riding stables that remain in central London and the only one where the horses are stabled on the first floor.

De Vere Mews was built in 1877 to house the horses, carriages and staff of the large houses in De Vere Gardens. The Civil Service Riding Club started there twenty-five years ago. There are flats on the second floor, as you can see in the picture, and the former coach house at ground level, where the mounting block is standing, is now used for cars.

How do they get up? Well, the horses don't, thank goodness, have to be taught to climb stairs. There is a winding ramp that they manage quite easily.

The Mews is in Canning Place just off Gloucester Road. Members are civil servants and members of recognised public institutions and their families. Rosemary Lyster of the SRC Press Office is one of the instructors.

Riding instruction is given on four nights a week in the new indoor school of the Knightsbridge Barracks, by kind permission of the Commanding Officer. At weekends and early on weekdays, members ride out in Rotten Row and they can enter on club horses for horse shows and gymkhanas. The club also holds its own and inter-club events in the paddock in Kensington Gardens. Beginners are welcome and there are BHS and BSJA tests and demonstrations for more experienced riders.

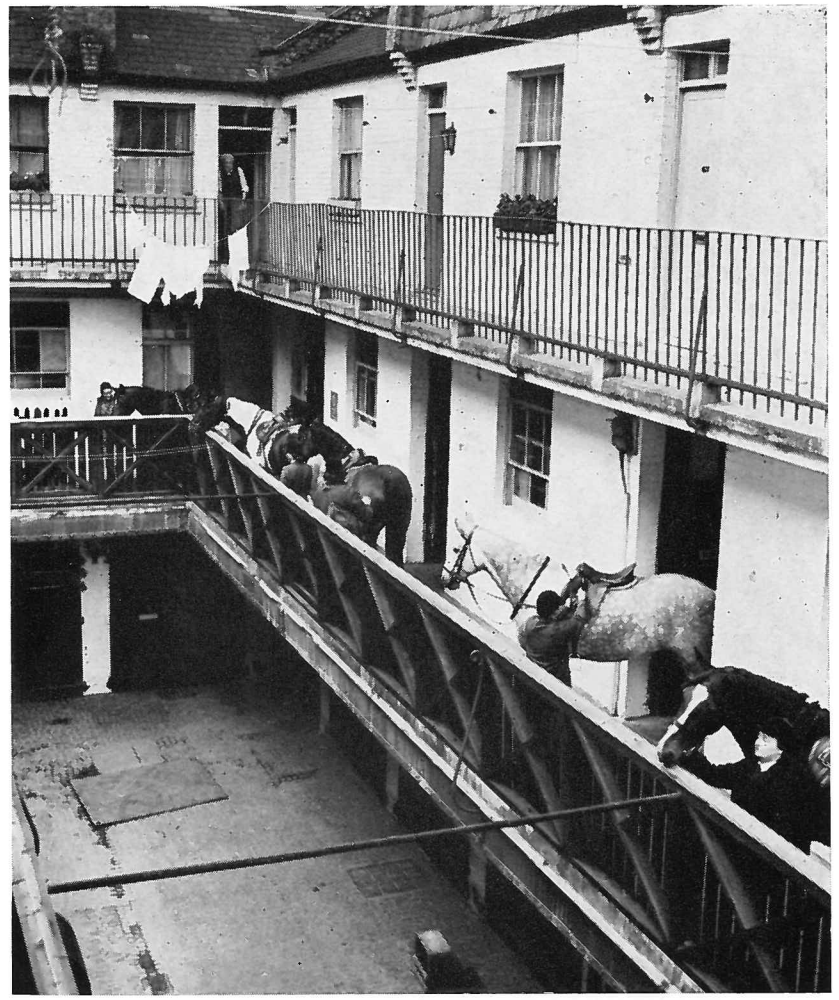

photo BIPS Ltd

To preserve the club, and an amenity that is unlikely to be replaced, and to save this interesting building from destruction, club members and local residents have petitioned for a preservation order. This has received some strong support from local MPs, Borough officials and the press, and is now being considered at a higher level.

Quest *April issue.* Extra copies are now available for anyone who missed getting one. Ask your local correspondent.

BIG PRIZE

A bottle of scotch* is offered for the best article that appears in the next two issues of Quest. The winning article will be selected by the Editorial Board for its impact, interest, presentation of content and whatever else makes it in their opinion especially good.

Any length over 100 words and less than 1000 will qualify but since space is precious we suggest you keep it under 500 to make sure of getting in. The prize will also be open to the best story caption to a picture, of between 100 and 250 words.

You can write about anything you like or may we suggest one of the special topics we hope to cover: Edinburgh Observatory's 150th anniversary, people from Daresbury and Rutherford at CERN and at home, Computer use and misuse, Sports Day 1972, Ideas for Sports Day 1973.

*** **Glen fiddich** it is . . . the Quest Board member who offers it can speak for its value and we regret that board members cannot compete.

move with the times

Radio 1 pop fans and other observers who kept the midnight watch on June 30 shared the experience of hearing the first performance of the Leap Second. Well folks, it's good to hear that Universal Co-ordinated Time is in step again with GMT. No they aren't pop groups — see Quest April issue p 23.