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RGO exhibition

Lions of the Serengeti

Energy Research Support Unit

QUEST

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Our cover picture shows (from left to right): Professor F Graham Smith FRS, Director of the RGO, Mr Patrick Moore and Sir Sam Edwards, Chairman of the Council talking about plans for the new Northern Hemisphere Observatory, which are displayed as part of the RGO's permanent exhibition on astronomy.

The exhibition, which covers the history of the RGO, Herstmonceux Castle, telescopes, astronomical instrumentation, time and navigation, astrophysics and astrometry, was opened by Mr Moore on Monday 4 April before an invited audience of, among others, local and county authorities, members of the astronomical society and the press.

It opened to the general public on Good Friday and will remain open this year until 2 October. The hours of opening are: Monday to Friday 2 pm–5.30 pm (last admission 4.30 pm) and weekends/public holidays 10.30 am–5.30 pm. The admission charges are: adults 50p, children and OAPs 25p. There is free car parking.

Photo: Keystone Press

Contents

Lions of the Serengeti

B BERTRAM

In this article Dr Brian Bertram of Cambridge University describes the ecology and social organisation of lions in the Serengeti National Park, Tanzania. Dr Bertram spent four years in Tanzania and in 1973 his place was taken by David and Jeannette Bygott who are continuing the work with the help of a £16,000 Council grant.

Few species of animal can have attracted so much interest and awe as the lion, yet until recent years almost nothing was known about this large mammal in its wild state. The Englishman in the street here knew that lions were large, cunning and ferocious animals which preyed on other animals, and which were liable to attack the hunters who tried to shoot them for sport. The African knew that they were large animals which usually avoided him but very occasionally fed on his cattle or his companions. It is only with the development of tourism and the change in Society's view of animals that it has become possible to find out how lions really live, because to do so requires the existence of National Parks where animals are not disturbed or molested by humans, whom they therefore no longer either attack or avoid.

Serengeti Research Institute

The Serengeti National Park in Tanzania is indubitably one of the finest such parks in the world, and was one of the first to encourage scientific study of its flora and fauna. The Serengeti Research Institute, established in 1966, provides a base for, and co-ordinates the research of, about fifteen scientists investigating a variety of topics relevant to the area, from soil to scavenging, grass to giraffes, termites, trees, hyaenas and hartebeest. The large predator species have always attracted at least their share of attention. At present David and Jeannette Bygott are the resident "lion-ologists", studying the ecology and social organisation of lions in the Serengeti.

First full study

Their lion work has a long background. In 1966 Dr George Schaller of the New York Zoological Society started the first full study of wild lions anywhere. He concentrated particularly on lions in open country—the nomadic individuals which frequent the famous open Serengeti plains, and two large resident prides at the woodland edge. When I replaced him in 1969 (financed by NERC, the Royal Society and the African Wildlife Leadership Foundation) I continued to monitor these two prides but turned my attention mainly to the lions of the woodland regions in the north of the National Park. There, for four years, I radio-tracked both lions and leopards, to discover what they were feeding on and what effect their predation had on their various prey species. The Bygotts are continuing studies on this fascinating and complex animal.

The author attaches a radio-transmitting collar to an immobilised lioness
(*Photo courtesy of Dr J M King, AWLF*)

Records of two large lion prides, numbering around forty animals, have now been kept for eleven years, which is longer than for almost any other wild mammals. All the lions in these prides are known individually, being recognisable by natural markings such as scars, nicks in their ears, and whisker spots, and so we know who produced how many cubs, when, and what became of them and why. It is partly from such long-term records of these two prides that we have discovered many of the details of lions' social organisation.

A lion pride

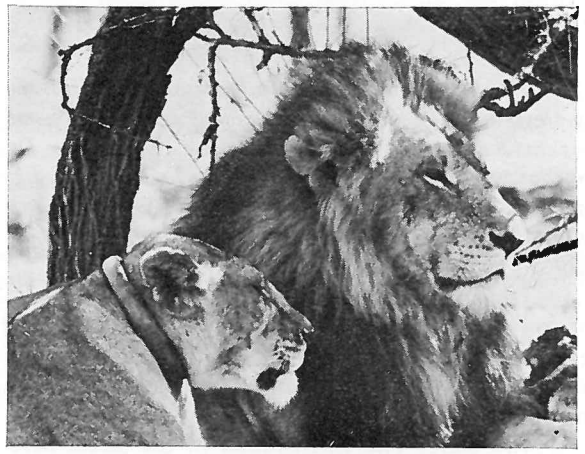
A lion pride is not just a loose grouping of animals like a flock of birds, but is much more similar to a human family. Lionesses, if allowed by their elders to do so, remain all their lives in the pride in which they were born, and never allow strange females to join. Thus over the generations—and prides probably do last for many generations—all the females in the pride are relatives. There must be every possible kind of relationships among them: mothers, daughters, half-sisters, grandmothers, second cousins and so on.

Adult male lions are more transient. A group of two or three of them takes over a pride by fighting with and ousting their male predecessors. They breed with the females, feed on prey caught by those females, and defend the pride's territory. After about three years they in turn are expelled by the arrival of a new group of younger and stronger males who dispossess them of their pride, their area, their meal ticket and sometimes their life.

Very social animals

Lions are very social animals in many ways. The females in a pride tend to be synchronised with one another in when they come into heat; during that period, which lasts for about three days, they mate on average every fifteen minutes. In spite of such sexual energy, though, most of their mating periods are unsuccessful. Nonetheless the lionesses in a pride are roughly synchronised in when they give birth. They each bring their cubs to join the rest of the pride, and they suckle them communally. Thus in the course of an hour or so a cub may get milk from his mother, his grandmother, his aunt and his cousin. Lionesses rear their cubs collectively, which improves their chances, but nonetheless well over half the cubs die, succumbing to starvation, accidents, or the teeth of other large predators, including strange lions.

Lions hunt co-operatively: several females spread out and each stalks individually towards a prey animal. This improves their success rate, which is low. Most hunts fail, usually because the prey detects the lions before the latter are close enough for a short, fast rush. Almost all their prey animals can run even faster than lions, and can keep it up for much longer, so the only chance for a lion to make a kill is to get within a critical distance of the victim undetected. Natural selection has of course produced prey species which are alert, speedy and not easily caught.



A lion and lioness rest beside the remains of her kill in the shade of an acacia tree. She wears a radio-collar, which enabled her to be found and observed whenever necessary

A lioness chases away vultures coming to feed on the carcass of a wildebeest

Lions feed mainly on zebra and wildebeest, often glutting themselves when the Serengeti's huge herds of these species are migrating through their territory, and having a lean time when they can prey only on the much less abundant resident species—buffalo, impala, warthog, and hartebeest. To feed on different prey species and in different areas requires a flexibility in the strategies lions use, both in moving around their area in search of prey and in the tactics used in hunting it once found. One of the Bygotts' tasks is to study this adaptability. By radio-tracking lions and by observing them continuously for several days and nights over full-moon periods, and by following prides which live in different habitats, they hope to determine some of the ways in which habitat, food distribution, hunting behaviour and social organisation interact.

The Bygotts are also studying an apparent increase in lion numbers. Over the past few years, the dry seasons have been less dry, and as a result of the greater availability of grass the numbers of most lion prey species has shot up. It begins to look as though the lion numbers have also increased, although more slowly, not so much by an increase in the size of the prides, as through the occupation by new prides of areas which were previously uninhabited by lions. To document these changes, and to know where each lion has come from, requires the lion-observers to be able to recognise literally hundreds of different individual lions, which is possible to do with the help of photographs, perseverance and identity cards.

The value of the study can be assessed at a variety of different levels. As social carnivores, lions are adapted to an environment and a way of life similar to that which another social carnivore—early man—had to deal with at one stage in his evolution a couple of million years ago; his experience at that time may have played a part in shaping his behaviour and the rules of his society, so an understanding of lion social organisation may well help us toward a better understanding of our own.

The conservation of wildlife areas is generally accepted as vital for future generations, as well as providing a major source of revenue to underdeveloped countries. To conserve as superb an area as the Serengeti must be close to the top of the priority list. Yet with human pressures from outside and ecological pressures from within, it is no longer possible to conserve an area solely by drawing lines round it on a map and preventing human depredations. We may well need to manage wildlife areas, and we must know whether management is really needed, how it should be carried out, and what other effects it might have. To do this we must understand the intricacies of the innumerable ways in which the lives of predators and prey, and grass and grazers, are inter-connected. Lion studies in the Serengeti are contributing towards the clarifying of this fascinating, complex and important subject.

Energy Research Support Unit

An Energy Research Support Unit (ERSU) has been set up at the Rutherford Laboratory.

The unit will offer support to universities and polytechnics by assisting with (i) the design and development of equipment and instrumentation; (ii) computing and data handling and (iii) measurements and tests. It will provide additional laboratory facilities, seconding staff where appropriate. There will be an information service to foster the exchange of ideas between researchers, and meetings, discussions and conferences will be held.

The new unit will use Rutherford's existing expertise and facilities to complement the energy research work being carried out in the universities and polytechnics. This part of the unit's activities covers additional development work to enable university projects to be carried over and adopted by industry. The unit will also help universities to undertake preliminary studies for the proposed Energy Research programmes.

ERSU is already collaborating on a project involving four universities investigating a proposed waste energy recovery system in which a high-speed turbine, running off heavy vapour (rather than steam) drives a high speed generator. Possible applications are stand-alone generators combined heat-and-power sources and production of electricity from waste heat. The final test programme would be undertaken at Rutherford.

Several research groups involved in energy research in buildings are seeking assistance with instrumentation and data handling. One group is concerned with energy conservation problems in a local school; another is investigating the effects of different levels of insulation in houses and the year-round efficiency of domestic heating boilers.

ERSU has also been asked to carry out the engineering design and to arrange for the manufacture of a windmill for the Autonomous House project being carried out at Cambridge University by Alexander Pike and his team.

Norman Lipman will be in charge of the unit, which will be part of the RL's Instrumentation Division.

Council Commentary

September 1976 to February 1977

Council's September Conference
A week-end conference of Council members and Board representatives was held at Gonville and Caius College, Cambridge in September 1976. The Conference discussed follow-up to the Richards Report on Academic-Industrial Collaboration in Engineering Research, the second report of the Polytechnics Committee and future SRC policy for postgraduate training. The main conclusions of the Conference were endorsed by the Council in October.

Finance
(i) *Moratorium on Research Grants*
In October, the Council noted with concern the increasing costs due to depreciation of sterling of UK subscriptions to international scientific organisations, eg CERN, met from the SRC budget. At the time there was the danger that SRC expenditure in financial year 1976-77 would exceed the funds available since there was uncertainty as to whether the Government would provide the additional funds required to meet exchange-rate variations. As a result the Council decided to implement restrictions on commitments in SRC Establishments for 1977/8 and introduced a moratorium on the announcement of approved research grants. SRC has since received compensation for exchange-rate variations in 1976/77 and the Council agreed that the moratorium should be lifted from 1 February 1977.

(ii) *Estimates 1977/78*
In November, the Council approved a provisional 1977/78 Estimate submission which has now been updated to £138.0M at 1977/78 prices. This figure includes additional earmarked funds for the increased cost of fees for postgraduate studentships and for dispersal and it allows for reduction of about £1M imposed on the SRC budget as part of the December reduction in public expenditure. The "cash-limits" procedure applies to this figure as was the case in 1976/77.

(iii) *Forward Look Guidelines*
In December the Council agreed the financial guidelines to be used by Boards in preparing the 1978/79-1982/83 Forward Look. It was then expected that SRC resources would be reduced by about 2.7% a year in real terms over the period; however the recently published public expenditure survey implies an effective rate of decline of about 2% a year. Council will complete its Forward Look in April 1977, for submission to the Advisory Board for the Research Councils.

Spallation Neutron Source (SNS)
In December, Council considered the scientific case for the conversion of Nimrod to provide a machine and target station for a Spallation Neutron Source at the Rutherford Laboratory at a capital cost not exceeding £7.6M at January 1976 prices. The proposal is to construct a high-intensity facility designed for thermal neutron scattering, based on the use of a proton-synchrotron to generate very intense neutron pulses from the spallation source. Such a source could be of considerable value to a wide range of scientists and would be complementary to the high-flux neutron facilities at the ILL at Grenoble. The Council approved the proposal in principle but wished to consider further the manpower and financial implications of the project as part of its Forward Look exercise, before giving final approval.

Postgraduate Training
(i) *Postgraduate Awards, 1976*
The Council had planned to award 3300 studentships in 1976, of which at least 310 were to be CASE awards. In the event, the demand for awards particularly for CASE, greatly exceeded the expectations and with government approval the SRC provided nearly 3400 studentships in 1976 of which 553 were CASE awards. The Council regretted that SRC was obliged to reject about 750 qualified candidates for SRC studentships in 1976.

(ii) *Policy Statement on Postgraduate Training and Plans for 1977*
Following the September Conference, the Council in December approved its statement of policy on the support of postgraduate training and its plans for studentships in 1977; this has since been published in the SRC Bulletin (February 1977). In 1977 3400 studentships will be made available of which at least 600 will be CASE awards.

International Organisations
Subscriptions to international organisations take a large part of the SRC's budget and in November and December the Council considered reports on all the organisations concerned. The three largest organisations are CERN, the European Space Agency (ESA) and the Institut Laue-Langevin (ILL) and the Council agreed that where possible it should seek a reduction in the subscription payable to CERN and ESA. The Council also considered reports on the Anglo-Australian Telescope, the European Incoherent Scatter Facility (EISCAT), the South African Astronomical Observatory (SAAO) and the Institut des Hautes Études Scientifiques and endorsed the scale of current SRC activity in these organisations.

Reports from the Select Committee on Science and Technology
(i) *University-Industry Relations*
In December the Council considered a request from DES for comments on the Select Committee's report on university-industry relations. A number of the recommendations in the report related to SRC and covered postgraduate training, academic-industrial collaboration in research, and universities and the national need.

The Council agreed its comments on the report in January; these have now been submitted to DES and will be taken account of in the Government reply.

(ii) *Advanced Ground Transport*
The Council has also considered a further report from the Select Committee on Advanced Ground Transport which remained critical of the earlier SRC decision to reject a proposal from a consortium of universities to use the facilities left at Earith when Tracked Hovercraft Ltd was closed down. Council's comments will be incorporated in the Government reply.

Energy Research
In November Council following the recommendations of the report of the Energy Round Table agreed to establish an Energy Research Support Unit (ERSU) at the Rutherford Laboratory, under the control of Energy Proposals Committee. This unit will provide technical and other assistance to university groups engaged in energy-related research, will assist the Energy Proposals Committee as needed and will provide the secretariats for the Committee and the Energy Round Table. The Council approving inclusion of £407K (at 1976 prices) in the 1977/78 Estimates for the Energy Proposals Committee which will provide for research grants and for support of the ERSU. (See page 3.)

Working Group on Collaborative Research
Arising from the discussions on the Richards Report at the Cambridge Conference, the Council approved in February the membership and the terms of reference of the Working Group on Collaborative Research, which will examine the extent to which and through what machinery the Council should support collaborative research between a university/polytechnic and an outside organisation engaged in the provision of goods and/or services. The Working Group will be chaired by Professor W E J Farvis (Edinburgh University).

The Report of the Teaching Company Working Party
The Council in February discussed the Report of the Working Party which had followed up an initial joint SRC/Department of Industry report on "The Teaching Company" by implementing a small number of pilot schemes. The Working Party had recommended the gradual expansion of the scheme over a five year period with joint funding by SRC/DoI and proposed that the budget should rise to £2M in 1982/83. The concept of the scheme is that a team of company staff, permanent academic staff and graduates on two or three year appointments (industrial associates) plan and carry through advances in the manufacturing methods of selected firms called Teaching Companies. The graduates undergo advanced training both through carrying out the research projects and also through carefully structured courses of instruction at academic institutions.

The Council agreed that the Teaching Company scheme should be developed as a special initiative for a five year period within the financial limits proposed by the Working Party. It also agreed that a Director/Coordinator and an SRC/DoI Management Committee should be appointed for the scheme.

Grants
(i) *ASR*
The Council has approved grants of up to £213K to Professor Willmore and Dr Simnett (Birmingham University) for work involved in provision of a hard X-ray imaging spectrometer for operation on the NASA Solar Maximum Mission Satellite, and up to

£180K to Professor Houghton (Oxford University) for Satellite Data Handling Analysis for experiments on Nimbus G and Pioneering Venus Orbiter Satellites.

(ii) *Engineering*
A package of five grants totalling £647K has been approved for a series of research programmes in Marine Technology involving Glasgow/Strathclyde Universities, Heriot-Watt University and London University (Imperial College and University College).

The Council has also approved grants totalling £205K under the Polymer Engineering Programme to Imperial College, Liverpool University and Manchester Polytechnic for a combined programme on the fracture of plastic pipes.

(iii) *Nuclear Physics*
The Council has approved up to £1.043M for grants to the Film Analysis Centres at Birmingham, Glasgow, Liverpool, Imperial College and Oxford.

Computer Networks

Two computer network units have been set up at the Rutherford Lab.

The Network Unit of the Computer Board and Research Councils has been set up to look into the short-term development of communications links between computers at universities and Research Council establishments throughout the country. Although it operates from the Rutherford Lab, the unit, called the Network Unit for short, is not part of the SRC. It is funded jointly by the Computer Board for Universities and by the SRC on behalf of all the Research Councils.

Director of the unit is Mervyn Williams, formerly Director of the Post Office's Telecommunications Development Department. Mr Williams has been a member of the SRC Computing Science Committee, the Department of Industry's Computers, Systems and Electronics Requirements Board and the Computer Agency Council.

Networks between university establishments and Research Council Institutes have been formed mainly within geographical regions. There are also United Kingdom wide connections to the three large computing centres in the Universities of Manchester and London and the Rutherford Lab. The aim of the unit is to lay a foundation for rationalising and extending existing networks in a form that will be compatible with one another and with national developments being undertaken by the Post Office and the Department of Industry.

The other unit is the Secretariat of the Department of Industry's National Committee on Computer Networks. Chaired by the ex-director of the former Atlas Lab—Jack Howlett, this committee has been set up to look into national computer network requirements in the 1980's. The Secretariat at Rutherford is headed by Donald Audsley, formerly head of the Technical Operations Division of the Space Documentation Service of the European Space Agency.

Recently the NCCN Secretariat has been involved in contacting computer mainframe, mini-computer and terminal manufacturers to stress the importance of formulating and adhering to standards in data communications. The object of the exercise which has involved contacting some 140 UK manufacturers and more than 60 editors of national and international computer and communications journals, is to ensure that the problems of setting up networks with computers of different makes are minimised

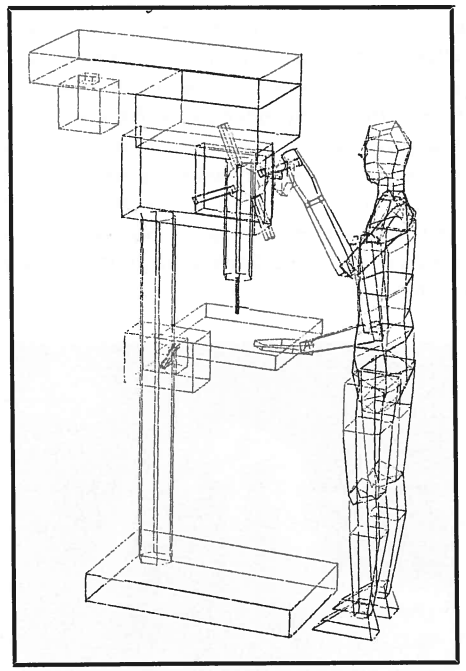
Computer aided work place and work task design

A team of engineers at Nottingham University under the direction of Mr M C Bonney is studying the computer aided design of work places and work tasks with the aid of a £112,000 award from the Council's Manufacturing Technology Committee. The particular emphasis of the project is to assist designers when human factors are important for reasons of comfort, safety, productivity and economics. As such, the work is a natural development from a project known as SAMMIE—System for Aiding Man-Machine Interaction Evaluation.

The prototype SAMMIE has been used in preliminary studies concerned with hospital and dental equipment layout, cockpits and cabins of vehicles. Through these early studies, a good working association has been built up with several design groups, and it is intended to carry out more extensive work in some of these areas.

SAMMIE provides a method of representing proposed designs in three-dimensional form on a visual display screen linked to a computer. The dimensions and positioning of the component parts of the workplace may be changed easily by the designer working in conjunction with the computer. The evaluation of ergonomic criteria is assisted by the use of a computerised man model which can be displayed simultaneously with the workplace model. The man model is capable of representing the physical attributes of particular operators, or of ranges of operators drawn from the potential user population. In this way an anthropometric evaluation can be made to establish the range of operators that can perform the required task in the proposed workspace. Assessments include whether the operator can fit into the workspace, whether he can reach controls, and assessments of comfort, sight lines, movement patterns and strength capabilities. Any necessary design changes made may be quickly re-analysed.

The complete system is intended to provide designers with a quick and easy method of assessing human factors criteria at any stage in the design process. Its use in the early stages of a design could ensure that equipment is designed with its eventual operator in mind, and that human factors are considered in a complementary rather than supplementary way with other important design criteria such as production methods and economics.



Drilling machine and operator

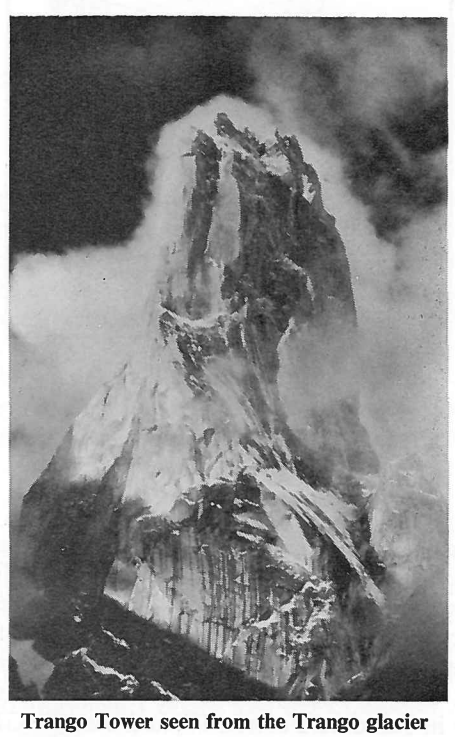
As a result of the award, interactive computer graphics equipment was installed in Nottingham University's Department of Production Engineering and Production Management in the Spring of 1975. This equipment comprises a Prime 300 mini computer with a refresh display terminal. Software is written mainly in Standard Fortran IV, and uses the GINO-F graphics software developed by the Computer Aided Design Centre, to facilitate implementation on other interactive graphics configurations.

The SAMMIE software, having been completely redesigned for implementation on the new hardware, is now soundly based and will provide a suitable vehicle for a range of applications. It is expected that the process of selecting relevant design areas and building application-specific sub systems will be the principal means by which SAMMIE is developed in the future.

Climbing Trango Tower

M HOWELLS

Malcolm Howells, who researches in the physics of solid surfaces and is a keen climber, relates his experiences last summer climbing Trango Tower, a 20,530 *ft peak of the Karakoram range in the Himalayas. In* 1974 *he made a two month overland trip to the Himalayas and described this climbing holiday in an earlier edition of Quest* (*see vol* 8 *no* 3). *In mid-March Malcolm left Daresbury Laboratory to join the Department of Materials Science in the State University of New York at Stony Brook.*



Trango Tower seen from the Trango glacier

Martin Boysen hung on his jumars* and looked up. The crack was vertical to begin with and overhanging further up. It looked just the same as last year, in fact there was no possible way it could have become any easier.

Twelve months earlier the crack had nearly killed him, made him part of the Trango Tower forever. He had wedged his knee in the crack—a normal enough thing for a climber to do—and then found it was stuck solid. After hours of struggling it was still there and beginning to swell. The prospects were obvious and terrifying. Mo Anthoine stood below holding the rope, powerless to help, while Martin worked, straining in the awkward position, panting and gasping because of the altitude. Using a piton,** which is about as sharp as a cake knife, he eventually managed to chew through his climbing breeches until the knee part could be pulled away. At last the knee popped out. There had not been enough supplies for any further attempts and the party had retreated.

An elemental battle

Now Martin was back ready to settle the score and the recollections of last year were not going to make it any easier. He could easily have let one of the rest of us try it. He could have drilled bolt holes up it, but he had not come all the way to the Himalayas to evade the problem. He thinks of climbing as having to do with men, and their ability, and strength of will, measured against the problems of the mountain, as an elemental battle not an engineering problem. He wanted to climb it, and the rest of us hung back and let him get on with it.

The crack was five inches wide and this time we brought pegs that fitted. We simply brought them the same width as Martin's knee. It was a pity we only had two. He took these and the rest of the paraphenalia and set off.

Again Mo was holding the rope—no doubt adding to the sense of déjà vu. He made steady progress for 100 ft, passed the knee jam using the last peg, and carried on. But the difficulties did not relent, and worse, it was essential to use knee jamming to make progress. The climbing was strenuous and he was gasping the thin air repeatedly after every move. It was clear that he would have to free climb the last section. He steeled himself, and with every muscle straining and lungs bursting, made it to the top of the crack. Triumph.

* rachet clamps used in pairs to climb fixed ropes.

** steel peg which can be hammered into rock cracks.

The Braldu River. Most of the approach march was along the north bank of this river

These events took place about halfway up the main face of the Trango Tower, and they represented our first steps into the unknown territory beyond the previous year's high point. The advantage of prior knowledge however, did not mean that we got to Martin's crack without any problems.

The Karakoram range is a desert area. Nothing grows and no-one can live there except in places where streams run down from the high snows. Travelling through this terrain is hard work and very expensive. Although portering is part of local life, it is gruelling work and the prices demanded are high. Balti porters get a daily rate similar to a professor in Karachi University. This means that the major problem of organising a Karakoram expedition is raising the money to pay the porters. The Mount Everest Foundation, The British Mountaineering Council and Barclays Bank gave us generous help, but most of us will still be paying off expedition debts for a long time to come. It is something you learn to live with or you don't go; a matter of priority.

Eight day journey

To get to Trango Tower you go to Rawalpindi in Central Pakistan and fly north to Skardu, the capital village of Baltistan. A 50 mile jeep ride takes you to Dusso and from there it is 75 miles of hard, dry walking. It took us (with our porters) eight days.

A rock climber's dream

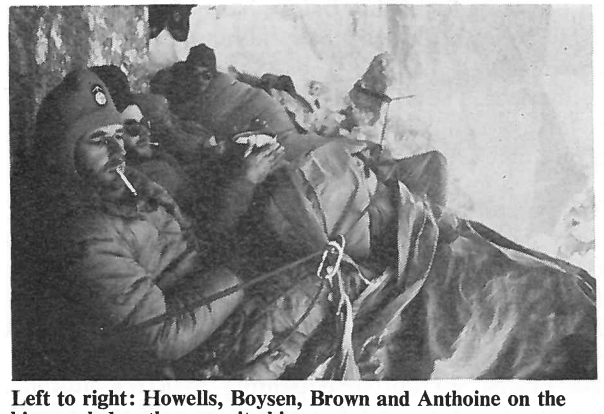
We were rewarded with our first sight of the tower and it really did make all the effort seem worthwhile. I was immensely relieved that this mountain that I had never seen but had come 5000 miles to climb was so obviously worth it. It was some kind of a freak shape, a great pinnacle on a Himalayan scale, a rock climber's dream. But we stand gazing at it from the Trango Glacier 3000 ft below the bottom, so there follows another punishing period of load carrying to establish a camp at the foot of the face. This is sheltered by a huge boulder about the size of the average cinema and becomes known as the boulder camp. From here it is an hour to the foot of the ramp which slants up/right-wards to a small snow field in the centre of the face.

Now the climbing begins in earnest. The ramp is a mixture of easy angled snow pitches with steep steps in between. These are rock with a layer of ice on top. We operate in two teams: Mo Anthoine and Joe Brown; Martin Boysen and myself. The two cameramen, Tony Riley and Jim Curran, keep up with us filming. Some of the fixed ropes from last year are still there, some are buried in ice. None can be used except with extreme caution. If a fixed rope breaks there is no second line of defence. You go right to the bottom.

After three days we have the ramp fix-roped again and have dug out a flat space on the snowfield big enough to squeeze in two small tents. They are sagging and distorted down to half their normal size, and everything gets wet, but we are safe from falling stones.

Intolerable weather

Above the snowfield the face is more or less vertical right to the top. Martin and I start work on it the next day, leading pitches in turn—sometimes the old fixed rope is helpful, other times it is totally buried. The next day Mo and Joe push on further. They are two pitches below Martin's crack when the weather, which had been breaking all day, suddenly becomes intolerable. It begins to snow heavily and they retreat down the ropes to the snowfield. There are now five of us here and we spend a cramped night with all the vital things like our spoons and mugs outside getting buried. Snow piles up round the tents and in the morning we have a real mess to contend with. The mountain is plastered in new snow which periodically drops off in big heaps, and it is still snowing heavily.



Left to right: Howells, Boysen, Brown and Anthoine on the bivouac below the summit chimneys

Brown jumaring up the summit chimneys looking up at the overhanging cracks above which he is about to lead

We dig out what we can find of our stuff and rush down the ramp to the safety of the boulder, collect a few things, then down to the glacier.

A safe bivouac

The bad weather keeps us waiting there for three days. The rest is much needed and when the time comes to go back up we are refreshed and fit. We have seen ledges above Martin's crack through the telescope and we decide to gamble on getting up the crack and finding a safe bivouac there on the first day. We will then be well placed for an attack on the summit chimneys. Mo and Martin start early and jumar up to the crack. They climb it and another pitch above and reach the ledges. They are fairly good. There is an overhang for shelter but we have to sleep on snow. Tony follows the lead pair, filming, and Joe and I come behind hauling a bag of food and bivouac equipment. The ledge is just big enough to allow four to lie down and is surrounded by a great deal of space: a tiny perch above the void.

The summit chimneys

Next morning I attack the first pitch of the summit chimneys. We are all hoping they will give a soft route to the top, but I soon find they do not. The climbing is steep and strenuous with ice clogging the cracks at the back of the chimney. I do free moves, peg moves, axe moves, all the time panting with the altitude. Finally it is done and Joe comes up and goes ahead. Another mixed pitch overhanging nearly all the way. He gets into a wide crack and has to keep leap-frogging the two pegs we have that fit. Finally it opens to a V shape that will not take the pegs. He makes a desperate free move to a hand jam and places the next peg hanging from that. Then it is me again, mostly free climbing once the holds are dug out of the snow, round a corner to a ledge and horror of horrors: an impasse. It looks impossible above. Either a chimney about a foot wide and a foot deep, full of hard water ice, or an overhanging corner, black with verglas. Depressed we both go down and give a pessimistic report to the others.

The black corner

We sleep fitfully and next morning Mo attacks the black corner. It is not impossible but it takes him three hours of hard pegging. Martin comes up and takes over. They are hoping like hell that the difficulties relent because the weather has broken again and there is no more food at the bivouac. This is probably our last chance. It soon becomes clear that far from relenting, the difficulties are redoubling.

Martin is in a deceptively steep and long V chimney full of ice. He free climbs to start with then takes to pegs when the effort becomes too much for the amount of air he can breathe. He runs out of pegs and goes free again. Next time he can't get enough breath; he falls off. The rope holds him and more pegs are sent up. The tools of war: he fights it again. Again he falls off. A setback, but his willpower is not quenched. He goes up again, and once more at the limit of his strength manages to pull out a bit extra and does it. Another three hour pitch. By now it is late afternoon and there is not much time but at last the mountain relents. The angle eases and they race up three more easier pitches to the top.

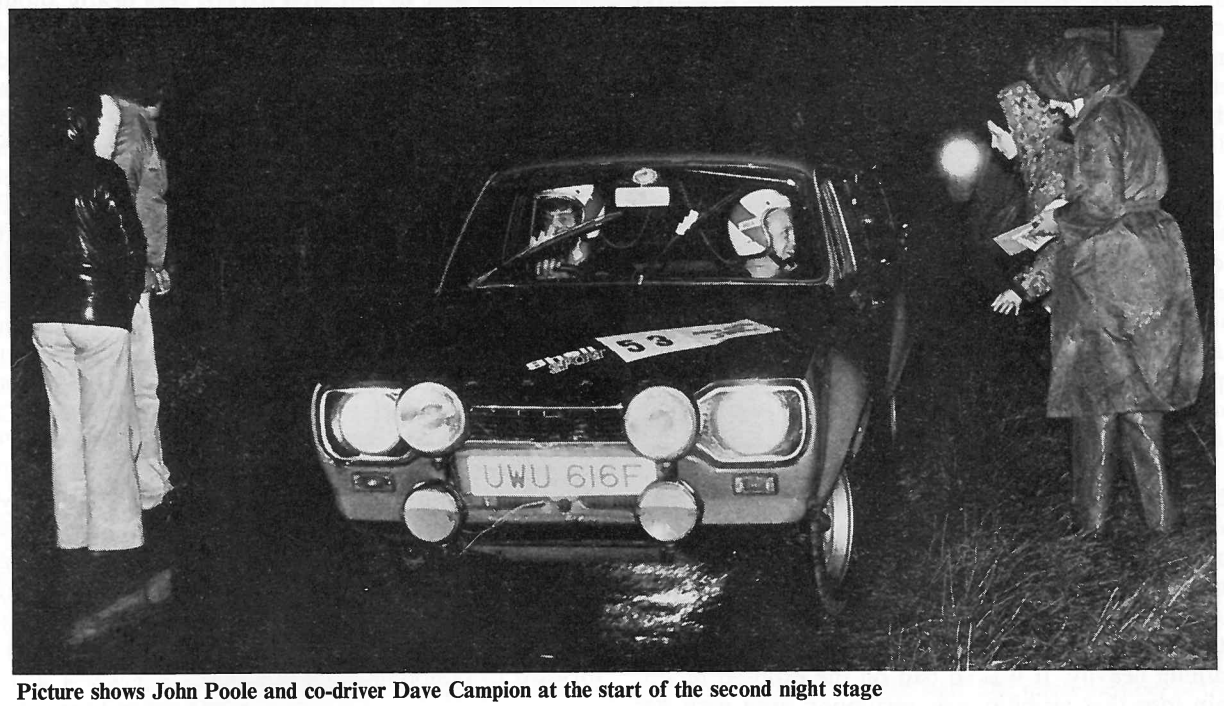
The summit

Suddenly all the straining, panting, shouting, worrying, is over. Just a clear, still evening, a blue sky and range after range of mountains as far as the eye can see. They think their thoughts and enjoy the moment. For Martin it has been something of a blood feud and now the summit is there at his feet. They go back down to Tony who has been filming from just below the summit. There is a lot of smiling and joking as the tension relaxes and they go down to the bivouac. More laughter and stories. There is no food, but no one minds.

Next morning Joe and I set off early to retrace the route to the top. The weather is still getting worse and it is snowing, but we expect no problems and find none. We get our summit although not the view and then go down. Everybody gets down to the glacier by the afternoon and after that it really is all over.

Motoring round Mull

J POOLE



Picture shows John Poole and co-driver Dave Campion at the start of the second night stage

Driving 200 miles flat out on narrow mountain roads through a wet October night may not be everyone's idea of fun, but 120 crews at the start of the 1976 Tour of Mull Rally were looking forward to just that. One year ago Dave Campion, a member of the same motor club as myself, decided to convert his 1969 Escort 1100 to an all-singing, all-dancing rally car and he asked me to navigate for him on the Tour of Mull. Major surgery was required on the car, so it was stripped down to the bare shell and a lot of new metal was grafted on.

After much hard work and a good deal of help from our friends the car was completed. Rather than take an untried car to the Isle of Mull we competed in a small rally on the military ranges around Catterick. Fortunately all worked well and nothing fell off and with some minor modifications we were ready to go.

Social event

The annual Tour of Mull is unique because it is as much a social event as a rally. Many people make a holiday of it and in fact we took our families and some friends and spent a fortnight there. During the week before the rally we were finishing off the car and preparing ourselves for the event.

'Pace notes'

In a rally, unlike a race, one competes against the clock; a target time is set for each section or special stage and there are penalties for exceeding it. The Tour of Mull takes place partly on the public roads and partly on the loose-surfaced forestry roads. The route is kept secret (as in all rallies) but because Mull is a fairly small island and there are only a limited number of public roads which can be used, most people devote a few days to making 'pace notes'. My notes enabled me to tell Dave in very great detail which way the road went. For example, the notes—

brow flat, 50 fast L, 100 sweep R, care brow 90L, and 90R,

when read to Dave would mean: over the next blind brow keep the accelerator flat on the floor, then in 50 metres there is a fast left bend, in 100 metres a sweeping bend to the right, followed by a blind brow over which he should drive carefully because it leads immediately into 90° left and 90° right bends.

The great day

Very soon the great day was upon us and at 15.53 on the Saturday afternoon we were on the start line in the main street of Tobermory. As we sat there waiting to go, the tension built up and I am sure that we had enough adrenalin to keep us going for days. Leaving the start was quite a relief but the competitive motoring didn't start until 10 miles down the road.

At the start of the first special stage neither of us spoke as we went through the rituals of donning crash helmets, checking watches, adjusting seat belts and so on. I was the first to speak as I repeated the start marshal's count down over our intercom. (It is so noisy in the car that we needed an intercom to hear each other.) At last, in a crescendo of noise and a spray of mud from the spinning wheels, we were off, our nervousness gone. We could now concentrate on accurate driving and putting up a reasonable time.

The second special stage followed immediately and this time we were looking forward to it. There was only one more special stage in the afternoon section which gave us a few hours in which to rest before the real meat of the event, the night section. The sunny afternoon gave way to a dull evening and by the time we started the first 7 mile road section at 23.23 it was raining heavily. It was so bad on the exposed mountain tops that visibility was very poor, even with 300 watts of quartz-iodine lighting up front.

The road used for the second of the night stages is one of the longest continuous stretches of road to be used competitively in Great Britain. The photograph, left, shows us about to start the twenty-three miles of tortuous road, with precipices into the sea on one side and cliffs on the other. We covered this road in just over 30 minutes which was still fully 3 minutes slower than the fastest car. At the end of this I was losing my voice and Dave was in danger of dissolving in a pool of perspiration. There was no respite however, as the next section was only a mile or so away and we had another 30 miles to do before we could rest briefly at the petrol halt.

The pressure was maintained throughout the night during what was effectively two circuits of the island (200 miles) interspersed with the 20 miles of forestry stages. There was a sting in the tail of the event as we had to tackle the 23 mile section for a third time, but on this occasion in the opposite direction, then a demanding 7 mile section with many hairpins to the finish.

Final sections

Whilst driving the final sections we could see that there were not going to be very many finishers as the route was littered with broken down and crashed rally cars. At one place I recall there was a car which had gone straight on at a 90° left, and parked very neatly about 6 inches away from it was another which had arrived afterwards—on its roof! Although there were a good many crashes there were no injuries apart from minor cuts and bruises. Though this may seem surprising it is not unusual in rallying because one is firmly strapped by a full-harness within a substantial roll cage and is surrounded by fire-proof bulkheads.

We learnt later in the morning that we had finished thirty-first from the 120 starters (56 finished) which was quite pleasing since neither of us had done a big rally for over two years. We had a slight excursion into the scenery in one of the forests on the night section which cost us many minutes—but that is what rallying is all about!

The presentation

At the prize presentation in the evening the rally organisers received a vote of thanks from the islanders for bringing the rally to the island and for providing such an enjoyable event for everyone. This was typical of the goodwill on the island towards the rally and it makes a very pleasant atmosphere which I look forward to sampling again this year.

John Poole works in the Theory and Parameters Section of the SRS Group at Daresbury Laboratory. He has been chairman of the Knutsford and District Motor Club for 3 years and has been involved with motor sport since moving to Daresbury in 1968.

Newsfront

New Year Honours

Our congratulations to Professor James Baddiley and Dr J Eric Small who were made Knight Bachelor; Professor F R Bradbury and Mr P T Dunican who received the CBE; Mr G A Harding who was awarded an OBE; Mr K E Welch who was made an MBE and Mrs D M Haas and Mr R D Prince who were awarded the BEM.

Professor James Baddiley is a member of the Biological Sciences Committee.

Dr J Eric Small is a member of the Advisory Board for the Research Councils.

Professor F R Bradbury is a former member of the Joint SRC/SSRC Committee.

Mr P T Dunican is a former member of the Transport and Civil Engineering Committee.

Mr G A Harding is a Senior Principal Scientific Officer at the Royal Greenwich Observatory.

Mr K E Welch is a Higher Executive Officer at London Office.

Mrs D M Haas is an Assistant Chief Photoprinter at London Office.

Mr R D Prince is a Skilled Labourer at the Appleton Laboratory.

Mr Ness (left), an experimental worker at the Daresbury Laboratory receives a cheque for £250 from the Deputy Director Dr Voss (see below left)

Suggestions award

Mr G K Ness, an experimental worker in the Engineering Division at Daresbury, has recently received £250, the largest sum yet at the laboratory under the Suggestion Awards Scheme. His suggestion concerned the cleaning and polishing of 29 NSF tandem bulkhead plates of 1.764 m diameter.

These bulkhead plates had been manufactured from aluminium alloy and in the delivered state were covered with a film of aluminium oxide. Mr Ness suggested that instead of using standard polishing or pickling methods to remove the oxide film, the plates could be laid flat and polished with the aid of a standard commercial floor polishing machine. The suggestion was tried and the results showed that the method was quick, easy, and produced a finish of a high quality.

In presenting the cheque, Dr R G P Voss, Deputy Director and Head of the NSF Division, congratulated Mr Ness upon his award and said that his suggestion had resulted in the polishing work being carried out not only at a much reduced cost, but also with the minimum of disruption to this aspect of the NSF construction programme.

Miss Joy Penny

Miss C J A (Joy) Penny retired from RGO in October 1976. She had worked in the Time Department, apart from one short break, since joining the Observatory at the Edinburgh outstation in 1944. She was perhaps best known both at the RGO and throughout the Council as a formidable fighter for the rights of the staff. She was a member of the Staff Side of the RGO Whitley Committee for over 25 years and a member of the Staff Side of the SRC Whitley Council since its formation in 1965. On 24 February Miss Penny was presented with an IPCS Special Award for Long Service at its Annual Delegate Conference of the SRC Branch in London.

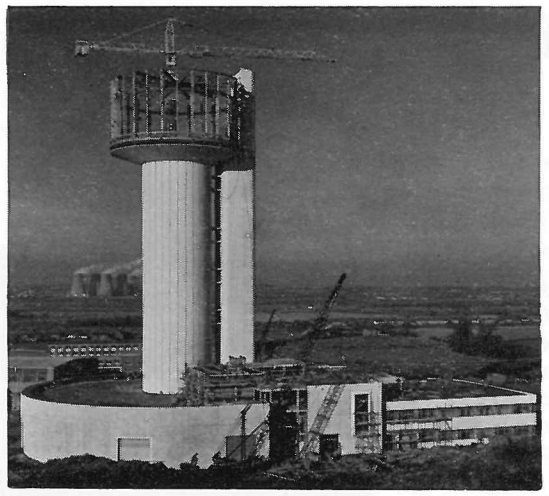
New Secretary for MRC

Dr J L Gowans CBE FRCP FRS has been appointed Secretary to the Medical Research Council. He succeeds Sir John Gray FRS who retired at the end of March.

Professor Gowans was formerly Royal Society Research Professor in the Sir William Dunn School of Pathology, University of Oxford, and also Honorary Director of the MRC Cellular Immunology Unit.

Progress on the NSF

The photograph (right) shows the progress at the end of December on the Nuclear Structure Facility (NSF) under construction at Daresbury Laboratory. The semicircular building at the foot of the circular tower is divided into three experimental areas, the first of which was finally handed over in October for use by the Laboratory. Completion of the steelwork for the ion source room at the top of the tower will be followed by the installation of the roof and wall panels. Delays on the main building, seen on the right foreground, and on the experimental areas, have hampered the construction and installation of plant and equipment for the tandem.



Picture (taken in December last year) shows the progress made on the Nuclear Structure Facility (NSF) at Daresbury

Inside the circular tower the pressure vessel has been hydraulically tested and its surface cleaned and primed. Painting of its final coat began in January. Assembly of modules of the insulating stack has started in the completed experimental area and, following consistently good performance of submodules of the accelerating tube, testing of a full tube module is now underway.

In preparation for the experiments to be carried out using beams from the 30 MV tandem, approval has been given by the NSF Management Committee for a data acquisition system which will be based on GEC 4070 computers. Also an NSF Programme Panel, under the chairmanship of Professor G C Morrison of the University of Birmingham, has been set up. It will shortly be calling for proposals for the initial experiments.

Picture shows John West, an atomic spectroscopist at Daresbury Laboratory with his 1929 Crossley Sportsman Coachbuilt saloon

Pictured above with his 1929 Crossley Sportsman Coachbuilt Saloon is John West, an atomic spectroscopist at Daresbury Laboratory. The car is immaculate to look at, which would suggest a history of care and attention, but in fact it surfaced on a scrap heap in Leicester in 1959 when a casual visitor bought it and resold it for spare parts for £20. Its purchaser realised that it was too good to scrap, got the engine going and resold it in 1962 to John West and A N Other for £30. When A N Other went to spend a year in Germany, John became the sole owner and has looked after it lovingly ever since. The bodywork, interior and engine are virtually as made.

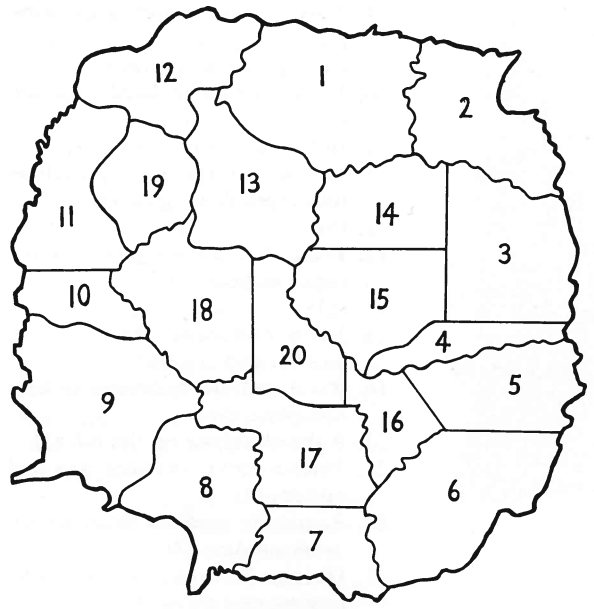
The 2-litre, 6-cylinder car was usually made as a 4-door saloon, and only six were made to the Sportsman design. John runs the car for four months every summer and is a regular participant in the Manchester to Blackpool rally.

Winkfield's new director

Frank Swales, formerly of Rutherford's Nimrod Division, has taken over the post of Station Director of the Winkfield Tracking Station of the Appleton Laboratory.

The Winkfield station is a joint venture between SRC and NASA (the United States National Aeronautics and Space Agency). It is one of twelve such stations around the world linked to NASA which coordinates all the work.

Winkfield operates around the clock and will usually cover 25 passes of unmanned satellites launched by NASA and ESA (European Space Agency) in a 24-hour period. In addition to the normal work of data collection, position determination control by command, the Winkfield station is involved with the design and construction of British satellites.



Nutcracker 23

NUTCRACKER 23

The King of Concilia had conquered the island of M'Shetwanda, and proposed to settle its twenty provinces (illustrated above, and numbered to spare readers their unpronounceable names) with colonists from the four tribes of his kingdom. Each tribe was to have five provinces. So warlike are the tribes, however, that the King was forced to rule that no tribe should have two adjacent provinces, so that no tribe could concentrate forces for an attack on a neighbour. The first four assignments were easy because of natural ties with local populations, and were soon announced—province 3 to the Asari, 7 to the Regeneni, 13 to the Escenci, and 16 to the N'Claure. Soon afterwards, however, one tribe was able to learn the assignment of another province, and immediately deduced the whole pattern. Which province?

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

Solution to Maxim 13

S	C	O	C	C	Y	X	T	E	D	I	U	M
T	A	U	T	E	E	X	O	T	I	C	M	I
A	N	T	H	R	A	X	T	H	R	O	B	S
C	A	R	E	E	R	X	E	N	O	N	I	U
C	L	E	M	A	R	X	V	I	T	A	L	S
A	S	I	A	L	E	X	I	C	O	N	I	E
T	E	N	T	T	E	X	T	U	R	E	C	S
O	S	W	I	R	L	X	R	A	Y	B	A	P
F	T	A	C	O	A	X	I	C	U	R	L	E
L	O	R	L	Y	N	X	F	I	N	A	L	E
E	N	D	O	W	O	X	I	D	I	S	E	D
S	I	L	O	F	O	X	E	S	O	K	A	Y
H	A	Y	M	A	N	X	D	Y	N	A	S	T

The winner was Mrs G Cullinane (State House) who wins a £2 record token.

London region soccer

London Office's five-a-side soccer 'A' team were back in action on 4 March playing in the second round of the London Region Civil Service Competition, with a place in the finals at stake. The team was: Steve Day, Howard Fardon, Paul Gilbert and Phil Osprey with newcomer Guy Read in goal.

Our first game was against the Registry of Friendly Societies 'A' team and after going two goals down in a shaky start we came back to win 4-3.

In the second game we lined up against old rivals Brixton DHSS 'A'. Paul was in unstoppable form scoring all five goals (including four from the half-way line) in our 5-3 victory.

Perhaps because we had already qualified for the finals, we lost some of our organisation and commitment, and an early goal—in our third game against Civil Aviation Authority 'A' team. We lost 2-1 but we had done enough to top our group and we went into Finals Night on Friday 15 April with Richard Weaver stepping in for Guy Read in goal.

Our first game against the Cabinet Office resulted in a 4-2 win with Day and Gilbert scoring the goals. Our second game was against Brixton DHSS 'B' and we won 2-1.

In the semi-final Paul gave us a 2-1 lead at half-time against St Stephen's Press but they countered strongly and we lost 2-3. We went down by the same score in the third place play off against DTI (HQ).

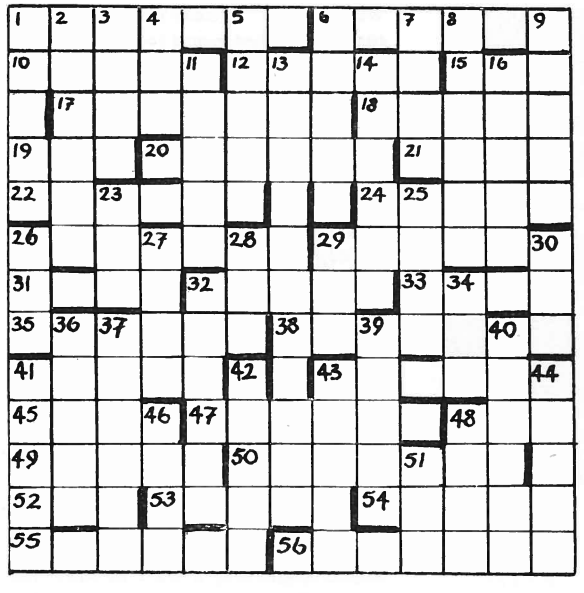
In the final St Stephen's Press beat CAA 'A' by 4-3. Although disappointed that we are not going forward to the National Championship in Birmingham in June fourth place from an entry of 93 teams is still an achievement!

Howard Fardon and Phil Osprey

Solution to Nutcracker 22

3	3	2	■	2	3	1	■	2	4	3
3	6	1	2	■	8	■	4	4	5	2
3	5	■	1	3	6	0	8	■	1	1
■	2	6	7	■	3	■	6	4	5	■
6	■	5	■	2	7	1	■	7	■	3
5	8	8	0	7	■	5	9	0	4	9
0	■	5	■	3	7	9	■	8	■	1
■	1	3	1	■	7	■	6	9	3	■
2	8	■	2	5	2	8	1	■	6	3
7	9	5	9	■	7	■	7	9	6	8
5	7	6	■	3	4	2	■	1	8	5

The winner was R Q Apsey (Rutherford) who wins a £2 book token.



MAXIM 14

MAXIM 14
The nine unclued words have something very much in common.

Clues

ACROSS
1. (7)
6. Groups of chaps ready for a row, e.g. this roughhouse (6)
10. Leers at a display of legs with nothing on (5)
12. Less likely to be dead in European river (5)
15. Woman first seen the day before (3)
17. Ditches bird that is initially satisfactory (7)
18. Enchantress makes father start nervously (5)
19. What's sometimes found in carburettors at front end of internal-combustion engines (3)
20. Good, clean French piece of millinery (6)
21. The mostly up-tight decades (4)
22. Sticks around Royal Society, but the villain's foiled again! (6)
24. A short space to press for result (5)
26. Nothing to add about the broken PSO—he lies low (7)
29. (6)
31. Accompanied by a joker—horrific! (4)
32. Joy is in the bathtub, lissome (5)
33. Transport network that's a product of 40 (4)
35. Tore madly about, very loud—such force! (6)
38. Removes bud. Goes AWOL (4, 3)
41. Idles when subject to order—the rule of the laboratory (5)
43. Type of jacket made by ravelling crochet? (6)
45. (4)
47. 100% storm-tossed in tree (6)
48. (3)
49. What's left to one in about a hundred (5)
50. Look out, mate! Here's junior manager (7)
52. Purpose of American — going towards Europe? (3)
53. Take casual type of this after his mistake (5)
54. Measure implicit in Mohammedan ceremonial (5)
55. (6)
56. Effect of electric discharge—in the end, hurt badly (7)

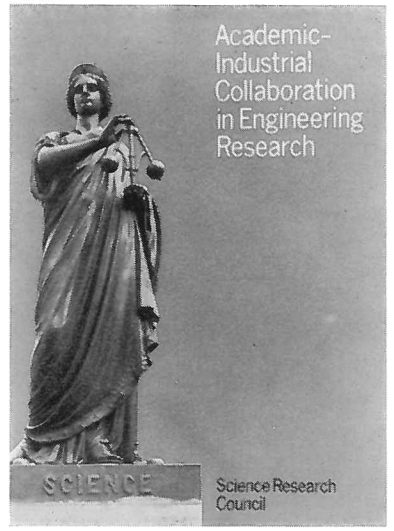
DOWN
1. Corridor I choose centres on architectural style (5)
2. Urge, with mixed drink, to get top chicken's achievement? (6)
3. Ulcer? Take out, repair, and see what we've got (4)
4. Fish brought up out of the wind (3)
5. Change: sonic change (5)
6. Ford's failure in Leeds election (5)
7. In Greek, it's *charakter* (4)
8. Drunk with rye, she's preaching unacceptable religion (6)
9. (5)
11. Fruit that *doesn't* give you the runs, we hear (5)
13. (11)
14. Steers erratically, the results of alcohol and acid (6)
16. Road with no beginning in time and place (5)
23. Rubbish tipped up the hill (3)
25. Pinches sailor between top and bottom (4)
26. Require to render a return in five working-days (3)
27. Having footwear poorly made, lacking rare earth (4)
28. Middle of July to end of August, a month ago (3)
29. Afterthought, one for a letter (3)
30. Held by sore footballer, when he's not looking (3)
32. Tree that's about right to be at end of gun-barrel (6)
34. It's the part of heroes to produce the next marine generation (3)
36. Self-centred love about shifting ice (5)
37. Where petrol goes back in barrel, lifeless (6)
39. River, blood-coloured, closely examined (5)
40. Currency unit and point, where comma would be used instead (6)
41. Start of melée with stoic wingers (Rugby Union) on top (5)
42. Not good fun—it's not suitable (5)
43. Start, and if you finish by day, make it an annual event (5)
44. Confess to monarch things belong to me (5)
46. What Yanks use instead of having tape in knots, kids (4)
48. (4)
51. (3)

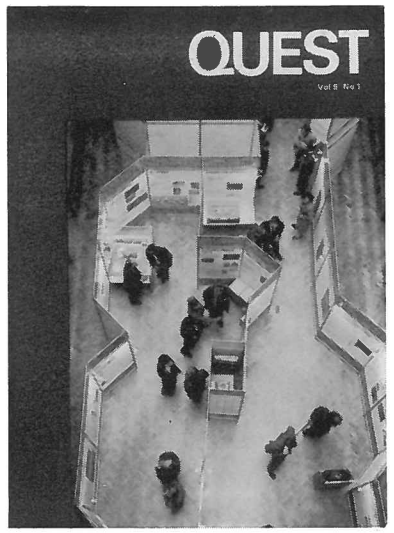
The prize will be awarded to the first correct entry drawn on 1 June. Please send your entry to the Editor 'Quest', Room 1532 at State House and state whether you would prefer a book or record token. The solution will appear in the next issue.

It all began with Caxton
Printing is indispensable to modern life. In one way or another, print is needed by everyone—business men, housewives, schoolchildren, shopkeepers, the government, bankers, musicians, passengers, hoteliers—in fact everybody you can think of. Thus, thousands of different kinds of printed matter are in use today.

It all began in October 1476 when William Caxton set up his printing press in Westminster. In October 1976 the Design Centre and the British Printing Industries Federation held an exhibition of modern print as part of the 500th anniversary celebrations.

Printing designers and printing technicians use their skills and techniques to ensure that each printed job is fashioned in the best way to carry out its purpose and three of the Council's publications (SRC Bulletin, Quest and a report 'Academic-Industrial Collaboration In Engineering Research' — see right) were among the 600 exhibits of good modern printing.



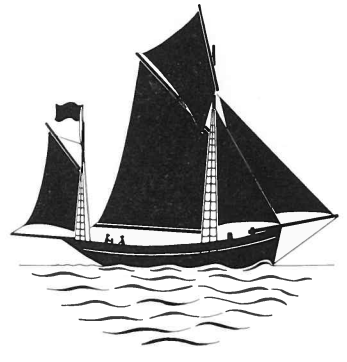


Director for Marine Technology
Mr A M Adye has been appointed Director of the Council's Marine Technology Programme. Mr Adye joins SRC on secondment from British Petroleum with which company he has had an active career in offshore operations, his most recent post being manager of the Abu Dhabi Marine Area project. He has also acted as Chairman of the Underwater Engineering Group of the Construction Industry Research and Information Association (CIRIA) for a period of three years from 1972 to 1976 and has been involved in the developing university activities in offshore engineering, for example as a member of the Board of the Institute of Offshore Engineering at Heriot-Watt University.

Finite elements
'Finite Elements'—the computer-generated film produced by Atlas Computing Division—has now sold more than 100 copies, to places as far afield as the US, Sweden, Norway, the Netherlands, Iraq, Iran, Switzerland, Canada, Brazil, Denmark, Australia, South Africa and New Zealand.

The film is now being marketed by Compeda, a new company formed by the National Research Development Corporation of London to handle a wide range of computer-produced material for engineers. Compeda will be assigning marketing rights for the film to specialist agents in the US and other countries, and is expected to arrange for foreign language soundtracks to help overseas sales.

Breton Tunnyman
Charles Booth (Rutherford Lab) who is a keen sailor in his spare time and holds a master navigator's certificate, acquired a converted Breton tunnyman 'Biche' last year and SRC staff were among those who sailed to many parts of France and to the Channel Islands. The ship is large,



70 feet in length with a 22-foot beam and 4,000 square feet of sail. Powerfully built of oak she is comfortably converted (two berth cabins, sprung mattresses, showers etc). She will operate throughout the season for voyages from weekends upwards to Biscay, Southern Ireland or wherever chosen, at a cost of around £66 per week. Further details from Charles Booth at Rutherford (building R2/310 tel: 0235-21900 ext 6645).