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contents

cover picture: discussion in the Quadrangle at Herstmonceux Castle, home of the Royal Greenwich Observatory. I to r: Dr. A. L. T. Powell, Dr. R. J. Dickens, Dr. R. A. Bell, Dr. B. D. Yallop. Dr. Powell has written the article on this year s Herstmonceux conference on page 3.

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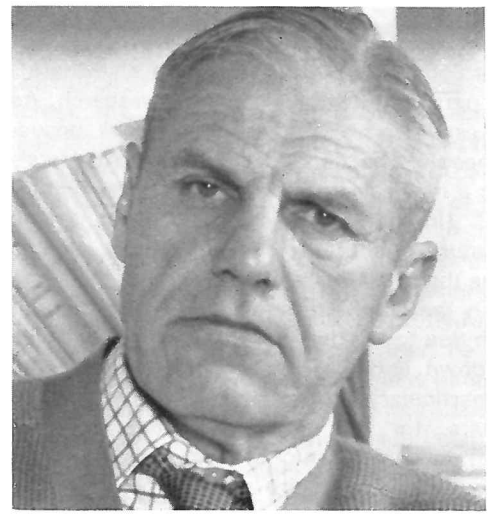


profile

Sir Richard Woolley, FRS
Astronomer Royal

When the Commonwealth Observer – the first and last of that line – arrived in England in 1956 to become the eleventh Astronomer Royal, press reports could only guess what his contribution to British astronomy would be. Hopes were based, however, on his considerable reputation for getting things done.

In sixteen years at the Mount Stromlo Observatory, near Canberra in Australia, Dr. Richard Woolley, FRS, had built up the Stellar Observatory as an important centre for southern hemisphere observing, he had persuaded the Ministry of the Interior (the parent organisation) to finance a large, 74 inch telescope – together with the Radcliffe 74 inch, this is still the largest in the hemisphere – and as a final act he had been instrumental in having the Observatory handed over to the Australian National University. Since the Government post – of Commonwealth Astronomer – lapsed at the same time, he incidentally assured himself of no successor!

How he became the first holder of the post is due, he says, to his tutor at Cambridge, Professor Stratton, who fulfilled the true university function of finding out the student's potential and giving guidance towards a career. Born in Dorset, later a pupil at All Hallows School, Honiton, Devon, the future astronomer then joined his family in Cape Town (his mother was South African, his father a Paymaster Rear Admiral in the Royal Navy) and took an MSc in mathematics at the University. He gained his next step by winning a scholarship to Cambridge and the consequent approval of his uncle who agreed to pay for his keep. At Caius College, after hesitating between research and a tripos, he took the mathematical tripos and was classed a wrangler. He became Eddington's pupil for his PhD. Then, he says, encouraged by Professor Stratton's advice, he turned to practical astronomy and spent an absorbing two years at the Mount Wilson Observatory as a Commonwealth Fund Fellow, followed by his first post at the Royal Greenwich Observatory – which was then *at* Greenwich.

As a chief assistant at Greenwich (1933–7) and for two more years as a John Couch Adams astronomer and Eddington's assistant at Cambridge, his early work was concerned with the spectrum of the sun's outer layers. Some of this work appears in the book 'Eclipses of the Sun and Moon' in which he collaborated with Sir Frank Dyson (pub. 1937). During the second spell at Cambridge, it was again Professor Stratton who encouraged him to take the Australian appointment – 'Commonwealth Astronomer' – a new, and therefore untried, position. As the stature of the appointment developed, he hopes that Professor Stratton had some personal feelings of satisfaction and was in some way repaid when he lived to see his former pupil become Astronomer Royal.

When he took up this next appointment, the Royal Greenwich Observatory was in the final stages of its removal to Herstmonceux, to be further away from the neon lights, the smoke and the polluted atmosphere of London. Proposed in 1939, and abandoned when the year turned out to be so inauspicious, the move was actually started in 1948. Early in 1956 the all important telescopes were still at Greenwich but were re-erected in their new domes at Herstmonceux later that year. Within his first three years he had the telescopes working on scheduled programmes. Another step which became identified with him but had in fact been agreed to by the Lords of the Admiralty (the parent department) was the decision to build the large telescope. He was however entirely responsible for getting it out of committee (where it had been for about ten years), and, together with Professors P. M. S. Blackett, R. O. Redman and H. H. Plaskett, deciding on the shape and scope of the 100 inch 'Isaac Newton' telescope in a commendably short space of time. Inaugurated by the Queen in 1967 it remains the largest telescope in Western Europe.

In the last decade the Observatory at Herstmonceux has been developed in many directions: chiefly as a research establishment, as a training centre for young astronomers and, together with the linked observatories in both hemispheres, as an important scientific centre. These are undoubtedly his most important, and most appreciated, achievements as its director.

In the 1950's the Observatory's work was mainly of a recording kind: measuring positions of stars for almanacs (for both surface and air navigation), running the time service, and making geomagnetical and meteorological observations. Without in any way

profile continued

cutting down or detracting from this work (apart from meteorology which has been taken elsewhere), the greater part of the work in 1970 is research. As a research establishment it has a new look unsuspected by people who decried the transfer to Herstmonceux as a move to 'recreate a nineteenth century observatory'. (In fact, the castle dates back to the fifteenth century and the science of astronomy has at least three thousand years on record).

Links with the southern hemisphere were natural, not so much due to his own background, but because observing 'down under' gives the other side of the picture – particularly for taking the positions of southern stars, for the nautical almanac, and for the study of the Magellanic Clouds – the galaxies nearest to our own which are only visible from the south. Overseas co-operation has been taken much further too, with staff being sent to observatories all round the world – to Mount Palomar (California) and Egypt in particular, although the Egyptian 74 inch has been inaccessible for a few years, buried under sandbags, as it is right in the Arab-Israeli line of fire. At Herstmonceux there are always astronomers from abroad on working visits, at present from Australia, the United States, Turkey and Spain. For the Anglo-Australian 150 inch telescope, now under construction on a mountain site in New South Wales, he mounted a virtually solo campaign. The idea was supported by Professor Bok and Dr. Eggen (who took over from him at Mount Stromlo when it became part of the university), but he initiated it and conducted the demonstrations before learned bodies, gaining the support of the Royal Society and, finally, funds from the SRC who are sharing the cost with the Australian Government.

Having no ambitions to be a teacher or to learn by just listening, he believes in 'training on the job' and enjoys working beside young people. The association with the University of Sussex began from the time the University – and its astronomy department – opened (in the 1960's) and ever since there has been a constant interchange of undergraduates, who come to work at the Observatory, with post graduate staff who go to the University. An eight week summer course brings in students from all over the British Isles (the applicants outnumber the places). Many of the scientists at the Observatory have been 'talent spotted' during such training – about 20 are Sussex graduates. The success of the scheme is indicated by the friendly atmosphere between people who are obviously very involved with their work and identify themselves with the aims of the Observatory.

Although his abilities as a driving force have meant a career in administration, Sir Richard (he received a Knighthood in 1963) remains at heart and in practice, a working astronomer – as witness his office equipped with instruments for measuring spectra, and many hours of night observing. It has meant a constant struggle to make time for it – where other people might have had to give up.

In Australia he admits to having been more of a '9 till 5' astronomer (or the night observing equivalent – it was a stellar observatory) due to the lure of the open spaces. It was quite usual to ride ten miles for 4–5 sets of tennis and ride back on an Australian horse which was, by British standards, unruly and unbroken – he kept his own horses plus a few house cows. Even in the English climate he finds time for tennis and cricket (playing with colleagues) and to look tanned and very fit.

Nevertheless his work in Australia led to one of his most important books 'The Outer Layers of a Star', published in 1953 in collaboration with Professor D. W. N. Stibbs (now at St. Andrews University) and he has worked in most branches of astronomy. At Herstmonceux he began with astrophysics and has turned, more recently, to star clusters – the motions of stars (galactic orbits) and variable stars (R R Lyrae). His instigation of new research for others has played an important part, also encouragement of publication through the Observatory bulletins and other media, so that there is an up to date record of their current research into the movements of stars and the chemical composition of stellar atmospheres.

This interest in the design of things is reflected in an interest in the structure of music – and that means music by Bach. Having rescored many pieces for two pianos for himself and his wife to play (while they were in Australia) he plays for the sheer pleasure of Bach's composition. A regular partner on the two grand pianos in the castle's ballroom is Mr. H. F. Finch, a retired member of the staff, and occasionally visiting astronomers.

From the amenities of the castle to the working facilities of the domes and the auxiliary machines (which include an ICT 1909 computer), the Herstmonceux Observatory mirrors his constructive achievement. Although it left Admiralty hands in 1965 to join SRC – a move he helped along, foreseeing that it would be easier to justify expense on research to fellow scientists than it had been to the buyers of naval frigates – the Observatory today has the atmosphere of a vessel with a sense of direction and urgency both at the helm and in the engine room, but with all shipshape and Bristol fashion. It is a very pleasant place for a visit – working or social.

As an illustration of the position held here today by the eleventh Astronomer Royal, that saying which applied to the architect of the original Greenwich Observatory is rather apt: 'Si monumentum requiris, circumspice'.

latest design

Following the new proposal for the 300 GeV Accelerator – the 'missing magnet' design that could be set up alongside the present accelerator at Meyrin in Switzerland – we reprint below the editorial comment from the CERN Courier. Their other comment was 'let us hope that it won't be very long before we move from the present extreme position where all the magnets are missing'.

The initial proposal was for an accelerator of 300 GeV with conventional combined-function magnets in a ring of diameter 2.4km. Using separated-function magnets an accelerator of 300 GeV could be built in a ring of 1.8km diameter which could later accommodate a superconducting accelerator of about 800 GeV.

The new proposal is that the project be started with a tunnel of 1.8km diameter capable of accommodating a 300 GeV accelerator using existing techniques but that initially only half the magnets be installed. Such a magnet ring would permit a maximum energy of 150 GeV. Should superconducting technology develop as hoped, the spaces could be filled with superconducting magnets which would permit a maximum energy of about 400 GeV. During the installation, the disturbance to experimental physics at 150 GeV would be minimal.

If the superconducting accelerator proved successful then the original conventional magnets could be removed, the whole ring filled with superconducting magnets and the maximum energy taken to 800 GeV or perhaps more.

On the other hand, should superconducting techniques not be mastered, the ring could be filled up with further conventional magnets at an additional cost of about 60 million Swiss francs and the accelerator taken to 300 GeV.

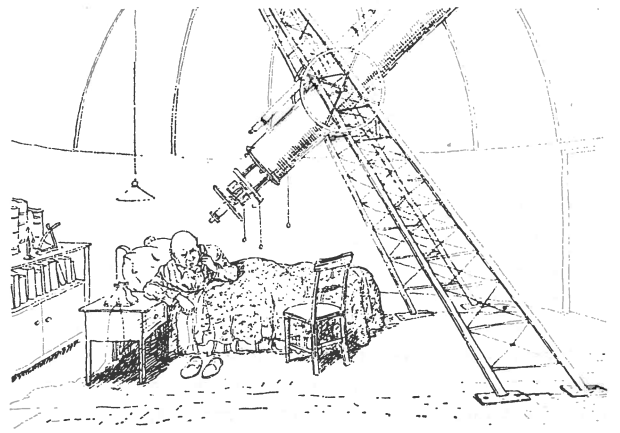
In this way, physics at high energy could start as early as is now possible with the future possibilities of completing the project as a conventional accelerator of 300 GeV or of conversion to an accelerator with energy higher than any currently under construction in the world and based on the most modern technology.

The present impasse in the 300 GeV project is due to the difficulty of selecting a site. At the same time it is disturbing to the traditional unity of CERN that only half the Member States (Austria, Belgium, Federal Republic of Germany, France, Italy, Switzerland) have so far adopted a positive attitude towards the project. The new proposal could possibly resolve these difficulties. With a diameter of 1.8km, the accelerator could be built not only on one of the five sites previously under discussion, but also on a site adjacent to CERN-Meyrin. There is sufficient uninhabited ground on the opposite side of the Geneva–St. Genis road to take such a ring and a long ejected beam line. The ground is not ideal but experience in tunnelling the ISR beam transport lines indicates that it is practicable.

Such a possibility has been discussed before. The construction of a machine in the range of 300 GeV across the road from the existing Laboratory was first proposed by C. A. Ramm on 13 April 1961. An extension to higher energies using superconducting techniques was referred to in a paper of G. Plass on 27 April 1961. The new potential of the missing magnet design and the growing likelihood that pulsed superconducting magnets will be mastered, open up again the discussion of a site at CERN-Meyrin.

Significant economies would then be possible in the project by sharing development effort, overhead costs and services with the existing Laboratory. The conventional accelerator plus experimental facilities would cost approximately 1100 MSF instead of 1431 MSF and there could be similar savings in the cost of running the existing Laboratory. The personnel complement, for example, could stabilize at 5,000 people instead of 7,400 in two separate Laboratories. In subsequent exploitation of the research facilities, the plateau budget could be 450 MSF instead of 600 MSF for two separate Laboratories.

from CERN Courier, April 1970



'PRO 3754. Is that the exchange? Would you please give me a ring five minutes before the occultation of Sirius by Pluto.'

(This cartoon first appeared on Dec 28, 1938 and is reproduced by kind permission of 'Punch').

astronomers meet

Alan Powell

The 14th Herstmonceux Conference is this year a precursor to the 14th meeting of the General Assembly of the International Astronomical Union, the latter being the tri-annual event that will be held at Brighton in August. The present Astronomer Royal instituted this Conference in 1956 shortly

after being appointed to this position. Over the years the popularity of the Conference has grown and a pleasant tradition of events has emerged which are now well established. My memories of the Conference go back to 1965. British weather being what it is these must be tainted for they always seem to have taken place in brilliant spring sunshine: plants in the delightful Castle grounds bursting with renewed vigour after the winter. (However, the records show that one year the Conference was held earlier than usual and the Castle became snow-bound).

In spite of the idyllic setting of the Castle and its grounds, serious discussions on astronomy do take place. A particular topic is chosen each year to engender interest in most of the British astronomical establishments; thus this in an ideal opportunity for British astronomers to meet and to compare notes. Usually one or two eminent astronomers who are experts in the chosen subject for the Conference are invited from Europe. This year the topic was 'The Distances and Sizes of Cosmic Objects'. There were over forty participants at the Conference most of whom stayed in the Castle. Some came from places as distant as Dublin and Aberdeen; in fact one hardy traveller came from Edinburgh in a three-wheeler.

The Conference seemed to be a great success, although maybe not so memorable as some in past years. One senior delegate was heard to remark that 'the establishment visitors have been replaced by the long-haired ones'. I do not know that I would go along with this sentiment as I feel there was a good cross-section of both talent and age.

The first day was high-lighted by the invited discourse on stellar rings by the eminent European astronomer, Professor Th. Schimdt-Kaler (Ruhr University). His thesis maintains that the rings are ellipsoidal shells of equal size seen in projection on the celestial sphere. The most convincing evidence for their existence comes from their use as galactic distance indicators; they delineate the spiral structure of our galaxy right into the centre. This structure is shown in more detail than by any of the previous methods. Professor Schmidt-Kaler finished with the remark that his work had not yet been approved by the establishment. With this the Astronomer Royal on behalf of the establishment formally accepted Professor Schmidt-Kaler's thesis. Naturally a very lively discussion followed which unfortunately had to be curtailed so that adherence to the programme could be maintained. The interest shown is perhaps best illustrated by the fact that he was still having discussions two hours after the end of the Conference, when they had to be curtailed so that he could meet other commitments.

Dr. Alan Powell is a Senior Scientific Officer at the Royal Greenwich Observatory engaged on research into the chemical composition of stars.

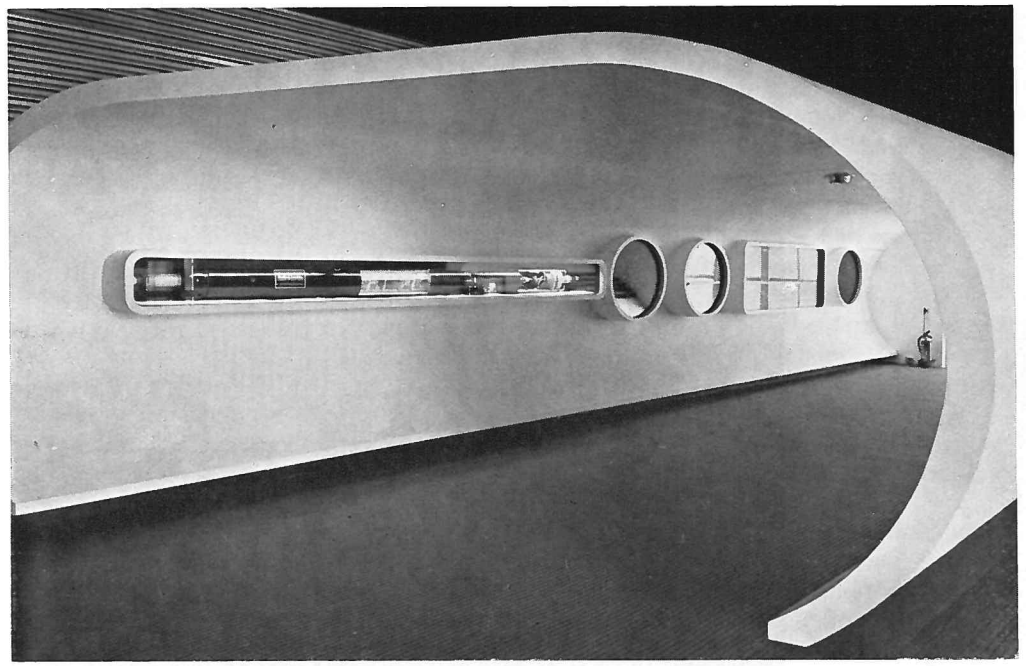
In the afternoon Dr. J. S. Hey (formerly of Royal Radar Establishment, Malvern) gave a fascinating account of the history of radio astronomy. Dr. Hey had been in at the beginning of radio astronomy just after the war and was able to give a lucid account interspersed with amusing anecdotes. The audience was amazed at the sophisticated engineering of one of the earliest radio telescopes that was built single-handed by Reber in 1939. With hindsight the delay in discovering the existence of radio sources seems incredible, but 'tout le monde est sage après coup' is perhaps a very apt comment here.

The evening was a kaleidoscope of social activity. At the kind invitation of the Astronomer Royal and Lady Woolley, the delegates and their wives enjoyed cocktails before dinner and afterwards partook of fruit and wine in the ornate Long Gallery. The evening was rounded off with an informal piano recital on two pianos given by Sir Richard Woolley and Dr. Malcolm Longair of the Institute of Theoretical Astronomy. Unfortunately throughout the Conference Lady Woolley was indisposed: so too was one of the speakers who was undergoing an appendix operation. Gallantly Malcolm Longair and Andrew Webster offered to fill the gap in the programme (in the final twenty minutes of the Conference) and gave a devastating and somewhat esoteric account of the current state of the theory of X-ray background radiation. Also they presented a theory which predicted both the observed X-Ray and Radio background radiation, a subject which, so far, has received little attention.

Although I have only mentioned three of the lectures, this is by no means a reflection on the remainder. In fact a lively and stimulating discussion continued throughout the two days of the Conference, and as the proceedings of the Conference will appear later in the year in 'The Observatory' I have not attempted to cover the Conference fully here. I will just add an amusing remark made by a delegate in one of the lighter moments, who said that the magnetic field played the same role in astronomy as sex does in life!

Having organised the Conference this year I realise how much the success of this annual event relies on the hard work of the members of the scientific and non-scientific staff, many of whom performed functions outside their usual line of duty.

One hopes that this annual event will continue in the future.



guest column

The following article on Expo 70 is illustrated by photographs taken by the Central Office of Information. Above is the communications display in the 'Building for the Future' section, designed by Casson Conda and Partners.

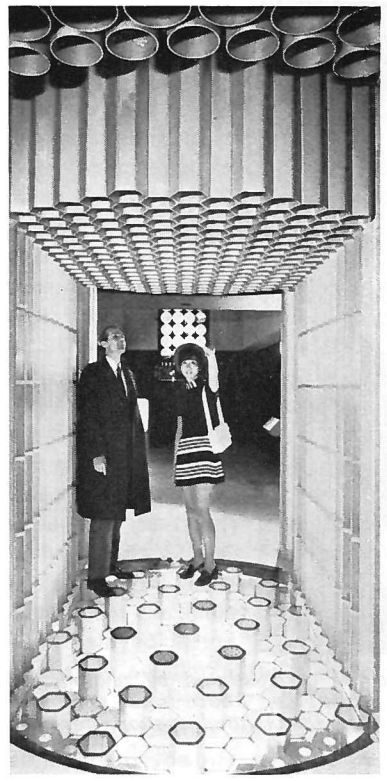
The guest writer is Dr. Paul Roberson, Deputy Chief Information Officer at the Department of Education and Science. He has recently returned from a visit to Japan made to see how Science and Technology are presented in Expos by Britain and other nations.

expo 70-science

The first problem that must face the designer of a national exhibit in an Expo is to decide the purpose of the Expo itself. The first international Expo of all, the Great Exhibition of the Industry of all nations held in 1851, was brought into being in an attempt to show the world contemporary invention, design and manufacture. More than 30 nations took part. The aspect of good design appeared from time to time in later International Expos, for example in Paris and in Chicago, but more recently the character of Expo has changed from a forum of good design into an exposition of national prestige, a presentation of the better aspects of a nation's way of life. As such, Expos are now places where one nation can get an idea of the progress, life, work and recreation of many others.

Inside this framework, the designer of a national exhibit is faced with a number of constraints, the most important being the sum of money made available to create the national exhibit and the amount of space that this sum will purchase. Here it has to be borne in mind that the space has to be furnished at a standard compatible with national prestige and arranged to accommodate the number of visitors expected to pass through the exhibit, a function of previous success.

For Expo '70 sufficient funds were made available to acquire a site of 90,000 square feet and to furnish it with a hanging pavilion covering some 27,000 square feet, the pavilion being designed in the form of a Japanese house suspended from four vertical steel structures. The total number of visitors to Expo was estimated at 50,000,000 over the six months of opening. This indicated to the designers that between 5,000 and 6,000 people would pass through Britain's pavilion every hour. Hence at peak periods each visitor might have about 20 minutes to see the whole pavilion – five minutes in each of the four main sections – a time function causing the



Two photographs of the 'Progress for Mankind' section designed by Leslie Gooday and Associates. On left a hostess and a visitor enter a representation of the core of the Dounreay fast breeder reactor.

COI photos

Picture above shows North Sea gas display (l) and the Harwell freezing method of desalination (r).

designers, along with many others, to adopt an 'Information on the move' philosophy. The 'stand and stare' philosophy can only be adopted by those nations able to afford huge pavilions or by those expecting to attract few visitors. These design restraints obviously control selection, deployment and presentation of exhibits from the long list put forward to cover education and aspects of the work of the Research Councils, of particular interest to the Japanese. It was decided by the designers to present all exhibits so that the rapidly moving hordes could gain impressions as they passed by.

The opening section, 'Britain's Heritage' contained references to major scientific achievements such as Harvey's discovery of the circulation of the blood, the initial discoveries of antisepsis, penicillin and Vitamin B 12 accompanied by exhibits showing the range of British inventions and discoveries *ie* from Faraday's work on induction to television, from Stevenson's 'Rocket' to the Jet engine and the Hovercraft and from pioneer work on navigational instruments, particularly the chronometer, to the first non-stop crossing of the Atlantic.

Radio astronomy was depicted by dioramas of the Chilbolton steerable aerial of the SRC Radio and Space Research Station and the new Jkm aerial array at the Mullard Laboratory, Cambridge.

Medical research was shown in a metal sculpture of the cell animated to show its basic functions, followed by a convoluted structure some 30ft. long by 17ft. high representing a myoglobin molecule. Into this structure were inserted very simple presentations representing research into genetic diseases, antibiotics, lysozyme viruses and interferon and immunology.

Agricultural research was represented by a number of dioramas showing engineering developments to mechanise harvesting and automatic control of tractors, biological control of pests by the introduction of predators, work on animal breeding and genetics, blood stock improvement and artificial insemination. Other exhibits showed bacterial conversion of hydro-carbons into proteins, production of better plants by breeding or chemical control, soil physics and the optimised use of fertilisers.

The work of the Natural Environment Research Council was restricted to displays showing the operation of GLORIA, the ultra high powered sonar device used for obtaining pictures of the deep ocean floor, the development and exploitation of natural resources

under the sea and the development of oceanographic instruments such as the Clover Leaf Buoy.

In view of the density and habit of the audience, it was necessary to display these exhibits in a simple form with very little caption material so that a quick impression of Britain's scientific effort could be obtained as the audience passed rapidly by.

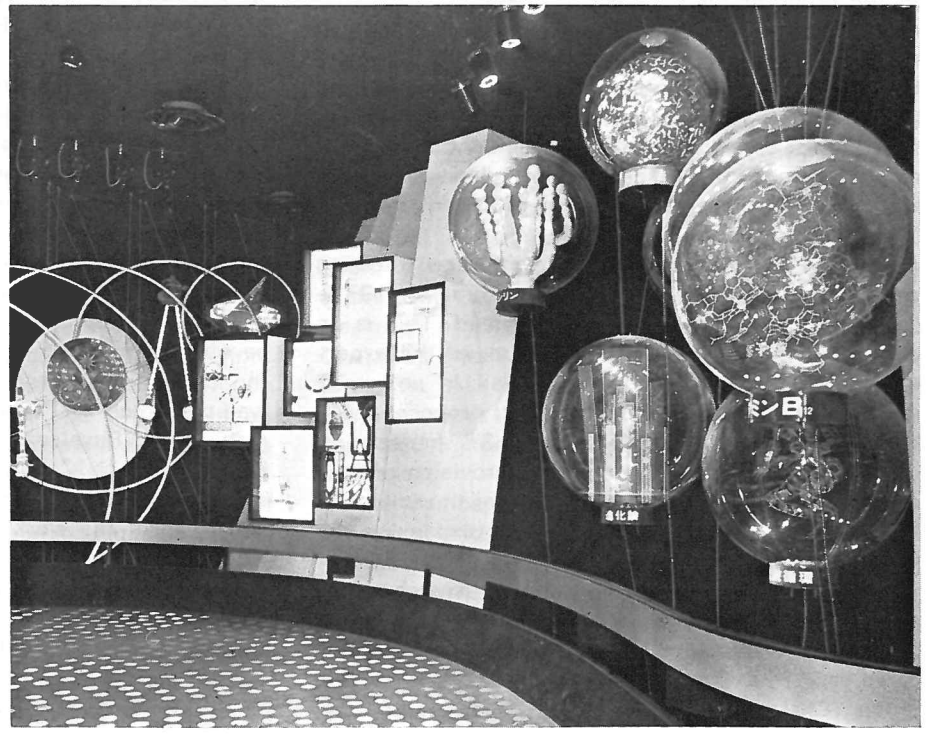
The Russians with a total of half a million square feet of display space dealt with the centenary of Lenin's birth, their education, services and the development of their culture and their territories. They obviously had a large section on Space, but their only reference to pure science was a display of scientific instruments and simple displays showing the fields of scientific endeavour where they had initiated certain pieces of work – for example Mendeleef and the periodic table.

In another giant pavilion, the US air supported plastic dome, the main exhibit on the technical side, was related to the moon landings and in this area the only scientific exhibit related to actual samples of moon rock. They did devote some space however to an artistic exhibit based on the use of lasers.

The French pavilion contained a substantial area devoted to the work of the National Centre for Scientific Research with a series of exhibits at quite a high level on for example, oceanography, molecular biology and immunology. The exhibition contained a number of very good films, including ones on mathematics, electron micrography and molecular biology.

The Australian pavilion had concentrated its exhibits on either side of an underground exhibition tube through which the audiences were carried on a travelator. On either side of this tube exhibits of highlights of Australian scientific work were displayed together with other aspects of Australian life. The work shown included anthropology, brain research and vision, viruses and immune reactions, soil science, meteorology and radio and optical astronomy – Parkes and the 150 inch Anglo-Australian telescope, the British end of which is administered by the SRC.

Within the first few days of its life, the British pavilion fulfilled the expectations of the organisers – the Central Office of Information – in that it was a popular exhibit. From opening to closing time there was a constant stream of visitors, mainly Japanese, passing through the pavilion sometimes four or five abreast. Very little of what was shown really stopped the majority, but they were obviously intrigued by exhibits from Britain showing the great contrast between the organisation of industrial life in this country and Japan and by our efforts to conserve our environment. Commonplace scenes of green fields, countryside, seashores, ancient buildings, wild life and flowers caused considerable astonishment to a people to whom these things seem completely unfamiliar.



Picture shows (from l to r) Time, Industrial Archaeology and Science displays in the British Heritage section designed by Charles Munro and Associates. COI photo.

council commentary

£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

March. All the Research Councils have recently arranged that each is free to send a senior assessor to meetings of the others at any time. The Chairman specially invited the other Councils to be represented at the March meeting when the agenda included a discussion of scientific manpower, and in particular postgraduate training appropriate to the needs of industry, and the numbers of postgraduate students in relation to the numbers needed as future university teachers and the numbers needed at the first degree stage for industry. Sir Gordon Cox, Secretary of the ARC, Dr. J. A. B. Gray, Secretary of the MRC, Mr. R. J. H. Beverton, Secretary of the NERC and Mr. D. Allen of the SSRC attended and all contributed to a valuable discussion, which will be taken further later in the year when the Government's plans for university expansion are known and later statistics are available on the employment of scientists and engineers.

The assessors from the other Research Councils also joined in a discussion of the broader aspects of future policy raised in the Chairman's Nottingham lecture on 'Science in Universities'. The latest form of the proposal for a European laboratory for molecular biology was next discussed. In the light of reactions from the UK and other countries this had been considerably scaled down by its proposers, and the first objectives had been somewhat modified to give special emphasis to the development of methods and instrumentation. The Council viewed this revised proposal more favourably than the original one.

April. The first main item before the April meeting was the five-year forward look programme for 1971–1976, which was discussed and agreed. This is an expanding programme, taking account of the expected increase of about 7% *pa* overall in university numbers in the next quinquennium. It proposes a 5% *pa* increase in studentships and a 3% increase in staff at SRC laboratories, including provision of staff for the proposed high flux beam reactor. It remains to be seen of course how much of the expansion the Government will authorise.

After the Forward Look, eight large research grants recommended by the Science Board were then fully considered and approved, the largest being a grant of up to £370,000 over 5 years to the Oxford enzyme group (Chairman Professor R. E. Richards) for research on the structure and function of enzymes of the glycolytic pathway. The major part of this grant is for an ultra high field NMR spectrometer, the first of its kind in Europe. Another Science Board item was the approval for a powerful national facility for synchrotron radiation at Daresbury, using ultra violet radiation from NINA, but without interference with the nuclear physics experiments. This is a revised and extended version of the proposal which was approved in principle in July 1969. The capital cost will now be £270,000.

The Council then turned to a review of the three large proposed items on the Nuclear Physics Board's domestic programme – a large computer at the Rutherford Laboratory, the high field bubble chamber and the nuclear structure facility. The first two of these were submitted for approval, and although the nuclear structure facility was not yet ready to be submitted for approval, Professor Wilkinson emphasised that the Board gave it equal priority. The computer, costing about £3¼ million will be used for other work besides that arising directly at the Rutherford Laboratory. The high field bubble chamber, costing about £3¼ million will be used at CERN. The Council approved these projects subject to the NP Board accommodating also the nuclear structure facility, and possible UK accession to a new CERN 300 GeV accelerator, within the present financial pattern.

May. The May meeting was held at the Royal Greenwich Observatory, Herstmonceux, with a tour of the Observatory on the previous day. At the beginning of the meeting, Dr. Pickavance outlined the new CERN proposal for a substitute for the 300 GeV accelerator; more economical but capable of more development, and small enough to site alongside the present CERN laboratory. The Council greatly welcomed this development, which appears to re-open the possibility of UK participation.

The next item was the proposed high-flux beam reactor, put forward as a purely SRC project now that the Ministry of Technology has withdrawn, and at an estimated £19 million capital and £4½ million *pa* operating cost the most expensive project which the Council has ever considered. The scientific case was presented by Professor E. W. J. Mitchell, Chairman of the Physics Committee and of the Neutron Beam Research Committee and the technical status of the project was reported by Dr. Pickavance, Chairman of the working party on this aspect. After a full discussion the Council authorised the appointment of a project leader and staff, to develop the proposals and the reactor design to the stage where costed proposals could be submitted for consideration.

The Council next approved five research grants recommended by the Engineering Board, the largest being a grant of up to £131,000 over 3 years to Professor R. W. H. Sargeant, ICST, for the development of on-line estimation and control of industrial processes. The new appointments to Boards to be made next October were approved, as was the formation of a Transport Committee of the Engineering Board.

Finally, the Council discussed in detail the issues which will arise at the forthcoming Ministerial meeting of the European Space Conference, concerning the future organisation and conduct of European space research.

the new biology

What are we all but music,
Chords of time and oscillations
Mostly harmonised but sometimes
In disorder – is each one
An extended variation?

Nona

international conference at Brighton

The International Astronomical Union is to hold its 14th General Assembly at Brighton this year from August 18 to 27. This is the second to be held in the United Kingdom, the first was the second assembly held at Cambridge in 1925. The eighth (in 1955) was held in Dublin.

The hosts will be the Brighton Corporation, the University of Sussex and the Royal Society (which is the body through which the UK belongs to the IAU). The officers of the National Organising Committee are:

President: HRH Prince Philip, Duke of Edinburgh.
Chairman: Professor Sir Bernard Lovell FRS, Director of the Nuffield Radio Astronomy Laboratories (Jodrell Bank) and a council member of the SRC.
Chairman of Finance and Policy Committee: Professor R. J. Taylor, University of Sussex.
Chairman of Local Organising Committee: Mr. D. H. Sadler, Superintendent of the Nautical Almanac Office at the Royal Greenwich Observatory. (He was a previous General Secretary of the IAU from 1958 to 1964).

The SRC has given Mr. Sadler leave of absence from his normal duties and has seconded Mr. R. C. Pepperell – Rutherford Laboratory Conference Organiser – to act as an administrator. Although it is not one of the host institutions, the SRC is very much involved both in the organisation and in participating – there will be about 300 astronomers attending the assembly from the Observatories, other SRC establishments and from universities. Also the RGO will be providing many services and has undertaken to invite all the participants (2,500–3,000 are expected) to make afternoon tours of the Royal Greenwich Observatory, including tea.

The IAU General Assemblies are usually held every three years. Their purpose is to provide meetings of IAU Commissions and to give astronomers from different countries a chance to meet each other for informal discussions. This year the two important 'invited discourses' will be on pulsars – with A. Hewish (UK) and V. L. Ginzburg (USSR) as speakers – and on galactic spiral structure – with B. J. Bok and C. C. Lin speaking (both from USA). There will also be a special scientific meeting on a topical subject – the scientific results obtained from the exploration of the Moon! In addition the various Commissions will hold up to 150 separate meetings and there will be several joint discussions on astronomical subjects – all to be fitted in in the space of ten days.

The IAU itself is one of the scientific unions federated in the International Council of Scientific Unions (ICSU). It was founded in 1919 with the primary aims of encouraging international cooperation in the field of astronomy, furthering the study of astronomy and safeguarding its interests. It is one of the very few international organisations that has individual membership but without payment of individual dues. The membership is about 2,000 (from 50 countries) and it tends to increase by about a third at each general assembly. Professor Otto Heckman of Germany is the current President and Dr. Lubos Perek of Czechoslovakia is General Secretary. The IAU is directed by the elected executive committee but most of its scientific work is concentrated in the Commissions – there are about 40 of these.

The members are also given a chance to meet on a cultural and social level. At this year's Assembly events will include tours and excursions on Saturday and Sunday, a concert of British music by the Royal Philharmonic Orchestra and a recital of Sir William Herschel's organ concertos by Lady (Susi) Jeans, the organist, who is also the widow of the distinguished astronomer Sir James Jeans.

eclipse 1970

Paul Dickinson

An account of the launching in Nova Scotia, during the solar eclipse, of the rocket-borne experiments prepared by the Radio and Space Research Station, represented on the spot by Tony Hall and Paul Dickinson who writes:

It was rather a special eclipse. Not every eclipse has the moon so near the earth that an observer can see totality for over two minutes. Very few indeed conveniently go on display all up the eastern seaboard of the USA which is rather well supplied with laboratories, observatories, people, and even one or two rocket ranges. Many of these were perfectly placed within the eighty mile wide path of totality. Even less probably in Nova Scotia, where the centre of the totality path was precisely along the south coast and where a second total eclipse will pass over the same place only two years later. The paths coincide where the latitude happens to equal that of the ionospheric observatory at Ottawa.

The sun is 'switched off' every night, but so slowly that many of the more rapid ionospheric processes cannot be observed. In an eclipse the sun is switched off much more rapidly. One can measure how the ionosphere follows the sudden drop in the sun's brightness, and measure the 'sluggishness' of the ionosphere.

The Canadians, through their National Research Council decided to contribute to the world programme of observations of this eclipse by flying four rockets to measure the ionisation in the D and E regions of the ionosphere, and to try to relate this to the sun's brightness. They invited us to contribute experiments to measure solar intensity at wavelengths relevant in the D region, namely the far ultra-violet (Hydrogen Lyman alpha at 1216Å) and the X-Ray spectrum (1.5 to 10Å).

We had about six months in which to prepare the experiments for eclipse day 7th March 1970. Some development work was needed mainly to get the extra sensitivity to measure a very obscured sun. Integration checks took three weeks in January in Winnipeg. There Tony Hall discovered the significance of what Canadian meteorologists call the Chill Factor. This is a sort of negative cold bonus. The temperature outside may be –40°, but if there is a wind your bones may inform you that it is –60°C. The chill factor is 20°!

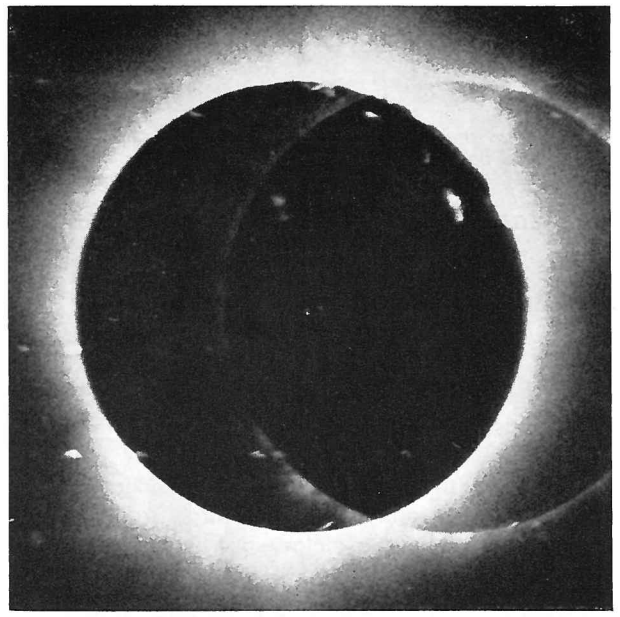
I had no idea what to expect in Nova Scotia. The map shows the south coast to be basically a straight line running WSW to ENE, but drawn by someone with advanced delirium tremens. Having seen the coastline I can now vouch for the sobriety of the cartographer, although the mapping could well have driven him to drink. The coast is a mass of bays, islands, estuaries, rocks, lakes and harbours. Each feature is itself tortuously indented and each indentation has rocky protruberances and so ad infinitum (knobbly barnacles on the rocks?).

Pine forest extends to the water's edge, more exactly to the edge of the sea ice. This extended about a mile offshore in places, when we arrived, but receded rapidly during the fortnight that we were there. Being salt ice it didn't thaw like civilised ice, which is either there, and hard, or not there, and wet. Instead it went to a white pulp which was a realistic imitation of ice until you tried to walk on it . . . . Not quite Richmond ice rink.

We arrived on February 23rd at Halifax airport and were driven in a gentle blizzard, a large station waggon and a series of graceful skids, seventy miles eastwards along the tortuous marine highway to Sheet Harbour. We stayed in an historic hotel (anything over 100 years old is historic in Canada), founded in c. 1860 by one Theobald Conrod, and now owned by Frazer Beaver. (Beaver may be named after the rodent, but Conrod . . .?) At the hotel Tony was able to demonstrate his virtuosity in audio frequency modulation, on the electric organ belonging to Mr. Beaver.

The rockets were to be launched from a temporary launch site established at East Quoddy, about twelve miles East of Sheet Harbour, on a spit of land called Smith's Point. Everything happened on Smith's Point. The four launchers were at the seaward end, while the entrance gate at the north end was barely 600 yards away. In between were the rocket store, the meteorologists accoutrements for balloon sonde launching, tracking and wind analysis for impact prediction, then there were trailers for the triplicated telemetry receivers, the experimenters, and the range safety officer, and for the ground transmitters for Dr. Belrose's experiment, complete with four 100 foot masts carrying his square array of dipole transmitting aerials. Lastly there was a trailer referred to as the

The writer, Dr. Paul Dickinson (seen left) is a Senior Scientific Officer in an RSRS research group at present engaged in rocket-borne experiments to measure ionising influences in the upper atmosphere.



The photograph shows the solar corona as recorded from above the earth's atmosphere during the eclipse of March 1970. The corona is seen in 1216Å wavelength radiation scattered from coronal atomic hydrogen. (The localised bright regions on the photograph are formed by overlapping images in spectral lines near to 1216Å.)

This observation was made from an Aerobee 150 rocket launched from Wallops Island which carried instruments prepared by the Astrophysics Research Unit in collaboration with other groups in the UK, USA and Canada (as reported in Quest, April 1970).

'Guard Van' from which trespassers could be repelled from the site and in which we, the press or others could be briefed, harangued, or fed as the case might be.

The objectives were to fire one rocket 75 minutes before totality, in full sun, and then to fire the other three in quite rapid succession, at totality, at totality plus 2 minutes and at totality plus 8 minutes. Since each rocket would be in the air for about 6 minutes we would have two rockets in the air at once, for several minutes. This meant that the last three rockets needed separate telemetry frequencies. Hence the triplicated receivers.

Immediately on arrival at the range Tony and I had to check out all twelve experiments (Lyman Alpha, X-Ray and Solar aspect experiments, four times each). A few long days and all our experiments were checked, fitted to the payloads, and working.

The rockets were Canadian Black Brant III vehicles, single stage, 10'' diameter, solid fuel, each launched off a separate rail type launcher. They were spin stabilised by virtue of canted fins, but were despun from 8 to less than 1 rev. per second shortly before the clamshell nosecone was ejected. Release of the nosecone exposed our sensors to the sun, and allowed deployment of the Langmuir Probes which Dr. McNamara, the chief experimenter, was flying to measure electron and ion densities. The nosecone also had to come off to make Dr. Belrose's experiment work, as only then could his receiver detect the RF pulses from the ground station, and measure differential absorption. If those clamshells refused to open, the mission would be a write off, so we were interested to see what held them on. It was a short stainless steel hawser, the same multistrand high tensile wire that is used in a yacht's rigging. This held the two halves together and was to be cut by an explosive chopper. I visualised the mess that wire would make of an ordinary chopper but tried to share the Canadians' confidence that the very opaque stainless steel shells closed over our precious experiments would deploy when the clockwork timer, started by the thump of launch, had counted off 45 seconds to the appointed time.

The payloads were not to be recovered after flight, so all our data was to be obtained from the radio telemetry link, using IRIG on frequencies around 250 MHz.

Six days before the eclipse there was the first of the planned dummy count-downs. In this operation everything was done except the pressing of the firing buttons. In fact a few artificial catastrophes were put in. The mains electricity supply failed, and we switched to the two diesel generators for auxiliary power (there was also a spare diesel generator!). We had a surprise as we were told that our experiments were drawing double the expected current on two rockets. Perspiration. Feverish checking of our signals. We found no fault in them. Then we realised that both the rockets affected were sharing one ground power supply. It was the meter not the current that was wrong. The Canadians changed their meter, and we breathed again.

The dummy run was so successful that no more were required. This was just as well, because the Sheet Harbour disease struck almost the entire crew. We English were spared, and the reader will be spared details.

We next suffered ordeal by visitors, with the NRC's own photographers making a comprehensive cine record, followed by the Press, and then by the CBC radio coverage, with tape recorders, interviews and short dummy count-downs ad nauseam.

The day of the eclipse was a long day. The launch team were on site at 0200 hrs. We were on site at 0500 hrs. The count-down went on, about an hour ahead of schedule. Two things could stop the firings, either high winds, or ships in the target area. There

was no wind but eight ships, with about three hours in which to get rid of them. The lobster fishermen were obliging and stopped to fish just outside the danger zone. The Russian trawler obediently steamed radially away from the predicted point of impact. The American ship's radio operator appeared to be having his coffee break, and they steamed radially towards the impact point, where they would arrive just as we were due to fire our first at 1343 hrs. Fortunately they heard us at 1200 hrs and got out fast.

We had cameras ready to photograph the spectacular solar corona at totality, and to take progressive shots of the occulting disc. We had worked out that one needs a x 10,000 filter to photograph the sun itself, and we had one at the ready. Relentlessly during the morning the sky clouded over and was opaque just in time to obscure the occulting sun completely. This meant we could concentrate on photographing the rockets (and on monitoring our experiments!). Our efforts were rewarded.

The rockets all went off with split second accuracy. The clamshells worked . . . everything worked. Even the eclipse was on time. Although obscured by cloud the rapidity of darkening during the final minute is most impressive, and one can well understand the fear produced among primitive peoples.

After the eclipse was over there was a marked 'rosy glow' particularly over East Quoddy. It is not normal for a rocket flight to be perfect. Four essentially perfect flights are worth celebrating. This we did, at lunch next day in the Guard Van, with Crackling Rosé wine and 80 (Eighty) lobsters between 30 of us. They were cooked for us by the nearest local inhabitant (who lived 20 yards away!) by name Byron Publicover, and with a name like that, no wonder he could cook lobsters.

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experiment

Intricate tracery of shape and glass,
Or metal finely tuned and
chatting lights,
Endowed with beauty born of
function.
Which secrets to you hold
and which will yield
To benefit mankind or cause him ill?
And will he use them wisely –
is he now
Adult in knowledge,
childish still in wisdom?

Nona

one o'clock shock

'You remind me of the incident of the clock and time-gun in Egypt. The man in charge of the time-gun fired it by the clock; and the man in charge of the clock set it right by the time-gun'.
A. S. EDDINGTON: 'Space, Time and Gravitation', p.3

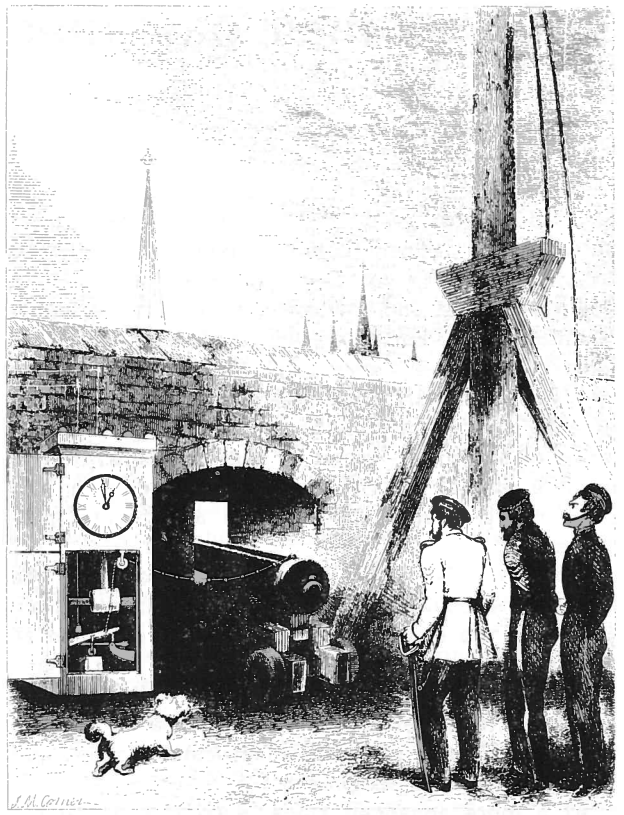
Bill Napier

Edinburgh's Royal Observatory prides itself on being a most up-to-date establishment responsible for all sorts of innovations such as the GALAXY machine. The truth is, there is a skeleton in the cupboard, in the form of an antiquated Edinburgh tradition: the daily firing of the one o'clock gun. Nervous citizens have protested down the years, but this time-gun still shakes the city every day at 1 p.m. It is fired from the battlements of Edinburgh Castle, situated on a high escarpment dominating the city and therefore well placed to maximise the blast.

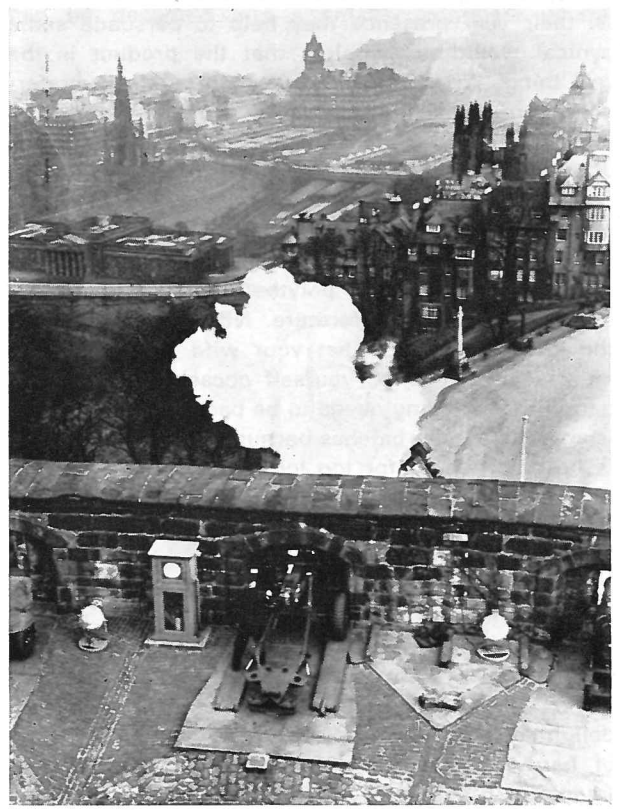
Although now a mere relic from the past, regulation of the time-gun was once a prime function of the Observatory. The link dates back to the mid-nineteenth century, when commerce in the city found itself increasingly hampered by the lack of accurate time-keeping. For navigational purposes, shipping interests also required a daily time check. In 1855 Edinburgh Chamber of Commerce attempted to meet this need by erecting a time-ball next to the Observatory which at that time was situated on Calton Hill at the East end of Princes Street.

The experiment was not a success. In bad weather the ball was invisible from the Firth of Forth, and in high winds the Observatory staff lacked the courage to raise the heavy ball on its column. And so there arose the idea of a time-gun, as recorded in the Proceedings of the Royal Observatory, 1861: 'The electrical time-ball, daily worked by the Observatory has given rise amongst the citizens of Edinburgh to a desire to have its visible manifestations supplemented by an audible signal, in the shape of a cannon in the Edinburgh Castle, to be fired by electrical signal from the Observatory. This desire has not only manifested itself at the meetings of public commercial companies, but also in the collection of so large a subscription to pay for the expenses of the connecting wire, and the gunpowder, that Her Majesty's Government have been pleased to entertain the proposal to some extent, and experiments were lately made by the military in the Castle, as to the best size of gun, charge of powder, and general position.'

Eventually a 24-pounder cannon was chosen. Connection between Observatory and cannon was by means of a steel wire which carried in one gigantic span from Nelson's Monument (on Calton Hill) to the Castle. For its time this was a remarkable engineering feat. The wire was 0.2 inches in diameter and weighed 3 cwt.; it stretched 4,020 ft. in a catenary with a central dip of 155 ft.



The Firing of the Time Gun 1861 and . . .
1961 (photo below by courtesy of Scotsman Publications)



Dr. Bill Napier is a Senior Scientific Officer engaged in stellar atmospheres and close binaries.

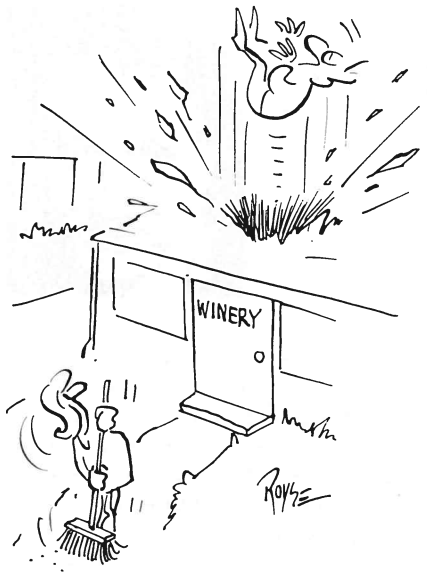
A trigger mechanism fired the cannon automatically. In spite of its Heath-Robinson appearance *(see illustration)* it could boast an accuracy of 0.1 seconds. Nowadays the gun is regulated by a crystal clock giving electronic pulses accurate to five milliseconds, but since hand firing has replaced the automatic trigger, the precision has deteriorated to ± 5 seconds.

Daily firings of the gun, synchronised with the falling of the time-ball, began officially on June 7th 1861, and created quite a stir amongst the local population. The Proceedings of 1862 record :

'From the Royal Observatory, Edinburgh, we hear of the usual round of official duties performed. The first and most prominent of these consists of the double system of time-signals, the visible and audible, which are kept up daily from the two chief hills of the city, under the electronic control of the Observatory and the interested surveillance of the citizens, but with a decided bias in favour of the ''gun'' over the ''ball''.'

The 'double system of time-signals' was beset by many troubles over the years. The fuses did not always ignite the gunpowder: snow or high winds broke electric cables; and only eight months after the official inception of the time-gun, a flash of lightning magnetised clocks in Castle and Observatory and set fire to Nelson's Monument.

The *useful* lifetime of the one o'clock gun was rather brief: electric clocks, connected at first to the Royal Observatory, were to supersede the time-gun within a generation. Eventually the introduction of radio was to remove all necessity for direct connection between the Observatory and town clocks. However the daily firing has become an institution and it earns dollars. Edinburgh's gun is likely to thunder its contempt for the nervous for many years to come.



home brewing

Alan Dobbins

'Genius of Health, thy grateful taste
Rivals the Cup of Love
And warms each English generous Breast
With Liberty and Love'
from Hogarth's engraving Beer Street.

If you are in favour of an increase in your prosperous presence – read on. But if you want to keep your coat buttoned and your prosperity in the bank – don't! Alan Dobbins' major pastime – and, incidentally, he helps to look after the finances of SRC as the Head of Finance II at London Office – has taken him through the money saving *(sic)* stage, followed by the purchase of big time equipment to the haven where he has a cellarful of his own home brew – some tens of gallons of wines, beers and liqueurs. He has other spare time interests but we thought this one would appeal most to some *Quest* readers, particularly the members of the wine circle at RSRS.

One good reason for starting home wine making is that for an imbiber, it is perhaps the only acceptable alternative to buying drinks which always seem to fall in the top tax bracket. Then in wine making, the brewing of beer can play an important part – for to achieve a mature wine of two years' vintage, one may well need another thirst quencher to get through the waiting period! Whatever the motive, the number of home brewers is certainly on the increase and so is the circulation of the amateurs' wine making journal, and the number of books published – though not all of these are very reliable or helpful. The ingredient for wines and beers are now to be found in many more shops, together with a splendid array of both simple and more complicated aids and equipment.

The only equipment needed to brew the first gallon is a one gallon jar or plastic bucket, three feet of polythene or rubber tubing, a piece of polythene sheet to cover the containers, a rubber band to hold down the sheet and the courage to start the whole chain reaction. For after the first success you are almost sure to be hooked, and you will then be able to consider using thermometers, hydrometers, wine-ometers and what-have-you-ometers, and a wide range of additives – rated as essential by some and as pure science fiction by others – as tools to help man in his struggle with nature and natural processes.

Perhaps it is easiest to start by assembling the basic items, buying a tin or jar of concentrated grape juice (for the kind of wine you fancy) or a can of hopped malt and then just following the instructions on the label – these amount to little more than adding water. If the results are pleasing, then is the time to think about trying more intricate recipes and buying specialised equipment.

At a more advanced stage, even if you use the gadgets only as an occasional check to prove that the specific gravity of the brew is what you think it is, their very presence may help to persuade some cynical would-be samplers that the product is the real thing. When they ask for yours again in preference to, say, whisky or gin – you know that they think it's good or that perhaps they have some ulterior motive.

To help in making his beverages Alan has built a corner unit in the kitchen with a lid instead of a door, which hides – in a 19in. by 14in. space – nine one-gallon high-density polythene jars of liquid fermenting at room temperature. **NB** – before altering the kitchen, be sure that your wife is prepared to let you have it all to yourself occasionally, remembering that drinking needs to be backed up by replenishment in regular batches because home brewed beer is best not stored for too long. With practice it can take less than an hour to prepare a new lot of two gallons and to rack and bottle the previous batch. Most of Alan's wine is made from various types and makes of concentrated grape juice (largely bought at discount in six gallon lots). The rest is a wide miscellany including low cost and seasonal fruits, such as pear and banana – the bananas acquired 'black' at 6d. a lb from a local greengrocer who was delighted to find a buyer. One neighbour gave 14 lbs of hard pears which soon became soft enough to transform.

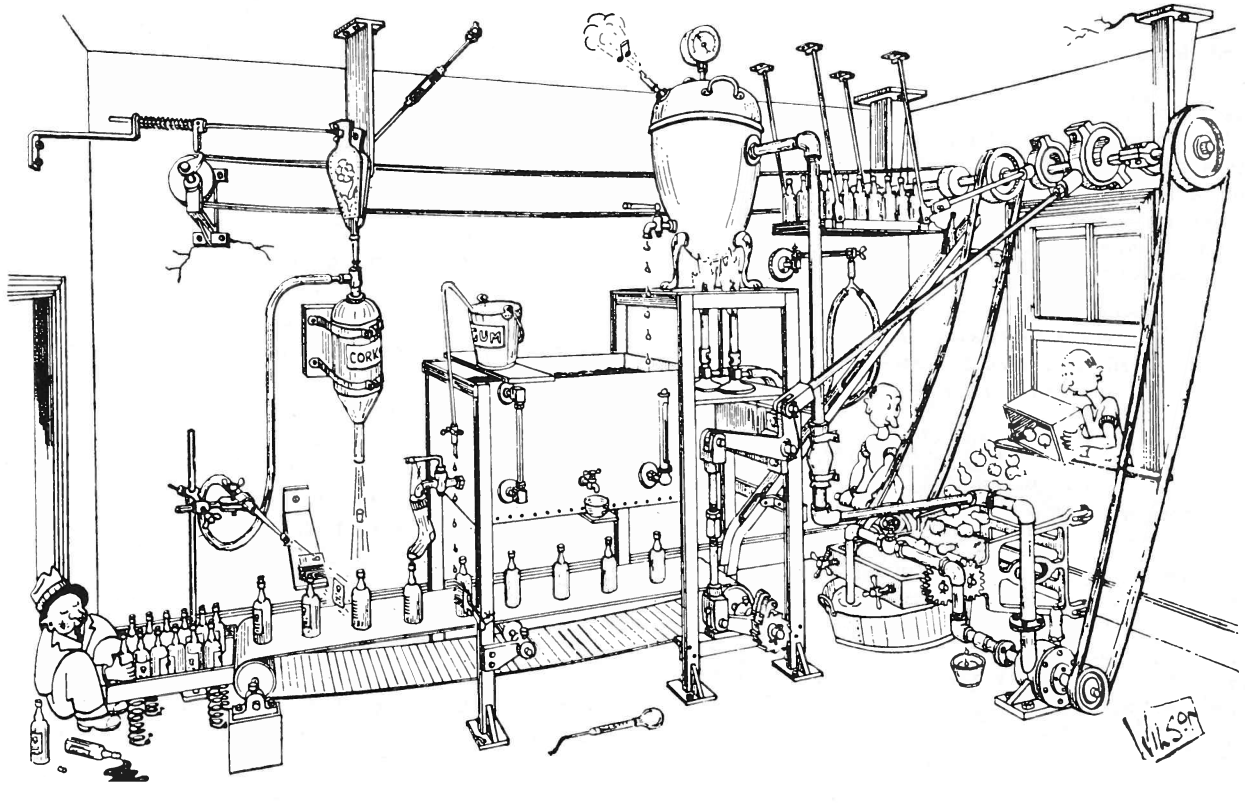
Wine can be prepared in large, medium or small quantities (one gallon and five gallon containers are generally easily available and most convenient) so it takes its place as a less demanding hobby. A consumption of three bottles a week by the family – there are four teenage children – and their visitors requires a total stock of about 50 gallons if one aims at a two year maturing period. This sort of stock allows plenty of wine for cooking (his wife is strictly a consumer not a brewer) and the rest of the bottle can be tipped away without feeling that it would be extravagant not to drink it up then and there.

As with 'antique' furniture there is a short cut for people who hate to have to wait until the wine matures. Alan tried it out for the benefit of members new to his local wine circle who thought waiting would be the greatest drawback. By use of a thermostatically controlled and heated container and an 'aging' ingredient, he produced a clear and apparently mature wine in no more than a month. Both old and new members agreed it was good and the method was rather 'clever' but the arguments on the ethics were protracted and unresolved. Perhaps it is rather a commercial trick to play on oneself.

Things are not always what they seem. A 'one gallon' jar may hold 8 pints or it may take 9 or only 7 and bottles may be 26 fl oz or 20 so their halves can be 13 or 10 or even 8. Such minor irritations should be turned to good account – *viz* opened wine can be decanted into a smaller container where, without air, it will keep better. If every empty jar is well rinsed with tap water then rinsed again with sterilising solution and restoppered, it will be standing ready for use. (**NB** – but don't rinse with tap water *after* sterilising!) However, some will argue that this sort of sterilising is sheer hocus pocus.

The subject of this article declined to have his photograph taken but did agree to be represented by the cartoons which are reproduced by courtesy of the 'Amateur Wine-maker'.

It is best on the whole not to take the process too seriously or the memory of the small accidents may loom darkly behind the latest success. On one occasion one of Alan's children, then aged ten, spent an almost sleepless night worrying because he heard his mother shrieking, as he thought, 'Alan! Alan! Swine! Swine! When he crept in to breakfast, looking miserable, he was told what had happened – to cheer him up. With the coming of Spring and rising ambient temperature (not, as some would have it, the breaking into bloom of the flower on which the wine was based) a doubly stoppered gallon of wine had started to ferment again and at midnight from its cupboard high on the wall it had suddenly cascaded in torrents just as his mother passed. She certainly shrieked as she ran but what she shouted was 'Wine! Wine!' It was three in the morning before all the mess was cleared up and the next day another 15 gallons of wine had to be started to use up



ingredients wetted by the deluge, before they went 'off'.

If you have read this far to try to find out how to brew a drop of the hard stuff, we will whet your thirst by saying that you can make liqueurs for as little as 10s to £1 for a whole bottle, although the initial outlay for the high proof spirit may be 55s for ¾ pint plus a few shillings for liqueur extracts, each of which is supplied with its own recipe, and pennies for the sugar. There is a method using wine from which some water has been removed (but not, in this case, 'distilled') which you can find out from your nearest home brewer – and there are quite a lot of them around in SRC.

That is all *Quest* is prepared to say at this stage about the connoisseurs' delight, in case some innocent soul should be led astray and laid out by the crock of gold before he has learnt how to find the rainbow. We shall be happy to give more space to the whole subject in future if it turns out that a large number of our readers are not teetotal. Indeed we will go so far as to suggest that SRC socialities should run a competition for the best recipes and invite us – purely for journalistic interest – to taste the prize selection.

Quest Quarterly Quote

hard times

'Gentlemen,

We have an immediate need for a copy of "Research in Britain: a Non-weeping Formula for Living on Tight Funds" by Sir Brian Flowers. Please send us a copy, without charge.'

Request from an American University following the Chairman's recent speech at Nottingham University.

(2) strangers in the night?

'Employees who are in subsistence classes B or C, and who are required to travel by rail alone at night, may occupy a 1st Class sleeping berth if the alternative is to share a 2nd Class berth with a stranger.'

from SRC General Notice 15/70

stop here . . . . I'm getting out

Laurie Lintern

'Juliet 13, taxi, first solo – Juliet 13, you are clear taxi – runway 21 left hand, the QFE 1004. Standby fire tender, crash crews'.

So here I was, nine months after leaving the Rutherford Laboratory, about to do my first solo flight. An intense interest in flight coupled with a childhood love of the sea and ships added up to the decision to fly in the Royal Navy. The forms went off and a few weeks later I found myself facing the Naval interview board. Three weeks later came the news that, to my great delight, I had been accepted for training as a pilot.

After a life of comparative ease (?) at the Rutherford Laboratory for five years, I looked forward to Britannia Royal Naval College Dartmouth with some trepidation. A gloomy June day saw my arrival at Dartmouth to join 21 Flight of naval air cadets. Within half an hour my civilian clothes were in the locker and I was wearing naval battledress. Our initial basic training was to last six weeks, during which time we did not leave the College. I began to feel like a prisoner although at the same time I did actually feel better for getting up at 6.30 a.m. and going to bed at 10.30 p.m. The Parade training (square bashing) and gym went on and on, hours per day.

Very soon it become obvious that I was going to be the worst drill pupil for some time to pass through Dartmouth. I couldn't march, I didn't know left from right, my co-ordination was awful. When I stood to attention one shoulder was higher than the other, especially with a rifle. I think I brought more trouble on other people because they laughed at me than I brought on myself. It was several weeks before I could laugh at myself, and as I walked around in my spare time I used to practise marching, turning and saluting, which most people found simple but which I found immeasurably difficult for some reason. The amount of trouble I took to sort out my mistakes was rewarded at the end of term when – by a supreme effort – I managed to survive the purge of ham-fisted individuals prior to the review by Earl Mountbatten, of officers passing out. This was to be his last review while a serving naval officer.

The main difficulty at Dartmouth was the fact that the discipline was more suited to cadets at the normal entry age of 18. For people of my age, then 24 (and some cadets were older), the discipline came as rather a crunch. As the Chaplain observed after returning from visiting a colleague at Dartmoor: 'Those chaps' (the inmates) 'have a darned sight easier life than you'. If the discipline was strict there were many compensations. Every afternoon we did an activity – which usually meant taking a boat out on the River Dart or out to sea. This I found great fun as I was keen on watersports and the scope was tremendous. I learned to sail – from dinghy to ocean racing yacht – manoeuvre a twin engined picket boat and even take charge of an inshore minesweeper, which we took to the Scilly Isles. The minesweeper was kept at Dartmouth for training air cadets on their condensed course in practical seamanship. After the first six weeks we were allowed 'ashore'. (One always goes ashore from a naval station, shipborne or on dry land). The shore leave amounted to about two evenings a week on average and, of course, we really lived it up in local pubs during the time available. The hand of discipline was still with us though: we had to be back at the College by 10.30 p.m.

During our time at Dartmouth we had our first flying experience on Tiger Moths. These were the last few the Navy possessed and we were one of the last courses to use them, as they changed to Chipmunks shortly afterwards. It was great to be in the air at last, in fact it was the first time I had flown. I didn't have very much trouble learning to fly the Tiger Moth, only at one stage my landing approaches weren't too good. As my instructor observed: 'Most pilots aim to put their aircraft down on the airfield; now maybe you have some new idea about flying or something but I can't quite understand why you always aim to put it down on the field *before* the runway!'

With the Dartmouth course finally completed after eight months basic naval training, I passed out as Sub-Lieutenant. At last we were going on to serious flying, alhough I looked back on my time at Dartmouth as being very enjoyable despite the tough discipline and continual slog. We went next to RAF Linton-on-Ouse in Yorkshire to join No 128 Royal Naval fixed wing pilots course. Here we would do our basic flying training up to wings standard in the Jet Provost. The life was quite a change from Dartmouth: the men called you 'Sir', saluted you and you even had a cup of tea in bed and your shoes polished! Discipline was more relaxed and it became obvious that this was necessary with the pressures that an intensive flying course puts on one. Flying, and particularly learning to fly, can make one very tired. After two weeks basic ground school where we learned about all the aircraft controls and systems we were at last airborne, firstly for an hour's work-free ride looking at the area and how the aircraft performed. This is perhaps the only full trip where one can sit back and look out of the canopy. The trip thrilled me tremendously, up there above the cotton wool clouds, climbing, diving, turning, looping and finally recovering through the cloud on radar. The next trip was down to business with only 10 to 15 hours to achieve your first solo flight. After a couple of trips I did my first take off, which was one of the best I did pre-solo. This initial period of training was a marvellous time and the chatter among friends after the day's flying went on for hours in the bar.

Then came the time for first solo. To be ready to fly solo certain basic points and skills had to be learned but basically if you could take it up, do one circuit of the airfield and bring it down safely you were OK. To recognise and take action in a stall or

The author – seen above left and on right beside a Tiger Moth – is an Experimental Officer at the Rutherford Laboratory in the Cambridge University team engaged in an experiment on Nimrod.
How he got back there is another story – to be continued.

Jet Provost Mark IV (photo by courtesy of the Ministry of Defence)

spin is essential. Then you have to know all the emergency procedures, how to take off and climb, turn, fly straight and level and descend at the correct rate for a safe landing.

All this seems to take a short time until, suddenly, while taxi-ing around for your next take off your instructor says: 'OK Stop by the tower, you're on your own' or 'Stop here, you're getting too dangerous for me, I'm getting out'. You sit there for about five minutes with the engine still running while the instructor's ejector seat is made safe and strapped down. This seems to take hours and you continually watch your fuel and engine instruments. But all keeps running well and you call the tower using your own call sign for the first time. 'Juliet 13, taxi, first solo'. '13, taxi, runway 21, left hand, the QFE 1004'. Handbrake off, pull away nice and straight, mustn't make a fool of myself now. You halt at the holding point before the runway, do your checks, call for take off. Your clearance comes and you line up with the large centre lines of the runway. Not much time to worry about it really. Full power, fire warning light out, RPM, JPT, oil pressure – all OK. Brakes holding. Right, go. You let off the brakes, build up speed, lift the nosewheel and up you go, a nice steady climb up to 1,000 feet, throttle back and commence a level 180° turn.

Then, suddenly, just before you do your downwind checks for a landing, you notice the instructor's seat is empty and it looks *very* empty. This is the first time you have had time to think about it since take off and the thought comes as a revelation: 'I've got to get this thing down'. You rush through your downwind checks, calling: 'Juliet 13, downwind to land' adding perhaps under your breath 'I hope'. Then you start working again, checking the wind to decide the best place to turn in, then throttling back, entering a descending turn – the woods and fields rushing below you and looking closer and closer. Then you are lined up and on the glide path, full flap down and speed right, over the boundary fence and 'bump' onto the runway, nosewheel down and 'phew, made it'. Then you remember you have to brake. You push hard on the brakes and your legs feel like jelly.

With your first solo over you approach flying with a great deal more confidence and you spend the next five hours doing nothing but circuits and 'bumps', or roller landings where you continue and take off again. This is done in various configurations to simulate all cases of emergency. After your five hours circuit consolidation you go out of the circuit for an area reconnaissance. This consists of flying around the local area, picking up the landmarks you have already been shown and returning safely to the airfield. There is a direction-finding facility worked on the radio transmission from your aircraft which enables air traffic control to give you a course for home.

The life was very enjoyable at Linton-on-Ouse and we had a very close-knit course. We were a good team both in the bar and on the sports field and sometimes even in the air. We had started flying in earnest, had gone solo and many of the initial worries were overcome. The way ahead was now clear.

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in loving memory of –

In loving memory of –
Who?
Who are we bidden remember?
H.L.W. and M.C.W.
Forgotten initials and forgotten
names.

They put the trough there
Thinking that horses last forever,
But horses, like men,
Become out of date.

And so the trough chokes up
A loving memory
Soon forgotten.

AP

newsfront

Congratulations to Mr. James Hartshorn who received an MBE in the Birthday Honours list. Mr. Hartshorn retired from the SRC London Office on May 31, 1970, after a long and interesting career in the public service.

Born on October 1900 in Calais, France, of English parents–his father was born in Nottingham (famed for its lace) and was a manufacturer of high class novelty laces* – he was educated in France and Switzerland then entered his father's business. In 1930 he became the British Pro-Consul at Calais and from 1934-40 he was Vice-Consul. But on May 21, 1940 he had to close the Consulate and evacuate the English colony on the HMS Venomous, under heavy fire of enemy planes and the advance of German troops.

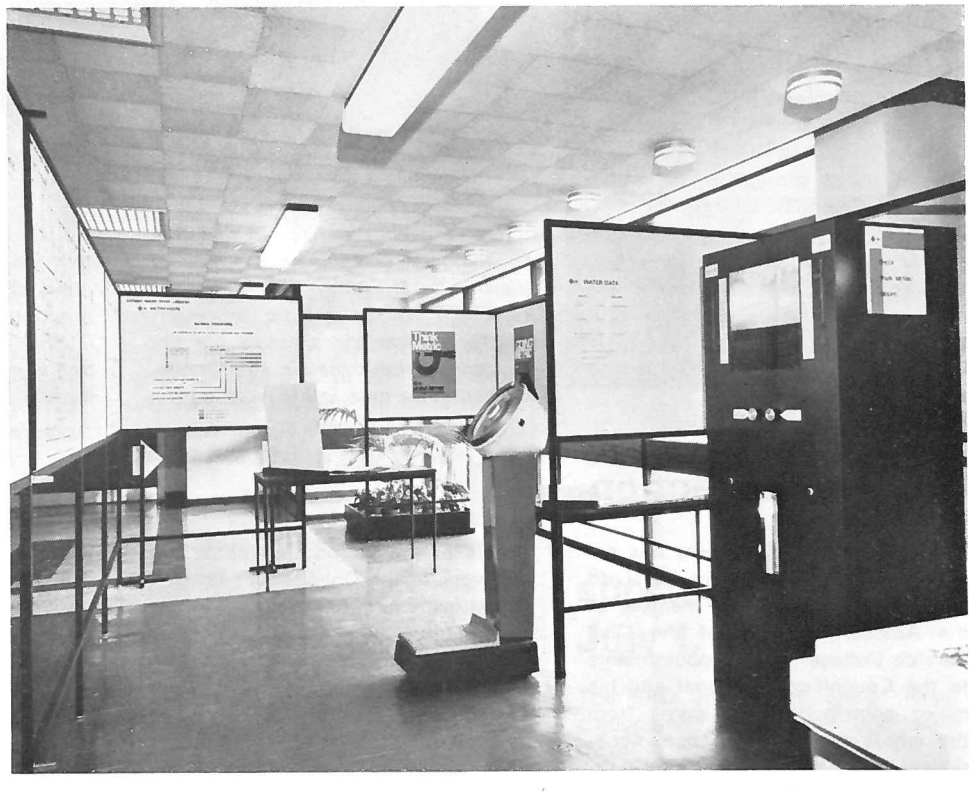
While in Calais he was sub-agent for the General Steam Navigation Company and, for many years, church warden of the English church. He married Margaret Elaine, who is a teacher and the daughter of the late Dr. Rayner, Senior Radiologist and Physician of Preston.

Early in 1941 he joined the Ministry of Economic Warfare (MEW), then the Foreign Office, the Control Office for Germany and Austria, the Board of Trade (TIDU) and finally DSIR (also LLU) where he came over to the SRC in 1965.

Mr. Hartshorn has made wide and detailed historical research relating to the English influence, the Colony and the celebrities of Calais. He is a member and correspondent of the 'Amis du Vieux Calais' and the Historical Society of the North of France. He therefore looks forward to a very busy retirement!

** (Nottingham made cotton laces (Malines and Valenciennes) while Calais went in for the silk, rayon and tinsel evening dress laces such as Chantilly.)*

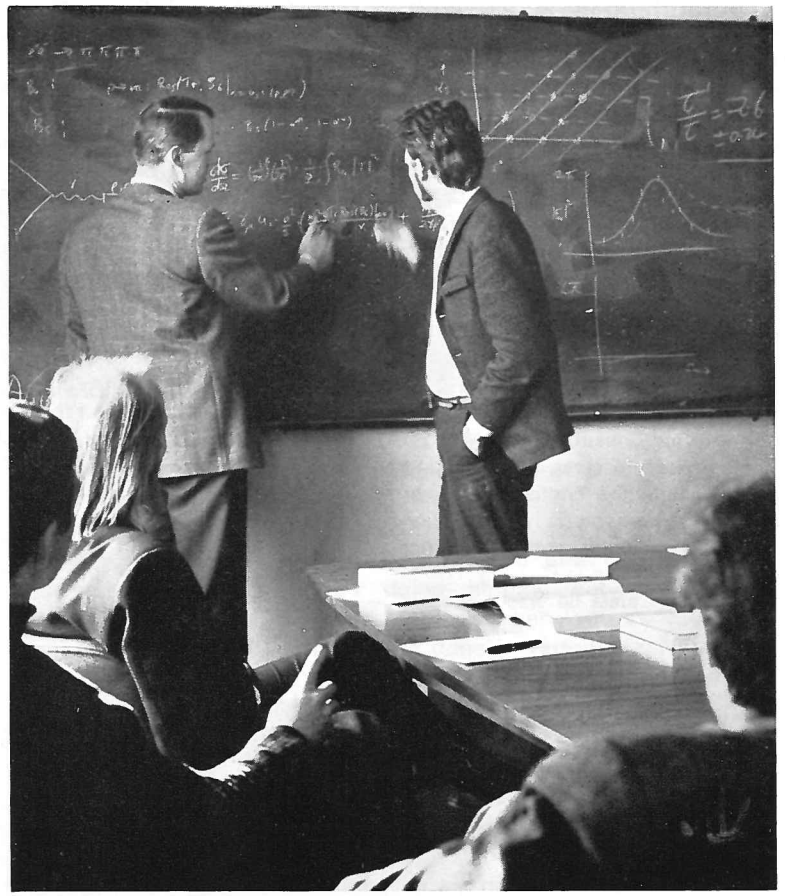
a measure of things to come



Metrication was the theme of an exhibition held at Daresbury on 1–5 June. The Exhibition presented metric units and measures and was specially devised to encourage direct thinking in metric terms, and so metric/imperial conversion factors were deliberately excluded.

Static display and working models, from a fashion model (vital statistics) to a colourful water flow rig, served to illustrate the basic and derived units. The weighing and measuring machines to check personal metric statistics (seen in the picture above) helped to drive the message home (by shock tactics we presume, since a mere 10 stone (imp.) equals 64 kilos!).

new theory group



On right, members of the recently formed Theory Group at DNPL discuss an application of the 'Veneziano model'. The group functions under the leadership of Professor A. Donnachie of Manchester University.
(photo Arthur Pickett DNPL)

***Congratulations** to Dr. R. W. P. McWhirter of the Astrophysics Research Unit who has received a special merit promotion to Senior Principal Scientific Officer, for original research work of a very high standard. The promotion was recommended by the special panel which reviews the work of scientists conducting research of high calibre, in Government and other public service establishments.*

Dr. McWhirter has carried out fundamental research in the field of plasma spectroscopy with particular reference to the atomic processes involved when the plasmas are not in local thermo-dynamic equilibrium. Of particular note is his work on the statistical mechanics of such systems and his experimental determination of electron impact excitation functions for multiple ionized ions.

SRC is also pleased to note that this is our eleventh special merit promotion — a very good record!

fultonism in action

Professor Sir Brian Flowers has accepted an invitation from the Lord Privy Seal to become a member of the Advisory Council of the Civil Service College. While appointments to the Council are personal and his major contribution will come from the whole of his experience, nonetheless the invitation to the Chairman of SRC reflects the Council's standing with the Civil Service Department on training and other matters.

The recommendation to set up a Civil Service College to provide a central training centre for the Civil Service was one of the major proposals of the Fulton Committee. As the work of the College will be vital to the fashioning of the Civil Service of the future, the Advisory Council will be widely representative, with members from universities, business schools and polytechnics, local government, business management institutions, the National Whitley Council and senior members of the Home Civil Service and the Foreign and Commonwealth Office. Sir William Armstrong, Head of the Home Civil Service, is chairman. Mr. E. Grebenik, former Professor of Social Studies at Leeds University, is the Principal of the College with Mr. J. H. Taylor, formerly Director of Training and Education at the Civil Service Department, as Deputy Principal.

The College, which opened in June, has three centres at Belgrave Road, London SW1, Sunningdale Park, Ascot, and Atholl Crescent, Edinburgh. Its function is to provide central management training for both specialists and generalists. In the first year the College will provide courses and seminars for some 8,000 students and considerable expansion is planned for the future.

long service

Our best wishes go to Mr. B. F. Offen and his wife, photographed below, on the occasion of Mr. Offen's retirement from the Royal Observatory, Cape Province, South Africa.

Mr. Offen, a senior technician, served the Observatory for 32 years and for a previous eight years he was a technician at the Boyden Observatory in Bloemfontein. He also spent five years in the Royal Navy and sailed the Atlantic in armoured merchant cruisers in World War I. Married in 1918, he celebrated both his Silver and Golden Wedding Anniversaries at the Royal Observatory. In 1966 Mr. Offen received the British Empire Medal for services rendered to the Admiralty (the Observatory's parent organisation until it came over to SRC).

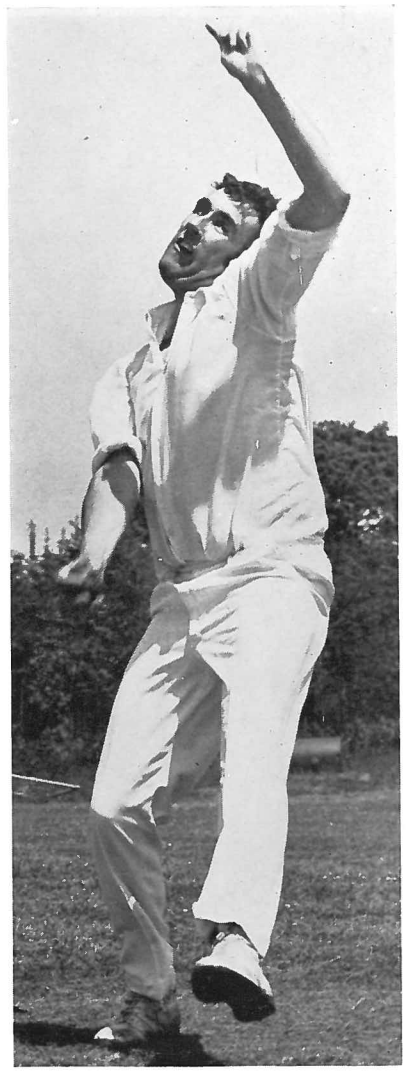
observed position

The most up-to-date Ordnance Survey map of the grounds of Herstmonceux Castle was published in 1909 long before the Royal Greenwich Observatory moved in. A new survey of the Observatory and the immediate surrounds has now been arranged, to be carried out early next year, and some work in the early stages of the project has already been completed by OS surveyors.

In response to requests for information made to the Observatory, the Ordnance Survey has determined the following values for the National Grid co-ordinates of the centre of the building housing the Isaac Newton 100 inch Telescope:
E 56S 086 92 N 110 089.94

well done, sir!

We sometimes wonder what people are up to when they disappear into the fields around SRC's countryside establishments, but there is no doubt about the intentions of cricketer John Philcox of RGO, on right, photographed in action. Someone's stumps are going to be terrifically stirred for a long, long walk back to the pavilion!
(photo David Calvert RGO)



stop press

sports day July 1, 1970

The SRC Sports and Social Association no doubt wish you were there!

'Down Your Way' on BBC's Radio 4 network recorded at the Royal Greenwich Observatory – June 15.