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## QUEST

House Journal of the Science Research Council

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### contents

Newsfront	Competitions	The great exhibition — 1	Crossword	Nil desperandum .	Name dropping .	for space experiments	for estimates .	at London office	at Daresbury .	at Atlas	for concordances	for star charts .	Supplement on Computer uses	Orienteering	The Crawford Collection	Royal Observatory, Edinburgh	
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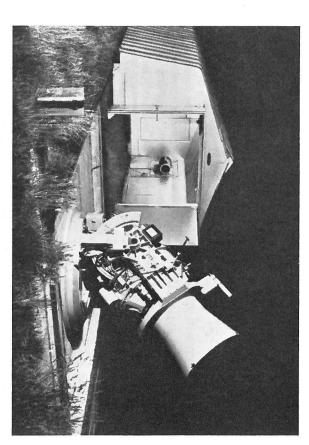
### our inheritance

Cover picture shows a sixteenth century research instrument used for measuring star positions.

It is an illustration of Tycho Brahe's Mural Quadrant from his book 'Astronomiae Instauratae Mechanica' published in 1602, which is just one of the rare and valuable books in the Crawford collection at the Royal Observatory, Edinburgh, see article on p. 2.

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# Edinburgh looks up to a bright future

The Royal Observatory Edinburgh celebrated its 150th anniversary on November 3 by opening a new library for its unique and priceless collection of great astronomical literature (see p.2) and by holding a symposium on Infrared Astronomy, one of the newest, fast-growing fields of research. 'In the next few years this will grow into one of the major activities at Edinburgh' said the Director, Professor H A Brück CBE, Astronomer Royal for Scotland, writing in *The Times* about the first century and a half (3.11.72).

10,000 stars an hour on the star-field photographs taken with Schmidt cameras, and can meaguidance systems for telescopes, The Observatory is perhaps best known in the field of pure research sure their position and brightness machine GALAXY that can locate developments, such as automatic make use of elopment of of. It is also known for its devstellar matter' that stars are made between the that floats in space chemistry of the diffuse material for its work on the physics and automatic instruments that current technical measuring in clouds 'inter-

with close to absolute accuracy. GALAXY was designed by the Instrumentation Division of astronomers and engineers. Their job is to bridge technical gaps like the one between the Observatory's 16/24 Schmidt cameras that photograph tens of thousands of

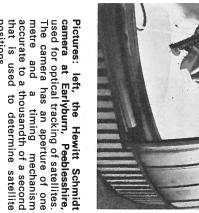
stars and the slowness of measuring them by non-mechanical

When I visited the Observatory Dr Neil Pratt, who wrote about GALAXY for *Quest*, was busy on the Mark 2 version that is being developed to match the power of the new 48-inch Schmidt camera in Australia (n.21)

in Australia (p.21).

Dr Reddish of the Observatory is Project Manager for the 48-inch and responsible for the team who will run the telescope, take plates and rush them to Edinburgh to be measured and sent to university astronomers in a very short time. The Observatory is also helping

with other national projects: the site testing for a new Northern Hemisphere observatory and the 60-inch Infrared flux collector in Tenerife. Dr Reddish described it as 'a move from research into management; a cost dear to pay,' although the Observatory does



Above, the 20-inch reflecting telescope at Edinburgh that can be used photographically or photoelectrically. Beneath the dome is a Coudé room into which starlight can be projected for examination under laboratory conditions.

also use the 60-inch for research. (His own research has contributed to Edinburgh's studies of interstellar matter.) But he added 'with the 48-inch and GALAXY we [the UK] should end up ahead of California and the European Space Observatory. We will probably scoop the pool'.

Dr Stoy, the Deputy Director,

Dr Stoy, the Deputy Director, told me he worked mostly with the 16-inch twin telescope, studying the structure of the Milky Way and intergalactic matter. Dr Clube, Head of the Astrophysics Division, is using the GALAXY machine to measure plates that he took at the Cape in 1967-70 to study star positions, their motions and galactic structure

tic structure.

The Observatory has a 16/24
Schmidt under the clearer skies of Italy at Monte Porzio. It develops experimental equipment for ultraviolet and infrared radiation observations from rockets and

### collection unrivalled **Edinburgh's**

### Vivienne Ainsworth

site, originally built outside needed repair. possible; and the building tional astronomy practically imbuildings, lights and other city Observatory, Edinburgh, since its the idea of abandoning the Royal The government were toying with In 1888 the future of astronomy in Scotland hung in the balance interference that made observaitself

of Edinburgh, high up on Blackment accepted his offer and as a result the Observatory's present built to house them. of books and instruments on conby offering to donate to the nation his magnificent private collection of Balcarres, came to the rescue ford Hill, and officially opened in premises were built to the south dition that a new observatory be James of Crawford and ninth Earl Ludovic Lindsay, The govern-26th

'Crawford Collection', as it is now called, is one of the finest in the world. It has been described as being second only in astronomical literature to the library of Poul-The collection of books or the

# the first and the few

nearly thirty editions of Euclid there are the first Arabic, Greek rivalled collection of calendars; specimens of printers illuminated coloured inks on coloured papers; some very early and beautifully illuminated manuscripts and set of Babbage's arithmetical tables printed in a variety of ested in the subject. literature, the largest of its kind marks and title pages. Lord Crawford was specially inter-Principia Mathematica'; a unique edition of editions. manuscripts There is a Newton's cometary Among have and

development of astronomy, with only one exception. (We don't have Galileo's 'Dialogo . . . sopra kovo Observatory, USSR. I have also heard it said (on more than due massimi sistemi del mondo 1632.) This claim might well be justified since the collection includes first one occasion by specialists in this field) that it is in fact the finest. works that have influenced the editions of all the most important

We have a unique and un-

a few of the "gems". Some of the wonderful bindings of leather and

vellum represent the highest art

many other items too numerous Revolutionibus' personally annota-ted by Erasmus Reinhold, and

to mention here. I have named but

phinae'; a beautiful and well pre-served copy of Copernicus' 'De

Kepler's 'Harmonices Mundi';

edition of 'Tabulae Rudol-

century; they were specially commissioned by Lord Crawford. of the book-binder in the late 19th

The

collection

has

recently

designed room with up-to-date fire

re-housed in a specially-

burglar alarm systems and

present Lord Crawford, grandson of the 26th Earl to whom we are so much indebted. special air-conditioning with room opened in November 1972 by the collection. It was also used to calculate the amount of shelving used to compile a new catalogue required. The room was officially which is very useful in this sort of according to authors and dates, temperature and humidity control observatory's computer was

of the Mrs Ainsworth is the Librarian Royal Observatory,

> Sol reducineem shellam tranm are 3 of 15. 24. 3. 53.55 Jed an era offer meaning 365 15.50.4.13.31. tre despoyen in it man paululum mileten processor in infequently.

### NICOLAI COPERNICI

Moudin auton i'A . F. Para de epicyc in um r c, in quo terra uerfetur, omniach in eodem plano zodiaci. AB, & ACB diameter, in qua summa absis contingat. Et facto in quoch epicyclum hoc modo. Sit mundo ac Soli homocentrus A centro epicyclus describatur D E, ac rurius in D centro epicycli=

ROE's library, see articles below,

rare books that can be found in 1536 to 1553. It is one of the

and Astronomy in Martin Luther's University at Wittenberg from was Professor of Mathematics Orbium Coelestium' with notes

On right is a page from Copernicus' 'De Revolutionibus

added by Erasmus Reinhold who

also Quest's cover picture.

Copernicus was born 500 years ago.
To celebrate the aniversary there is an exhibition at the British Museum until May and Macmillan are publishing 'On the Revolutions' in

'On the (at £25).

to medic mero apogeo sol mersatur. quando en subyas funt o centraq terra cente primi tric; c. e Junt else arroyerola los tune quande In secundo modo O intellique uting circuly primi ejecunds in eadon tectulinea medio tunic centre frains epicycls. have sprit processio from frai A ling. I paule herain read ad medium remple brokedin is being biander m is sequentia gram seconds D. at L upostern of amuco space axisto thing di CSOL ÿ ) led in praces rè, secudi gg, thoc est de, simi fip. Ex hoc manifestű est, parumper ip dentia addat nes . Rurlus; rum'ch ad A c dentia, ambo liter annuus, ac annuus tes in succedetia, ex F in præces Sitos epicycli fint reuolutio cetrum terræ lincam pares primi motus

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الكالية وم المسابعة المسابعة المسابعة و المسابعة المسابع unfeihr mitzen gerühr annn 3434 distantias æquales Interea si centru terræ iai 6 HID. C. A.C.L. nesock aniem homocentro a B coæqualem in L centro, ac di Epwysh promish of shift in next or extendatur in rectam lineam ork, erich kid angulus the state of the s andning FP C. gow and bidemon to and murie EDF orghis angri magnatine (3) is only primos books make punch ( ab led his melie les vor in the anignhom & OF tem a 1 circumferentia, & in 1 centro relumatur epicyclus, & cotiam CL mæqualem ipsi IDF,& G similiter secundum IG, &CN sid I suerit æqualis, F quoch suum eccentrum secundum distan cyclif faciet iplum apogeum præcedere uel fequi, auctum dimi in a minimum: in medijs autem circumferentijs ipsius r a cpiæqualisipsi x c1, propter renolutionum paritatem, Igitur ut lu quòd cum terra suerit in F, maximum efficiet n emenium tuerit tantia cr, quæ ip Solis apo geum,

burn, Peeblesshire. Edinburgh continued satellites such as TD-1A. It has a satellite tracking station at Early-

During the Observatory's early

technical developments led

astronomy. It looks as if this is going to happen again. Professor Brück thinks 'the future of all British astronomy looks distinctly to big advances in theoretical

He represents Scotland in a different way

### for life hooked

### John Barrow

time to explain. stands there man coming out of the wood you might suddenly see One day in the middle of a large scratching his head and muttering

'\* \* \* ! Where's this \* \* \* control' (see picture) and I won't have tracksuit, don't worry! It If he's wearing a light holds a compass and rotating might be me a undermap,

and emerge completely wrecked and unable to speak for ten minutes? Well, in one word, I'm an hour and a half looking fran-tically for red and white flags, an 'orienteer' forest every Sunday, run round for l disappear into a

map, called checkpoints or controls, each to be visited in order with no laid down route in bepursuers by navigating through the ing of a series of locations on a petitive, and set a course consistskill of orienteering was developed in Norway and Sweden in pass, and a reasonably fit pair of tween, using only the map, a comthought of making the skill commembers who To begin at the beginning. The 1914-18 war by resistance forests. learnt to Later someone elude

That is what orienteering is and, with many refinements, is the practised



John Barrow, a bit disorientated — see story below. He is wearing the club colours of Edinburgh University in the Southern Orienteering Championships held in 1969 in Worth Forest, Sussex.

John is a Scientific Officer at the Royal Observatory Edinburgh. He has been working on the Northern Hemisphere Observatory Site Testing Project and is now engaged on work involving the two Iris Photometers and the Schmidt telescope at the Observatory.

Britain, was not formed Scottish Championships but the British Orienteering Federation, America. In Britain it is still fairly 1967. new. We have held eleven Annual throughout Europe governing body and 3 North

### keeping fit and going places

said to be the largest gathering of competitors at any single-sport meeting. With their vast areas of 400 competitors, and an international standard event in Staff-Orienteers are still struggling for recognition but already a National Standard Event may have competitors last year and was ordshire last Easter had nearly neld in Sweden attracted 1000. An annual five day meeting 9500

> competitions. forest it is easy for the Scandina-vians to choose good areas for

onds faster, that makes me — and many others — determined to try again and win. I also think it is one of the healthiest of leisure code at each control and find that 'What's the great attraction', you may well ask. To me oriensomeone has done it a few secemerge triumphantly with the con-I've ever taken part in. When I eering is the most satisfying sport card stamped with the right

burgh in Euro-Meeting, a petition held every two between European cities. I spent my holiday in Scandinavia. My first visit was in 1967 when year it was in central Sweden and the Scottish Association was looking for people to represent Edin-For five consecutive summers com-

> I was in my second year at Edin-burgh University. After a swift reckoning I decided I could afford higher standard than I had ever experienced, but I got my first to go: and had a great holiday. The orienteering was of a much chance to see Sweden.

# meeting friendly people

centre was at Boras, east of Göteborg, and easily accessible can get well off the beaten track The following summer, I went to the Swedish Five Day Event simply breathtaking. tiansand, some of the scenery is have ever met abroad; and in the and really see these countries Sweden so often is that there one reach of Boras. One of the reasons I've returned to Norway and five races were all within easy from Britain (regular ferries from Immingham by Tor Line) and the mentioned Norway, between Oslo and Krisforests on the south east coast of Norwegians are the friendliest I that are so healthy and clean. earlier. The main

> gium, France and even England! peted and have represented Great Britain (twice). I have com-Sports Council. I have been selec-Denmark, the Netherlands, peted in events abroad in Sweden, in which Scotland has so far comted for every international event competitor in international teams, my travel is subsidised by the Nowadays, as a recognised

## ooking for jungles

as other sports. Take a simple competition. There are three main officials. The Planner chooses conlake, or a piece of dense jungle in order to get from one control to has to cross a 40 foot crag, or a practice, by testing whether one the courses, both in theory and to the age, sex and ability of the competitors. The Controller vets up into a course scaled according trols from a map and makes them to need twice as much organising istrators: and orienteering seems often have to double as admin-As it's a new sport, competitors

... while at the controls

### stai trek

ing the used in Tenerife. Group 36 inch optical telescope to measure Left: Jim Campbell of the Royal Observatory, Edinburgh, is using the telescope has been converted by fittinfra-red light emitted by stars. The on the 60-inch flux collector photometer that is normally ROE's Infra-red Research

ROYAL OBSER

INFRA-RED PHOTOMETI

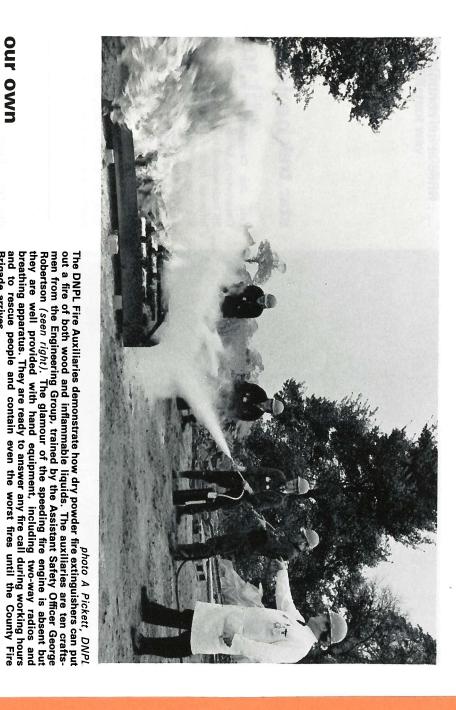
9 8 8 4

Group Group local Jim correspondent for Quest. is in charge of the Infra-red and of the Instrumentation at the Observatory. He is also

betwe arrang finish, teams, the next. Finally the Organiser arranges things like start and en control points. refreshments, first aid and, possibly, radio links

they go in The mor and the International Orienteering Federation has drawn up its own list of map symbols so that com-petitors will be sure to find maps symbo 1: 200 6 incl essar) detail teers they petitic based addition, a new area will a new map. Recently oriencan ols. Orienteering maps are at nave begun to resurvey comas possible without unnec-obscuring detail like tree )00 (about 3 inch to a mile), series), to show as much on the Ordnance Survey areas and redraw maps Europe. understand wherever

it, the ten screed has encouraged you to try it, I will be only too happy to tell you how and where to begin. long ti is easy to become hooked on orienteering as I was, and I don't becom e more one helps to organise more the sport threatens to ne a full time occupation. It I'm going to get off for a ime yet. If this hastily writeering as I was, and I don't



our own

## fire-fighters

Brigade arrives.

In the picture (I to r) are: Eric Wilkinson, Les Davies, John Towers, David Bouch and George Robertson.

successful one was Dr the afternoon. give an elegant kaleidoscope effect. By outputting the completed picture well-known signature which turned superimposing copies of the original, which are rotated and expanded to collect their works of art later in the SD4020, visitors were able Probably Howlett's

in lengths of paper tape! Machine which paid out winnings crowd was a simulated Fruit The other program which collected

into a most interesting composition.

every year on a Saturday. Visitors are shown how the Laboratory is oratory hold an open day nearly

the different sorts of problems

The staff of the Atlas Computer Lab-

**DOILY cartoons** 

are shown

ing, from the Massachusetts Institute various parts of the computer generated films made in World program made at the Laboraincluded animation of a frog jump-The Graphics Section also showed Technology, a Navajo folk story m Colorado and the *Tomorrow's* world.

ford Laboratory crossed the road to The Safety Group from the Rutherpart and gave a

ran a number of programs using the interactive display on the PDP15.

This year the Graphics Section

Research

Council.

research programme of the Science how the work fits into the whole that the computers can tackle and

In one program, aptly named DOILY

define a simple line

the user

electrically of kiss-of-life revival for operators who have come into contact with an 'live' computer.

showed great interest. were families and friends, and they About 300 people came, many

### answers to puzzles see pages 14 and 16

out N, Peter follows with 7-N. John cannot influence the result if Peter blow that: 6. If John then plays perfectly.

The computer is housed in the Nautical Almanac Office at the

crowded areas of sky.

way a computer provides a quick method for locating objects in

logue of star positions and bright-ness on magnetic tape. When

holds a specially prepared cata-Royal Greenwich Observatory and

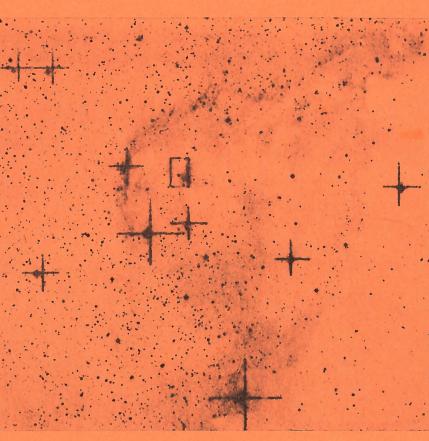
positions of faint stars or galaxies

the catalogue is scanned and the

Chairman Gideon Coutts
Treasurer Hartfee Gideon
Secretary Ferguson Hartfee
Whitley Rep. Redbreast Ferguson
Cttee. Member Coutts Redbreast (the detailed membership are: Old Cttee. New

nutcracker 11: Hartfee

# hinking Mechanical



have been placed as closely as possible to the nine bright stars on reversed) which has been copied through a 'finding' chart made on transparent paper by a graph plotter linked to a computer. The 'finding' chart shows nine bright stars as crosses and the position of a tenth, Palomar Sky Survey). Used in this the crosses indicate the degree of the star chart (produced by the brightness. marked with a rectangle, which is the one to be studied. The sizes of The picture above shows part of a photographic star chart (light and dark The plotted crosses region around the object. ready to be plotted on to a chart, to the scale desired, and compared with photographs of the The star or galaxy that the chart

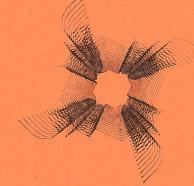
refers to will lie in the centre of the rectangle if its position is known accurately. If not, the size observations) as precisely as for normal stars. So the box on the of the box may be altered accordchart may surround a number of of x-ray sources (from rocket possible to measure the position ing to the accuracy with which it is known. For example, it is not

From charts such as these an observer at the telescope can find

Research Council. collected news of computers and computer uses in the Science For this supplement Quest has

The picture below was produced on the SD 4020 at the Atlas Computer Laboratory.

On the left is a star chart plotted with the help of the computer at the Royal Greenwich Observatory – see below.



### the computer ho see stars? w does

Roger Wood explains

on a grid in the eyepiece of the telescope so that the faint object is centred in a detecting instruobserv to a can be used to determine the posithe correct field from the disposi-tion of the bright stars and then centre on his fainter object. When the object only after several hours' tion of the faint object in relation scope, ible, even through a large telethe object is too faint to be viswhich may reveal the spectrum of such as a spectrograph, er positions the visible star nearby visible star. the computer programme

Photo copyright: National Geographic Society, Palomar Observatory Sky

### computer the Atlas

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€.

BA 0650 PE

ξυνεθεσθε κοινη ταδ' ίνα βακχευητ' άει.

doyous yap to pepeis kaivous det.

### greek writes

in the text. So far we have processed texts in all the main Eurotext, surrounded by its context, a literary text and print out con-cordances listing each word in the count up the number of words in for the 1906A. It can be used to COCOA program, which was developed for the Atlas computer in of programs to analyse literary Persian, Sanskrit and Armenian. pean languages as well as Arabic, oratory has been the development 1967 and has now been rewritten a reference to its location One of the earliest was the

French accents and German umthat are not written in our alpha-bet have to be transliterated into recognise 64 characters which consist of the English ('Roman') bet sometimes need extra characguages written in the same alphamathematical symbols, languages Because the computer can only numerals and a few characters. Even lan-

since it has only 24 letters in the alphabet which means that each Greek is fairly straightforward

### Susan Hockey

the computers at the Atlas Lab-Among the more unusual uses of

roman alphabets on a grid on the VT15 display of the PDP 15 comoratory's visual display system computerised text back into the original script by using the labwent into the machine and is only print the characters which is on the lineprinter which can it out again in the original script? The normal output from COCOA We draw the characters of nondevised a way of converting the get over this problem we have of the problem. How can we get the computer is only a small part

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ώκυδρομοις τ' άελλαις θρφσκει

dellais

The alphabet used for Persian text looks like this: capitals and diacritics. But for Persian and Arabic which have characters for the alphabet itself alphabets longer than ours, we mathematical and we only have to resort to have to use some non-alphabetic can be matched to a roman letter, eg B for beta and W for omega, symbols to mark

# ABPT=JCHXD\*RZ)S\$I @ V&EUFQKGLMNW(O Y'

that have been transliterated. To However getting the text into

puter using a 'light pen', as shown in the picture (right).

stored together; a useful capacity when referencing Greek text in when referencing Greek to Roman capitals for instance. more than one alphabet can be another program. a disc ready to be recalled by 256 characters which means that The characters are then stored on room for four character sets or fonts', each consisting of up to The disc has

a small space, while the hardcopy graphed and output either on 16 gives easier access to a particular eral copies of a concordance in recording paper ('hard copy'), which can be split up into pages. The characters appear on a small cathode ray tube to be photo-SD4020 on a magnetic tape from The film is useful for storing sevmm or 35mm film or on photothe Atlas or the 1906A computers. The processed text is fed to the

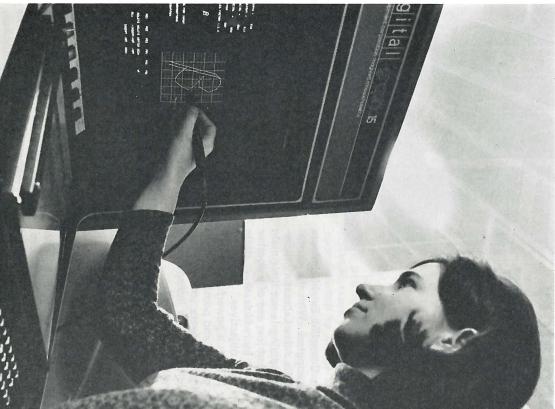
short straight lines that will look all straight so we can produce curves by drawing a series of plotted in any size anywhere on the screen, we can write titles and headings without defining extra characters for them. The lines are any character can be

Above: Egyptian hieroglyphs; and left: part of the concordance to Euripides' Bacchae.

ters are reduced. to look like one when the characproduce a thickened effect by drawing doubled lines that join up duced to print out size. ike one smooth curve when re-We can

simply the rules for writing the script and choosing the right form of the written from right to left: the SD4020 simply types backwards. characters below 64). keeping simply input all four in the trans-literated script as 'B' (thereby choosing the right form of the letter on output so that we can stance has four different forms. ing on where they occur in a word, so that the letter B for inwritten in different forms depend the letters are joined on to the following one. Then, again, the letters of the Arabic script are caused problems in Arabic The spacing between with Arabic or Hebrew which are The program therefore includes caused problems in Arabic and Persian, where most but not all of is set by the program. At first this There is no problem in coping the number of input characters

We have used COCOA to analyse the poems of Hafiz, a Persian lyric poet who lived in the 14th century AD. 495 of his poems survive; each consisting of about 10 couplets. A complete 1906A after the closure of the Atlas computer. These concordances will be used for research into all the works of Aeschylus, Euripides' Bacchae has been com-4,000 pages of Persian. We have concordance of the text (over 71,000 words) produced nearly phanes are to be processed on the hocles, pleted on Atlas, but the others, ances of Greek drama. One play also been working on concord-Euripides and Aristo-, Sop-



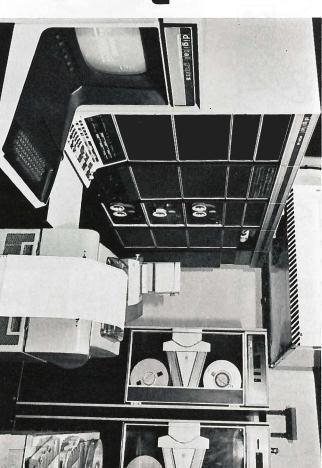
Susan Hockey drawing a Greek  $\beta$  on the VT15 'light pen'. The double line will appear as one thic when the character is output on the SD4020 m member of the Applications Software Group at the Visual Display System with a ick line and the curves rounded microfilm recorder. Susan is a the Atlas Computer Laboratory.

the literary style of the authors.

The advantage of our method of printing non-Roman scripts is Hebrew and Armenian character sets available and work has begun on Russian. To show that the for all of them. Already we have that the same method can be used

trated of ph some same for n charac have cuneiform, which is syllabic, phonetic e basic method can be used non-alphabetic scripts, we Egyptian hieroglyphs (illus-labove) which are a mixture phonetic and ideographic experimented with some pic, and

# the computer laboratory is changing



In the picture is the Atlas Laboratory's PDP 15 interactive graphics display machine which is used for generating animated films.

J Howlett

All the Council's Establishments

have computers. With the exception of the Atlas Laboratory, however, computing is not their main business but just one of a number of means by which they attain their real objectives. The computer is such a powerful and versatile device, and possibilities for applying its powers so wide, that it rapidly becomes indispensable wherever it is installed.

At the Atlas Laboratory our

the computing is still only a means to an end, but the ends are outside the Laboratory – in other parts of the Council, in other Research Councils and Government organisations and, most of all, in universities. We exist to give computational support, in its widest sense, to research and development projects carried on outside the Laboratory. We also have our own research and development projects whose aim is to improve and widen the scope of this support. Recently the Laboratory has

Recently the Laboratory has been reassessing its role and, as a result, has embarked on a change of policy. To explain this a little history is necessary. We were set up in late 1961 as part of the NIRNS group: at the time the universities were badly under-

provided with computing resources and many research workers had a near-desperate need for some real power. The Laboratory's terms of reference were such that we could give computing support without charge, and with very little formality, in pretty well any field. All we looked for was an assurance that the work could not be done on the university's own computer and that it had been planned and programmed with reasonable efficiency.

### 'We set a new standard . . . '

We started a regular service in October 1964 with this very open style and, to put it mildly, we have never been short of business. The Atlas computer was far more advanced and powerful than any machine then available to university people in Britain – or in Europe, for that matter. The staffing, equipment and organisation of the Laboratory were equally far beyond anything in the universities.

I don't see any reason to be coy about this; we set a new

standard, and we have had the satisfaction of seeing it followed by the universities when re-equipping their own computer centres

erent from what it was when we started. In 1966 a Joint Working Group on Computers for Research published a report (the "Flowers equipped as any in the world. In these new circumstances it is as a whole, are now as well inery into university computing centres. British universities, taken Board was set up, and to date has ment. versity situation very clearly and set out a programme of re-equip-Report") that displayed the unithe Atlas Laboratory is well dewhich we (and our masters) have been providing. The conclusion service of the kind which we have put about £28M's worth of macherent if there iລ still a need for a central natural — and necessary — to ask The climate now is very diff kind of service: to is that there is most As a result the Computer a need but for a diff-

signed to provide.

There are several parts to the argument. Take first the need. In many important but difficult theo-

going to take two or three years or more to complete. It is this kind of support that university are many research computer centres find difficult to provide. People from all over the long periods as visual displays of output) and special software. Most important special ancillary hardware They need great computing power with the help of computers. There ples - progress can only be made atomic data, to name two examor the prediction of observable properties of substances from can use the resources for quite of all they need to know that they atomic and molecular structures retical problems – the study of university want their services they must respond to them. ideas for tackling such problems. if their project is groups with (such

## freedom to choose

Here the Atlas Laboratory has two great advantages. One is that we are not tied to any single institution, discipline or project, and therefore have freedom to choose

what we shall use our resources for; the other is that we are part of an organisation — the SRC — which has powerful machinery, in the form of its Boards and subject committees, for assessing research projects in the whole field of pure and applied science.

When we put all these argu-

When we put all these arguments together, the right rôle for the Laboratory becomes obvious. We should support research workers whose needs cannot be met by their own university; but because we are committing scarce and expensive resources, perhaps for a long period, the project must be able to stand up to the scrutiny of Council's experts. What this means is that applications for computing support are treated in just the same way as any others made to the Council but the grant, if given, is not one of money but of time on one of our computers and, perhaps, other resources.

An applicant might be awarded an input/output terminal so that he can use the computer from a distance. We have several

Dr J Howlett CBE is the Director of the Atlas Computer Laboratory.

already, such as the card-reader/
line-printer in Professor Burke's
Department of Applied Mathematics in Belfast, through which
he and his colleagues use about
ten hours a week on the ICL
1906A.

If the application has got through the Council's mill we can be assured that our resources are being used on work of good scientific quality. And the research worker can plan his project with the assurance that he will get the support he has been promised, and will not have to worry about being squeezed out when he is only half way through.

when he is only hair way ......

This is all quite simply stated, but it describes a really important change in our method of working. It should mean that the resources of the Laboratory are used in a more positive way in support of scientific research. One cannot of course switch to a new style of working overnight, and the transition is bound to be gradual. But we are already very much into the swing of it and everything seems to indicate that we are providing what is wanted, just as we did in 1964.

# Daresbury runs faster with IBM 370/165

and a new fixed-head file, all of which are faster and hold more data than their predecessors. The processor, this system includes new tape drives, new disk drives pressing duties. The ne and the fixed-head file to attend and gives the operators more time which makes tape mounting faster new tape drives are self-loading, 165. In addition to a much faster much replaced by a system based on the Daresbury Laboratory has been Trevor Daniels

After four years of service, the
IBM 360/65 main computer at system about 850 million more powerful IBM 370/ their many The new disks give

of one-line storage compared with about 500 million bytes available to the 360/65.

ections and can detect and autoout extensive checking and even more reliable than the Daresbury Laboratory where the running of the 65 computer. matically put right many features will make the 165 system many on-line links demand This facility is very important to that would have proved fatal to eliability. We hope that the new The new hardware can a high errors carry COTT-

Users have already benefitted from the improved turn-around time, but as the new system is

has been.

controlled by the same number of operators the volume of card and paper handled had to be reduced before we could make full use of the power of the new system.

## getting things done ... on the spot

To achieve this we have made two important changes. The first was to provide a Users' area within the main computer hall, containing a card reader and card punch machine. This is separated from the main computer mach-

continued on next page

# **London Office joins in**

SRC cannot afford to foster an image of old world charm.
Computers are modern tools adapt tend to slide backwards at a faster and faster pace. Clearly, as administrators concerned with rigid crnment bodies with faint amuse-There is still perhaps a tendency for those in the "outside" world to regard administration in govthese days that those who don't business of research, we in s and quill pens spring to Ridiculous of course but it well for us to remember hierarchies, thoughts, no doubt, high wing

able of dealing with the vetting and payment of claims under the grants after they are made. way in London Office to provide a data processing service for the staff dealing with research grant applications. It will also be capthat, used intelligently, can assist the administrative task enormously. A project is now under

Laboratory through a remote ter-CL 1906A computer at the Atlas We have the use of time on

Daresbury's IBM 370/165 continued from p. 11

p. 11

fifteenth floor of State House. minal installed in an office on the

gether) awards work will be the next area existing tested with a pilot run in the past few months and now the 'parallel tested with a pilot run Plans and specifications pre-red during the last year were stage (the new and the has systems operating started. Student to-

people processing them, other than to get through them as quickly as possible, and are the proposal forms in an insurance company, orders and invoices in move the drudgery associated with any repetitive process. In large administrative systems most They offer no challenge to the private companies, transactions are perfectly straightto receive attention. forward It is worthwhile to try to recheques in a bank, and so on just to make savings.

change will be for the better. potential of the computer system makes itself felt. I think that the Staff in London Office will find jobs change as

The more unusual cases, those that are rejected by the computer because they do not conform to

ones best handled by computers.

the sets of rules that the computer

applies in each case, are the ones

and M Officer assigned to the 'com-

### Lawrie Wright

is greater satisfaction in dealing with them. best handled by people. And be cause the cases are unusual, therefore more interesting, there

scale operations, they may used to increase operating e ciency and capacity, rather the contract of the contra processing is merely staff can be replaced are data-processing machines sophisticated enough for smaller over the years to a point where mechanised in some way or other puters has not much currency logical step. And now that there volume processing) these days. Most suitable The idea that large numbers of computers introduction of (usually has the by comcomputer work been than large effinext

which is more useful for file inter

by computer. A FORTRAN program was specially written for by computer. A FORTRAN fully run on Atlas via the remote the purpose and has been success financial year have been produced This year, for the first time, the SRC's Estimates for the coming

error is overlooked by Finance Division's Estimates Section but spotted by DES: then it's back to which are extremely difficult to track down, if indeed they are discovered at all. The worst sitprone manual reworking of the Estimates which goes on from the beginning of November, when the first draft is submitted to DES, as possible the tedious and errorterminal in State House.

The aim of using a computer for this job was to eliminate as far uation which can arise is that an When work like this is done under easy for small errors to occur severe time pressure it is all too 1971 six versions of the Estimates some time in December: in

Interestingly, when the program

figures it could not reproduce the 1972/73 estimates: some errors had crept in which nobody had had to be amended to persuade Atlas to produce the "right" spotted, and some of the figures cannot be persuaded to do, was tried out using last year's to produce the "right". What Atlas unfortunately

improves

the estimates

...and

no prospect at present of replac-ing the bulky wads of estimates forms with a couple of punched program is now being adapted, is to knock up a set of Estimates from the crude data submitted by nor can the 1906A for which the the Establishments. So there is AF



### Plugged in

Picture shows Dr Eric Dunford at the Radio and Space Research Station using one of the teletypewriters connected to the Station's ICL 1904A computer in multi-access mode. By this means he can develop his own programs on line to the computer at the same time as it is running other jobs in batch mode. See Barry Martin's article below.

### programming languages of the two computers are compatible, most users have been affected only by the dramatic improvement Since the operating systems and stalled and the computing service right up to the time the new hard. of the new reopened within a short time ware was ready and this was inless. The 65 was in operation rogation and editing. The users found the installation system almost pain-

The user has a choice of terminal, either an IBM typewriter (for typed output) or a TV-like display Dr Trevor Daniels is in the Computer and Electronics Division of the Daresbury Nuclear Physics Laboratory.

programs and feeding in jobs. The 65 had only a few terminals and

their use was limited by the power

to encourage the greater use of interactive terminals in developing more widespread effect. This is

program is running.

may be

used while the user's

helping to debug programs by providing interactive aids which job submittal/retrieval, as well as helping to debug programs by

that movement of cards and output is kept to a minimum.

The second change will have a

close to the reception desk so

carrying out much of his normal interactive work such as file inter-rogation and editing, program development and compiling, and

to assist the terminal user in This is a set of programs designed

reader and line-printers are

return it over the desk or through the users' card reader. The main be passed quickly to the user who can correct it on the spot and

job has to be corrected it can now inery and the operators by a job reception and output desk. If a

and allow them to be driven by the IBM Time Sharing Option.

and more powerful 165 makes it storage. The capacity of the larger of the central processing (CPU) and the capacity of

possible to have more terminals

card

# GEORGE handles the data

**Barry Martin** 

and the new artificial satellites, ionosphere. Later, as more experi-ments were flown both by rockets propagation in the troposhere and those associated with radio wave solve other problems; in particular search workers at RSRS began to find out how it could be used to computer was operational reartificial satellites, but once the at the Radio and Space Research first large computer. Its prime task Station in 1967 was the Station's The ICL 1905 computer installed calculate the orbits of

> GEORGE 3 is a system that allocates jobs to the computer in demand for more power the 1905 workload ing system was used for an entire on which the GEORGE 3 operatone of the first 1904A systems to be delivered and probably the first was upgraded to a 1904A. It was In 1970 because of an all round

efficient use of the computer time such a way as to make the most

Dr B R Martin is Head of the Division responsible for Space Systems Analysis and Computing facilities at RSRS.

of the language. The macros do away with the need for users to learn the command language and some and the operators written by the operators themof them have been written with grams are commands, known as 'macros', written in GEORGE 3 written to tailor thought and hard work to prepare; operators. Most of the profacilities. It took a lot of special programs had to be - to simplify the operation computer. They have saved in mind it to suit users

a lot of time and effort.
On the satellite side the Station

### GEORGE continued

has become more involved with many large scale computer projects and has now formed a new division under its Space Science Services devoted to systems analysis and computing for space science. The division's work opened with the processing of data from the Ariel 4 (UK) satellite (launched by NASA in December 1971): work that was shared with the Atlas Computer Laboratory.

# commanding attitude

The satellite is carrying four experiments to measure waves and particles in the ionosphere, to be used in studies of their interactions. The data are telemetered from the satellite to NASA ground stations, recorded on analogue tapes (as continuous signals) and sent to RSRS. RSRS then convert them to digital form for the computer to analyse, to remove spurious errors and take out faults that have arisen while digitising. The cleaned-up tape is then sent to ACL for scientific analysis on the larger 1906A computer.

At present RSRS are setting up a Satellite Control Centre for UK 5, which should be launched in April 1974 (for details see J F Smith's article in Quest 5, 2 p. 11). The Centre will control the vehicle and the experiments it carries, and will collect and process the data for the experimenters. Since the experimenters will need to have a 'quick look' at their results within an hour from the time they are telemetered from the satellite, about a quarter of the information will be processed in near real time. The rest will be processed and sent to them within 48 hours.

The Control Centre will contain three PDP8 computers and peripheral equipment. One of them will be used solely to send commands to the satellite, through NASA data links, and to collect data. This one will be linked to the 1904A computer so that complicated calculations such as attitude reconstitution can be made almost immediately. The second PDP8 will transmit data to the

experimenters, including information on the satellite's orbit and attitude, through the Post Office Datel 600 Service. The third computer will provide a back-up service to the first two and will be available for post-launch program development, as required. It is hoped that the complete system will be ready by this April.

For another large project: the

International Ultra-violet Explorer (IUE) Satellite, RSRS is associated with the Astrophysics Research Unit (now administered by RSRS) and University College London (UCL) in providing the camera systems for an echelle spectrograph. The satellite is due to be launched in December 1976 and will measure the ultraviolet spectrum from Stellar sources.

sources.

RSRS have installed an Interdata 70 computer at UCL, and will write computer programs to calibrate the camera system (before launch) and to process the spectra information as it is telemetered to earth. Our main software task however is to write complete programs for postlaunch data reduction which will, in effect, clean up the 'picture' received. These will be on the VICAR (Video Image Communication and Retrieval) System which

was written by the Jet Propulsion Laboratory at Pasedena for processing pictures of Mars sent back by the Mariner spacecraft. The main object of these programs is to remove noise, enhance the image and generally clean up the 'picture'. The program was originally written for the IBM 300 range of computers so RSRS have installed a link to the IBM 360/195 at Rutherford Laboratory in order to speed up program development.

## the pattern changes

matics and physics. Then the data analysis side grew and we had to cope with the problem of doing it on a large scale. Now the added a lot of interest; and the even more interesting and varied transmitting data in near real time. We look forward to dealing with have presented new challenges. cations to the work at RSRS applications in the future. emphasis is ing theoretical problems in mathetially emphasis was laid on solvbeen continually changing. arrived, the applications have Since our first large computer we have become involved with large collaborative projects The growth of computer appli on handling and

# nutcracker 11 - quorum

When the members of the Civil Service Institute had voted for their new Committee, they found (naturally enough) that they had simply elected each member of the old Committee to a new post. Thus Redbreast had been elected as Committee Member, having been nominated by the outgoing Treasurer, while the outgoing Committee Member had been elected

to the post vacated by Gidecn. The outgoing Secretary had been elected Whitley Representative, while Coutts had been elected to the post vacated by the man who took the post vacated by Hartfee. Ferguson had moved to the post vacated by the man who moved to the post vacated by the man who moved to the post vacated by the man who had been elected Chairman. Who is the new Secretary?

-	_						_	.>0
ກ	14	13	9	ω	7	_	Across	Vol
16 Sunnv	Galaxy	Elated	Punch	NASA	Indisposition	Solar eclipses	)SS	crossword solution – maxim 1 (Vol. 5, 4 p16)
4	ω	2		Down	20	19	17	- max
4 Chorus	Risk	Lodestar	1 Science Policy	'n	20 Young's Modulus	19 Inner Mongolia	17 Pair	(im 1 Prizewinner and maxim 2 are on page 17.
ž	16	15	12	1	10	6	ហ	r and
18 Anad	Stern	Inform	Parallel	Beau	Clan	Sensory Organs	5 Pitch	page 17.
						Organs		

# Name dropping doesn't help

Both Arthur Clarke and Stanley Kubrick are said to have expressed surprise when it was pointed out to them that the name HAL given to the computer in the film "2001" could be obtained by a mild encipherment of the letters IBM. I don't suppose that anyone asked them if HAL might stand for Howlett's Atlas Laboratory, but that would have been wrong as well. HAL was in fact an acronym for Heuristic and ALgorithmic, which is supposed to mean something to people who know about things like that.

The trouble with using acro-

nyms as widely as we do is that one begins to see them where they don't exist. When the Sigma/Atlas Multi-access System breaks down and one is advised by one of the old hands to "Ring SAM" one automatically sees the connexion.

(I hasten to add that the System in fact rarely breaks down, at least not without good

reason. The usual good reasons are:

- Sigma is not working.
   Atlas is not working.
- 2 Atlas is not working.3 The telephone lines are not
- working.
  4 The modems are not working.
  5 The remote console is not
- working.
  6 Somebody pulls a plug out

while you are working.)
Only that isn't the connexion.
SAM — sorry — Sam is a person
I mean a real person who is very
helpful to people using the multiaccess systems. I must confess
that even after talking to him I
did just wonder whether Atlas had
perfected a Turing machine (Sigma Android Manipulator?) and
given it a Berkshire accent but
reliable sources assure me that
he's Sam Harris and he is really

HAL's name wasn't really HAL at all, of course. He/It was actually HAL 9000. The days when computers had proper names

Picture shows Brian Murphy at the control desk of the satellite data processing equipment, at the Radio and Space Research Station, see article on p. 13-14. (ICL photograph)

seem to have gone. MERCURY, TITAN, and ATLAS are from a bygone age. And what of Joe Lyons' computer LEO?

Perhaps it is only natural justice that computers should be depersonalised and known only by numbers but it can be very confusing for mere humans. I don't find it hard to imagine the Council discussing one of those tortuous schemes put up by the nuclear physicists for saving themselves money whereby they take an old computer from RHEL and trade it in against a new one for DNPL, then give the old DNPL computer to University A, thereby saving rental which they capitalise and use to purchase peripherals to replace the rented ones at University B, then use the Green Shield stamps they got on the last deal to buy more peripherals for RHEL. After about ten minutes of this no one will be quite sure whether the new DNPL machine is a 360/175 or a 370/165 or

to buy replacement machines for universities involves four 125's or two 145's. It doesn't really matter though: the Council Secretariat whether the alternative proposal will sort it out when they write the

### finding the formula

ercising it: may seem a small thing compared staff at LO have to develop. account of an which may be encountered in ex-Hustrates whole. the fundamental than any of these to computer, but it is probably more ticle accelerator, a telescope or a cussion is one of the skills which work knowing how to work a The of e following anecdote one of the pitfalls to write the Council as a incoherent dis-۵ coherent par-

was. One view was that Council had said "as early as possible" while another argued for "in officers as to what the decision Secretariat's oratory. spent in year a good deal of time some disagreement among senior vision should be included for the tion: they read "as early as poss-ble in 1974". while another argued for in 1974". The minutes record the third large computer at Atlas Lab-When Council discussed the Year Afterwards, there was considering when Forward compromise Look soluprowas last

JAF

blow that for a lark

### nil desperandum

Road behaviour of a car in response to steering Determination of Susceptibility of Passengers to Vibration Behaviour of Anchors in Clay Noise and vibration on board ship Fluid Mechanics of Wet Steam Effect on Passengers of fast long distant rail travel £23,321 £14,474 £16,679 £23,508 £9,907

Are these classic examples of "passing the buck" in that neither Admiral Nelson, George Stephenson or Henry Ford appear to have done their homework properly? Fortunately, its never too late and perhaps these deficiencies can be put right before those new fangled mediums of air and space travel catch up with us.

However, in case you should fear that the animal and bird kingdoms are left out in the cold, let us commend to you current valuable researches such as:—

Neural basis of classical conditioning in the Turtle

Genetics and sex behaviour of the Mouse

Mechanical design of a Frog's leg

Endrocine control of Canary reproduction

Drought resistance in Eggs of Chirocephalus Diaphanous

Monograph of Fleas of the World

Control of feeding and drinking in the Barbary Dove

Control of the Cat's Sex Life (2 researches)

There are no prizes offered as to winners in the above contest, but we can only presume that the Barbary Dove and Domestic Cat are hot favourites as they carry highest stakes. Perhaps we shall soon know what 'Cats on a Hot Tin Roof' really get up to.

The biggest slice of the cake goes to Computer Research and Development. One day it might even happen that this very costly and much misused Caliban will eventually be tamed and put in its rightful place, but perhaps not until the slice of cake is considerably cut down.

Finally, let us spur on to greater efforts and support for such causes as:—
"22 Paracylcophany Radicals and Homolytic substitution of mono-substituted
22 Paracyclophanes"
£4,611
because we may need to learn to ride a bicycle one day – unless all that verbiage means something entirely different.

The heart of the layman and taxpayer is gladdened when he reads of all that the Sciences are doing on his behalf in the line of extensive researches. It is a little disappointing therefore to see that that worthy publication entitled "List of Research Grants Current on 1/10/71" slid into circulation without so much as a bleep from our public relations hierarchy.

Let us therefore correct this omission and allow our non-scientists such satisfaction as is open to them from knowing that after random selection from some thousands of others, such researches as the following are actively going ahead on our behalf. (We commend the accuracy in estimating costs to the nearest £ unit but why not to the nearest 1p?).

Philis Tine

12 15 17

Sir Robert's skin (4) Photos of a kip on board (5)

tungsten (5)

10

in a code that's to change (12) What's drunk in Bordeaux (3) Bring forth (dog-eared) SOS f

### ties to tie

many as twenty the game will be the best possible strategy, how many over rather quickly." candles were put out by Peter's first than two or I may run out of breath before we've finished." at random: Peter had first go and think the maximum should be more blew out the maximum number of candles. John had to apologise to the Assuming that each of them used So they picked a suitable number in a serious vein or satirical or say why we want one. Drawings should Why don't we have an SRC Competitors are asked to design so it's up to also be taken up book token but a good design might of prose or verse. The Prize is a £1 ments must not exceed 100 words be black on white (suitable for publication) and descriptions or as a good

at a time?" asked Peter. "If it's as

maximum number,"

blow?

"But how many can we blow out

Editor.

will have to explain to the Editor why her cake is covered in grease."

blows out the last one candles out," said John.

loses and

"Whoever

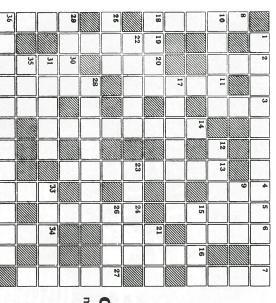
couldn't resist using it as the basis birthday cake with 21 candles they

a competition.

"We'll take turns at blowing the

When Peter and John saw QUEST's replied John, "We can blow out less

if we like; but not less than one. I



crossword maxim 2

2 For 3 Cu 4 On 5 (5)

Current value of steam-power (3)

Found in every woman (3)

One of twins when in pod (3)

36 35

2

Heath and Wilson (12)

υþ

et French bird (3)

Rent-payers make irregular holes

31 Su

gar

sometimes goes with a

(5)

Biro (4) Da

29

sh that could be written with

 $\mathfrak{Z}$ 

Give help to a good chap, though

entries to Quest at London Office not later than April 16 marked 'CROSSWORD'. gains a £1 book token. The first correct answer opened Send

were caught by the early entry date.

8 Given for a while before

Across

21 Rueful to worry without alternative (3)

Urge that goes with chips (3)

22 23 25 26 28 They appear in spring, disappear-Ted's vortex (4) ing in October (7)

The winner of maxim 1 was Richards of LO. ے ت

Quest apologises to those who

4

1 Encountered half a light-quantum

Fake's real? A ruby, maybe (5) (5) \*

=

beheaded (5)
They help to make footwear that

8 7

lt's

dreadful and illegal to be

Vile sort of characteristic (4)

river (4)

Nothing oriental about American

13 14

(8

en

ures, presumably (5)

It's too much to bear, but

Half-undeterred, went wrong (5) Regal variation (of Nimrod?) (5) distraught lover takes zero notice (8)

16 19 20 21 21 ontinually criticise a horse (3) rising condensate is joined (3)

again (5) root trees, and put back

27 28 Comes back in a miasma of bubbles (5) Lots say R & D is in a mess (5)

Evaporate a seat of infection (4)

29 30 32 33 Owing tax (3) One with nearly costly notion (4)

S Poor 33 Ac., losing its titanium (3) ing of  $O_2$  and  $N_2$  mostly (3)

\* The out a answers to 5, 13, 17, 23 spell message.

### by our Etymological Correspondent What's in a

name

of the City and no doubt providing the wealthy burghers that in the 14th century the present site of State House word 'stede' or 'stead' meaning a farm. It is on record Many newcomers to State House have speculated on the duties to the King. and quite possibly was deeded to the Church who lived there with fresh milk and other country was a farm lying just outside the western extremity origin of its name. It derives from the Old English local minor noble who wished to escape produce. At this time it was ecclesiastical property some

Statute of Mortmain in 1279. On the dissolution of This must have occurred before the passing of the the property was bought by John

> Company of Whoremasters that 'there shall forever bee Stationers' Hall, he left the of London. In his will, whicl Worthing, at that time Alderman of the Ward of Cheapskate and later in turn pafture for scheep and and three times Lord Mayor is still preserved at arm to his heirs on condition Master of the Worshipful

for this reason that, although a large building has been erected on part of the site and most of the rest has been animals which might some d paved, a number of plots of grass are still preserved and of good hurdles are kept in readiness to pen in any stray This condition remains in lay appear to take advantage O-year old benefaction. force even today and it is

### the exhibition great

Seen right the solid gold mask that covered the head of the mummy of King Tutankhamun photo by courtesy of the British Museum

F V Bale

and headlines, such as "Tomb Sensation!" One had visions of the mummy having changed its were selling the Evening Standard's Tutankhamun Supplement, a collection of "historic" pictures and headlines, such as "Tomb kinky can you get? We didn't buy it continued: "Mummy Stuck when Removed from Tomb". How sex, or a compromising cartouche would ignore it. In the road out-Court Road station presumably infound on the catafalque, but no – the queue - with hindsight we tended to get you to the end of signed detour from Tottenham several shabby little men

crowds, poor light, and constant exhortations to "move on slowly and under cover. We were quite so we were relieved to get inside after only one and three-quarter the handbook, which was just as happy to keep moving and to read in rows of ten followed by a quick glimpse as one passed by hours, spent mostly in the yard adies and gentlemen, that's them at a sort of rough jog-trot -Crown Jewels — a three hour wait business of going to see the We expected a repetition of the because inside there were

I suppose that we started queueing about 9.30 am, after following

be admitted into the next room k, remember the be'ind!" It took

meter, and a perhaps too

to get out because he "felt the call o' nature" — I suppose it's all those open spaces he was used and announced that if he iem; one Texan gentleman wanted The crowds were a real prob-

There was plenty of time to look through; often one was waiting to waitin' be'ind!" It took another hour and three quarters to get people

and sometimes the sides were poorly lit, although there were production at 75p, with magnificent photographs that sometimes mirrors in one or two. Each case more useful inside. I thought the did the exhibits more than justice. ighting was not desirable. It was improved: mostly it was overhead little more than a list – which was One could buy a short catalogue ighting in some cases could be The handbook was a thermometer/humidity superb much

# the man from Texas

jest have to go backwards. I suggested that he was just making difficulties for himself, and he did offer "if you jest stay right there" to tell me a thing or two when he got back. couldn't get out forwards he'd

£10K a year! "It'd be easier to look after a battalion!" said one and I believed erent queues going in opposite directions under the mis-guidance hibits, in cases rather too close together for the number of people wanting to see them. For us it was made more difficult by two difftwo uncorrelated custodians. Room one had many small ex-I wouldn't have his job for

done in miniature) — an effigy of the king on a bier with a falcon and the human headed bird (Ba) of the god Ptah standing (apparently) on a bootblack's box, which gold, about life-size (1.751117).
Then a number of exquisite small carnelian beaten gold inlaid with glass and a model of the canopic coffin of vases, a painted alabaster casket, at the entrance: a wooden statue of Tutankhamun in black and monial barge, alabaster unguent items - a model of a typical cerewooden effigies of the king and There was a striking figure just (really beautifully

> beat even today. surprising - it would be hard to ture work which we found most It was the precision of the miniaturned out to be a plinth of the shape of the sign for "Truth".

stools and chests, a gaming board, a gold staff with a miniagolden shrine with most beautiful dreds. design. The state of preservation is truly remarkable, superior to that of much extant furniture of of Anubis" of strangely modern being purely ceremonial. Then the ently intended for sleeping length suggested inter-breeding with a dachshund, but not apparsupported by two beasts whose the "bed of the divine cow" gilt head of the sacred cow, and the seventeen and eighteen hunit, a fan and a standing "emblem ture effigy of the king surmounting furniture: beautifully decorated One moved on to a black-and-Then there was a small

> had been photographed, and were shown in panels about five feet nification were still of remarkable clarity and precision. This was and even with this degree of maghigh on the surrounding walls, by any standards, artistic or techworkmanship of the highest order relief work on all its sides. These

# ... and a boomerang

burnished, painted and inlaid, finally, there was the pièce de resistance of the exhibition, the mask of solid gold, beaten and truly bow and a boomerang. trumpet, sation?), came next and some of the king in action, one of which is curiously feminine (tomb sen-Some beautiful golden effigies magnificent nagnificent jewellery, a the crook and flail, a doomerang. Then

> peopl stay in we di time which had been placed over the head and shoulders after mummification. One could spend a good xamining this, and indeed the last room for very long. had had enough and didn't because by now most

well pity could this period, and we felt that it was ticularl interes it all m facilities for old people who found Þ that there were no special worth it, exhausting as undoubtedly be. It was a uperb exhibition if if one is interested in in antiquities, and parone is

body item; easily is so ing at one really paid attention to every superb Wallace shopping and I went to see the After much to see that one could used most of my time look-the pictures. There was nonuch too much. er lunch my wife went spend several days in it if e Collection. It is also a exhibition. It is free. There at all. Curious, isn't it!

### result mottoes competition

competition. The range of languages employed was small and we were examples we gave to start things particularly disappointed dard were about normal for a Quest deterred potential entrants. contribution in Sanskrit. Perhaps the Division did not produce its expected off were of too high a standard, and The number of entries and the stanthat NP

of poverty, while *Panta rhei* (All things are in a flux) would suit the Neutron Beam Research Unit. *Ut tensio sic vis* (loosely rendered as is obviously appropriate to any obserpresent. Non multa, sed multum (not Physics, despite continual pleadings many, but much) is apt for Nuclear L3) is particularly fitting for RGO at vatory but Lange Locken lei(s)ten (or Vigile et orare (watch and pray)

purpose. "the strain is showing") is multi-

terms are chosen": it clearly represents a cry from the heart. the motto "Many are called but few had to the Civil Service Commission adopt Although it was strictly outside the of the competition we felt we accept the suggestion that

above, Honourable mentions to all the but no prizewinners this time.

# Quest's BIG PRIZE competition

from three issues instead of two (Vol 5, 4 and Vol 6, 1 and 2) and in mind - the winner will be picked them will not appear until the next issue (for lack of space) - and in in articles recently. Since some of announced in the one after. case they were written with the prize Quest thanks authors who have sent

and you might encourage us to award another. Meanwhile please keep writing;

# PS from Quest to authors

When we persuade you to write an just enough to outline the subject. article of so many words, we mean

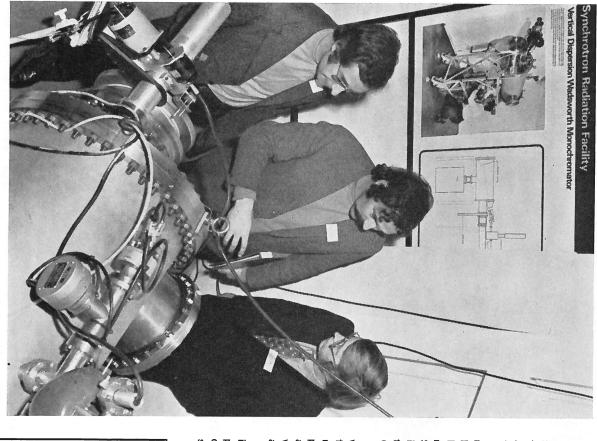
> around SRC; we do not try to copy gress and fill in details. The aim of Quest is to tell everyone don't feel pressed to write a definitive article; we will be pleased to return to the subject to report promany of us read already. So please technology, sport or whatever) that the specialised journals (in science,

working on a new method that might being exhibited somewhere or you blow-by-blow accounts of SRC prolocal Quest correspondent; interest other people, please tell your jects and jobs. So if your work Quest needs more news and more setting up an experiment

> you are known who Angler-of-the-year, etc, ho in SRC is. o

### PS to picture-makers

with camera, felt pen or set square and compasses, please consider (diagrams) of experir sults. We are also Quest comment expressed in cartoon drawform of at work or off, and more illustrations colour and ca We can ings and in art for art's sake in the wants more pictures of people as photos. So if you use anything black and white n make b & w prints from photographs or line drawings. an of experiments and reoutlet for interested your are handy



looking at the books (see caption right and p. 2)



### of the tunnel the light at the end

newsfront

ralia; and Dr D Lynch from Iowa State Univ., USA. Daresbury's SRF is one of only ten in the world and the only one in operation in this Country. Lynch from Perth University, monochromator, I to r, are: Kunz from DESY, Hamburg; the Synchrotron Radiation tists who came to Daresbury from all over the world to see and discuss Seen left, three of the hundred scien-'SRF'). Beside the Wadsworth Facility Dr C Aust-

product from high energy electron accelerators. Light is produced at all wavelengths, including the visible and a high intensity of x-rays. radiation': the light emitted as a bywas the first in Europe held specially for people interested in 'synchrotron meeting, held

cil physicists will use it for x-ray in atomic, molecular and solid state studies of crystal structures. physics and Medical Research Coun-It has many research applications

# Is your Computer on fire?

Rutherford Laboratory and is organised by the Atlas Laboratory and the Fire Protection Associa-The conference will be held at Rutherford Laboratory and is happens you might be interested to go to the Conference on Fire ments on Thursday Protection of Computer Establish-We hope not, but just in case March 29.

SRC establishments, from university computer Visitors are expected from other histories and protection Speakers will talk about centres devices.

ded by the latest automatic measur-ing machines like GALAXY at the of the new telescope will be exten-

Royal Observatory, Edinburgh.

Dr Vincent Reddish of ROE is the

More advanced in design,

the power

the same type and size at the Mount

Hemisphere with the instrument of that has been made for the Northern

Wilson and Palomar Observatories.

scope is to complete the sky survey

One of the first jobs for the tele-

telescope.

site as the 150 inch Anglo-Australian before being shipped to Australia where it will be put on the same

Parsons and Co Ltd have just built for the Science Research Council. It is undergoing final factory trials

Seen right is the 48 inch Schmidt telescope that Sir Howard Grubb

getting ready to sail

Seen (left) at the opening of the Crawford Library at the Royal Observatory Edinburgh are: (I to r) Professor H A Brück CBE. Director of the Observatory. Sir Michael Swann FRS who has just retired from our Council on appointment as Chairman at the BBC Board of Governors; Lord Crawford whose grandfather created the library and gave it to ROE (see p. 2); and our Chairman, Sir Brian Flowers, FRS.

### new honours

We add Quest's congratulations to the three members of staff who received Honours.

We are sorry

Time Department at the Royal Greenwich Observatory. H M Smith, OBE, Head of the

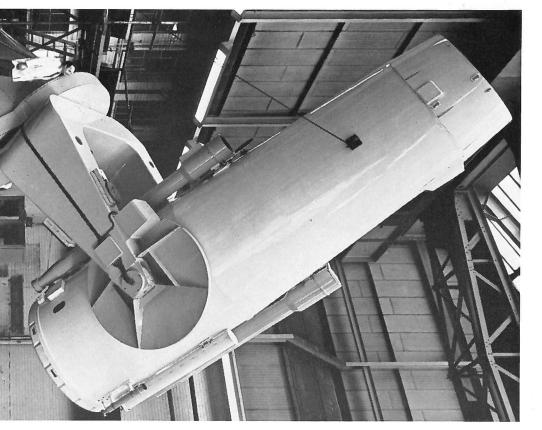
oratory (seen far right). istration at the Atlas Computer Lab-C L Roberts, MBE, Head of Admin-

Observatory. Operator at the Royal Greenwich A L Jefferies, BEM, Telephone





Quest apologises to W J Parmenter (I) and C L Roberts (r) who got a personality switch in the last issue. It was Mr Parmenter who retired and Mr Roberts who made the presentation (and is also mentioned left).



the 14-inch-square plates may record

Since each photograph taken

9

astronomers.

tion at ROE and distribution to collection at the telescope to project officer and will be in charge of the whole operation from data

reduc-듲