orbit

Cover photograph:

The Computer Room at the Atlas Laboratory.
A line of Ampex tape decks stands sentinel in the background.

Editorial

"And what is the use of a book", thought Alice, "without pictures". (Lewis Carrol - 'Alice in Wonderland').

For over two years ORBIT has appeared in almost the simplest possible form and with only line drawings for illustration. Now we can give more attention to the presentation of our material and hope to lure more people to read our pages. Since information at all levels, from advertisement hoardings, newspapers, etc., is presented with such professional skill, publications like ORBIT of previous months tend to lose a lot of impact just because they are not visually attractive.

Unfortunately, a cursary inspection of journals, indicates that, generally, the more glossy the presentation the more glossy the contents. The glossiest are innocuous, lifeless, public relations exercises whose purpose seems to be to reassure rather than to communicate.

ORBIT's purpose is to communicate. We are trying to relay what the different groups within the Laboratory are doing and to bring in information from related fields outside and comment with influences the future of our work. We try not to communicate a view through rose-tinted spectacles. We are financed by the Rutherford Laboratory with the obvious purpose of nourishing the life of the Laboratory but this is not necessarily best achieved by presenting only the bright and beautiful. For one thing no one would believe us. But the bright and beautiful is more likely to be accepted if it is realised that we sometimes present unfavourable material. News of unsuccessful work and unfavourable comment is important. For example, we have tried to indicate that not everyone in the world is leaping in the air with joy at the prospect of storage rings for £30 million. Nevertheless, a very high percentage of the news and comment in our pages is for and not against.

Also we are trying to cater for a wide variety of people and, to quote Cervantes, "He that publishes a book runs a very great hazard, since nothing can be more impossible than to compose one that may secure the approbation of every reader". Half the Laboratory consider that there is a ponderous weight of technical material; half consider that there is too much 'trivia'. We are trying to do something for both categories of people.

The first number in our new format concentrates on the Atlas Laboratory. ORBIT has not previously devoted much space to Atlas and it seems a good time to give almost all the Journal to telling the Atlas story as the 'take-over' day approaches.

2

Atlas Computer Laboratory

The Atlas Laboratory is not yet strictly in business but it is very much a going concern. The computer is all there and working and, whilst it is still in the hands of the commissioning engineers, it is being run by the Operations Group for 8 hours a day and is doing real work. It is rash to make predictions in public, but we hope to take the machine over before the end of the year. To be fair, I must say that the contract with the manufacturer says that this must happen not later than 31 March 1965. We had thought we might have the machine by 1 October, but this proved too optimistic.

The Laboratory is part of the N.I.R.N.S. and has serious responsibilities towards the nuclear physics programme but is not just a part of this programme. It is a wholly mathematical enterprise, based on one large computer, whose terms of reference require it to provide a service to these groups of users:

(1) research workers in Universities and C.A.Ts - not only in physical science but all other fields such as biology, sociology and literature;

(2) N.I.R.N.S. itself - primarily for analysis of experimental results from bubble chambers and spark chambers;

(3) A.E.R.E. - who will use the Laboratory as a computing bureau;

(4) Government-supported research institutes, such as D.S.I.R., M.R.C. and the Meteorological Office.

As in the N.I.R.N.S other Laboratories, no charge is made for University work; A.E.R.E. and other Government users will be charged the actual cost of the work done. Again no security measures are applied so that no classified work will come in. The terms of reference say that, after these demands have been met, any time left over can be sold to private customers at commercial rates. But the demand we can see already, indicates that there is more likely to be a shortage of time than a surplus, so the

chance of our actually selling any to industry is very small. Money earned by selling time does not help to fill the Atlas Laboratory coffers, but goes straight to the Treasury: thus is temptation removed.

In 1961, the Government was considering buying a large Atlas computer to be used in this way. It invited the Governing Board of the Institute to consider broadening its terms of reference to accept the responsibility of managing the machine; the Board agreed and set up a special committee, the Atlas Computer Committee, to look after the pro-

Dr.J.Howlett, Director of the Atlas Computer Laboratory, is the author of this article.

Dr.Jack Howlett was born in 1912. He read mathematics at Manchester University and after some time in the research department of the L.M.S., joined the Ministry of Supply in 1940. In 1948, he became head of the Computing Group at A.E.R.E. and in 1961 was appointed Director of the Atlas Laboratory. Dr. Howlett lives at Tubney, Berkshire; he is married and has five children.

ject. This is a body of senior people, chaired originally by Sir William Penney and now by Professor Flowers, reporting to the Board; it takes the major policy decisions and settles the Laboratory complement and budget, both of which are kept separate from those for the physics programme. There is also a Users' Committee, chaired by Professor Fox, to keep an eye on the Director and to voice the needs of the users.

The Building

The Laboratory is sited judiciously between the Rutherford Laboratory and A.E.R.E. and is a simple, functional and, we all feel, very stylish structure. It is in two parts, an air-conditioned block housing the computer and a straightforward office block, linked by the entrance hall and stairway. It is one of the very few buildings in this country designed as a computing laboratory. We thought very hard about the operational needs, the disposition of the computer and all the ancillary equipment, the volume and pattern of traffic flow, and feel smugly pleased with the result. The photographs show the main features and will, I hope, convey something of the feeling of brightness and space in the operating area.

I am glad to have this opportunity of saying how much we appreciated the co-operation of S.W.O.. The architect and engineers and everyone else went to endless trouble to understand our needs and to produce an efficient design which would meet them; it was a most pleasing and interesting experience.

The Computer

The ideas behind the machine are due to Professor Kilburn and his colleagues in the Computer Laboratory of the University of Manchester. Ferranti Limited, who in 1963 sold their computer business to I.C.T. Limited, developed these into the engineered version and installed the first Atlas in the Manchester Laboratory in December 1962. A second is working in the University of London Institute of Computer Science and ours is the third and biggest. The general aims of the design were: the circuitry should be as fast as could be guaranteed with the components in quantity production when serious

construction started in 1961; there should be no reason, apart from shortage of space or money, why a system could not be built up to almost any size; the principle of time-sharing should be exploited to get the greatest possible rate of flow of work.

Our own installation is on a large scale and gives University workers access to something much bigger and more powerful than they can get on to anywhere else, at least with any ease. I am willing to risk the opinion that the total resources of the Laboratory are comparable with those of any open computing laboratory in the world - I choose my words carefully, because of course there are weapons and other closed laboratories with much greater resources, and of course we shall be overtaken, but that is inevitable - you can always do better by waiting another year or so.

The main store is divided into cores and drums, but the user can treat it as one continuous store of nearly 150,000 words; a built-in program organises any necessary transfers. There is also a "fixed store" of 8,192 words made of ferrite and copper slugs set in a wire mesh with an access time of about 0.3 us; this holds all the basic programs, such as those for reading and punching cards or paper tape, and computing simple functions. We are in the middle of discussions with I.C.T. about a visual-display system to provide graphical output and produce microfilm and cine films, and we are looking into the case for adding a disc store of about 4 million words capacity and, about three years ahead, a magnetic card file which would hold about 100 million words. The capital cost of the installation as we have it was £2.8 millions; the additions would cost about £400,000 more.

Compiler programs have already been written which will cause the machine to accept programs in the most commonly used languages: Fortran, Algol, Mercury Autocode and its extended form (E.M.A.) and Atlas Autocode (designed and written by Manchester University). We shall be adding some list-processing routines, that is, programs which manipulate strings of characters which have no numerical properties, such as punctuation

THE MAIN PARAMETERS OF THE ATLAS COMPUTER SYSTEMS ARE:

Word length :	48 binary digits
Main Store :	Magnetic cores 49,152 words (48 x 1,024): access time 2 μs
	Magnetic drum 98,304 words: mean access time 6 ms, transfer rate 512 words in 2 ms
Magnetic tape store :	16 Ampex units, 2 IBM units
Input :	2 ICT card readers, 600 cards per minute
	2 Ferranti paper tape readers, 300 characters per second
Output:	2 Anelex printers, 1,000 lines per minute : 1 ICT card punch, 100 cards per minute : 1 Teletype tape punch, 100 characters per second

in a literary text.

Considered as a piece of machinery to be operated by people, Atlas is very different from any previous computer because most of its activities are maintained, controlled and reported on by an elaborate built-in program called the 'Supervisor'. This is discussed later so I will say no more than that it is a most advanced piece of computer technology which makes Atlas a fascinating machine - I am inclined to add 'to grapple with'. The system has given I.C.T. and ourselves plenty of headaches and without doubt there are more in store: it is Supervisor faults and deficiencies as much as hardware troubles which are holding up the take-over. But it is very pleasing to see it in action, as for example when a small job goes into the machine whilst a large-scale calculation is in progress, wriggles through the meshes of the large job and sur-faces, completed, without any apparent disturbance to the other. But we have to do some cold assessing of the efficiency of this process.

Organisation of the Laboratory

This is quite simple and expresses the three essential needs: work has to be processed through the installation, basic programs have to be provided to make this possible and the whole place has to keep alive intellectually or nothing will be done well. There is an Operations Group, a Programming Group, a number of individual research posts and an Administrative Group.

Mr. Hailstone writes about his Operations Group. With literally hundreds of users dis-tributed all over the country it is a large-scale enterprise, which is looking to me more and more like a sophisticated mail-order business. When we are running to capacity, he will have an empire of 66 people.

Dr. Churchhouse also writes separately about the Programming Group, which is planned to rise to 17, all mathematicians.

The research posts are provided so that we can have in the Laboratory people who will work as individuals, free from the day-to-day pressures, whose interests may lead to uses of the machine in new fields or in unusual ways. We had always hoped that the holders of these posts would form or retain links with the academic world, and are very pleased that we have been able to arrange for some of these posts to be held jointly with Fellowships at Oxford Colleges. At the moment we have joint appointments with Trinity, Pembroke and St. Catherine's, and one person retains a connection with the University of Edinburgh.

The present complement allows for 7 posts. Important though it is, there is not much I need say about the Administration. Mr. C.L. Roberts is the L.A.O. and the whole service is a branch of the Rutherford Laboratory administrative organisation. The special problems which will exercise this group come from the heavy flow of work and the large number of short-term visitors.

The Work of the Laboratory

The prime job of the Laboratory is to run the computer and the supporting services as effi-ciently as possible so that a large number of people can get their work done quickly with the least possible trouble to themselves. I find it hard to write coherently about this work because it is so varied; if it were not, the aim of providing computational help over a wide field would not have been achieved. A.E.R.E. alone will send quite a variety, the biggest calculations probably being con-cerned with reactor theory. The Rutherford Laboratory work will be almost wholly track analysis and interpretation of bubble-chamber and spark-chamber experiments; the very large and complex programs have already been written in Fortran and run on Orion and on IBM 7090 machines, but it will take a lot of hard work to get them running smoothly on Atlas. I hope we shall make life a little easier for the physicists, who have been having a hard time over the past year or so, getting their work done wherever they could.

The Meteorological Office has already gone a good way with developing a big program which integrates the equations of motion of the atmo-sphere as part of its research into methods of numerical weather forecasting. The Medical Research Council's Molecular Biology Unit at Cambridge will send problems coming from its work on the structure of proteins, viruses and DNA, and M.R.C. generally is stimulating interest in the use of computers in the medical world. They arranged a very successful conference in Oxford last July when mathematicians, biologists, physiolo-gists, clinicians and others talked to one another for three days. An enormous range of work is coming in from the Universities from theory of lubricated bearings to analysis of social statistics, with problems in nuclear and molecular theory somewhere in the middle. The striking fact about this work is the speed with which it has appeared, making it clear that the demand is already there waiting to be satisfied.

If I might end with a personal comment, I would like to say that I find the whole project unfailingly fascinating and exceedingly rewarding.

In answer to your advertisment of

The first collaboration in the Joint Fellowship scheme was with Trinity College, Oxford. Both sides were anxious to make it clear that this would be no ordinary appointment and that they were prepared to consider a man working in any field and at any stage in his career; what mattered was that he should be a first-class man who was attracted by the idea of working in the environment of a big computer. We advertised both here and in America, in pretty broad terms as can be seen from the actual advertisement printed below.

The comments on the announcement ranged from, "It's a pity you can't make up your minds about what you want" to, "Tremendous - the advertisement of the decade". 124 applications were received from all over the world, which most certainly showed the breadth of interests that were hoped for. There were pure mathematicians, English scholars, philosophers, entomologists, engineers, at least one musician, educationalists, sociologists, and many others; a dozen posts could have been filled with people who would have been a great asset to the Laboratory. One man who wanted to do some simulation studies of the effects of radiation on animal life finished his letter with the sentence: "The idea of a world in which only insects survive fascinates me". Another from California, who was interested in management techniques, when asked for more information about his proposals, started his reply with: "Hm! If what I told you before hasn't convinced you that I'm the man you want ... ". The exercise has brought contact with many interesting people. The Laboratory was more than pleased to receive Dr.I.J.Good who was elected to the Fellowship.

The Data Preparation Room

Operating the Computer

J.E.Hailstone (Operations Manager)

A few years ago it was usual for computers used for scientific work to be operated by the programmers - the people who prepare the sequence of instructions to carry out a given set of calculations; today, it is necessary for full time operators to control the flow of work through a computer of the size and speed of Atlas, and in addition the computer itself is built and programmed so that some of the features previously dependent on human effort and the ability to make decisions, are carried out automatically.

The Operations Group is concerned with providing the operating teams for the computer, the services for receipt and dispatch of work, the preparation and editing of programs and data in a number of different media, and the preparation of accounts for computer time used, together with the operating statistics needed to assess the use made of the computer.

The operating teams have to face some new problems which arise from having a number of different forms of input and output, and from the features of the Supervisor built in to make the maximum use of the computer time. Because Atlas has a very high computing speed and the speed of the input devices is not sufficient to supply information to the central computer at a rate which would keep it fully occupied, input and output are carried out independently using a magnetic tape system as a buffer between the input and output peripherals and the central processor. It

is therefore possible to operate all the input and output devices, such as the paper tape readers and punches, simultaneously and at the same time to be using the central processor to carry out the calculations for a program held in the fast store of the computer.

The control of this simultaneous operation requires a small proportion of the time available to the program in the fast store, so that the input-output devices interrupt relatively infrequently and each interruption needs only a small amount of time to deal with the information recently made available by input or needed for an output device. From the operators' point of view, a number of programs are being fed in, a program is actually being computed and several programs may have results coming out all at the same time. To keep track of each job an elaborate book keeping system is incorporated in the Supervisor, so that programs and results can be collated correctly and returned to the originator.

Another important feature of the Supervisor is the ability to schedule jobs so that as many as possible of the facilities connected to the computer can be kept working at the highest possible rate. Each program is preceded by a statement of what facilities will be needed, an estimate of the time required, the number of lines of output and other characteristics. The Supervisor acts on this information and attempts to carry out

A Visitor's
IMPRESSIONS

From the outside, the Atlas Laboratory is
an uninspiring building - rather square, dull
and ordinary. But inside it has been tailored
to the needs of the Laboratory's work in a
most refreshing way. Everything seems
designed to meet the demands of the work and
to provide a pleasant environment. It is
impeccably neat and tasteful, a credit to the
designers and to those whose job it is to keep
the place in order. Even in the bowels of the
Laboratory, places like the Alternator House
and the Plant Room, everything is well laid out
and kept tidy.

A highly developed aesthetic sense is in evi-
dence everywhere. Worthy of particular men-
tion is the office furniture. Perhaps this is
the first Laboratory to break away from the
ponderous Victorian articles which encumber
other Government establishments. Of
Scandanavian design, the desks are by the
Birmingham Aston Cabinet Co., and the chairs
by Panda Office Equipment. To crown the im-
provement in appearance, the cost was actually
less than for the standard equipment. The
offices are neat, each with their own built in
bookcase and there are half size offices called
"cells" which house short term visitors and
"think rooms," which are equivalent to library
"quiet rooms" elsewhere. Perhaps the Atlas
inmates think noisily.

Abstract paintings decorate the walls and even
the facilities for the needs of nature and indi-
cated à la continental airport. "Women" or
"Men" on the doors would look more incon-
gruous.

The computer block is splendidly designed -
a place you can breath in. And to work there
must be made all the more pleasing by the
presence in the Data Preparation Room of
many delightful girls. It must have one of
the highest concentrations of talent in the coun-
try. The Computer Room itself is a science-
fiction writer's dream-world of machines
taking over man. Tapes wheel about on the
18 tape decks, results chatter out of machines
wherever they will, seemingly completely
independent of human control. Next door is
the Card and Tape Store where the names on
the data files really bring home the wide range
and interest of the work the computer is hand-
ing. From frightening esoteric mathematical
exercises like "Multivariate Analysis" we go via

Miss Dorothy Belton (daughter of Mrs. Belton
from Administration R1) at the reception desk
in the Entrance Hall.

"Bubble Chamber (Geometry)" to "Children in
Care," "Manager's Diaries," and "Animal
Feeding Trials".

The Laboratory is in a very happy situation.
It is small enough to retain personal contacts
throughout its staff, and it is obvious that the
management place some emphasis on this.
Twice a week the whole community gathers for
coffee and a chat in the Main Conference Room.
And yet it is large enough to command resour-
ces. The present complement is 105 in 1966,
and the building is designed to accommodate also
about 20 visitors.

Everyone seems personally involved and proud
of the distinctive identity that has been
achieved, not least by some of the breakaways
from convention mentioned above. To an out-
sider, looking in, the Atlas Laboratory seems
to have a stimulating physical and mental
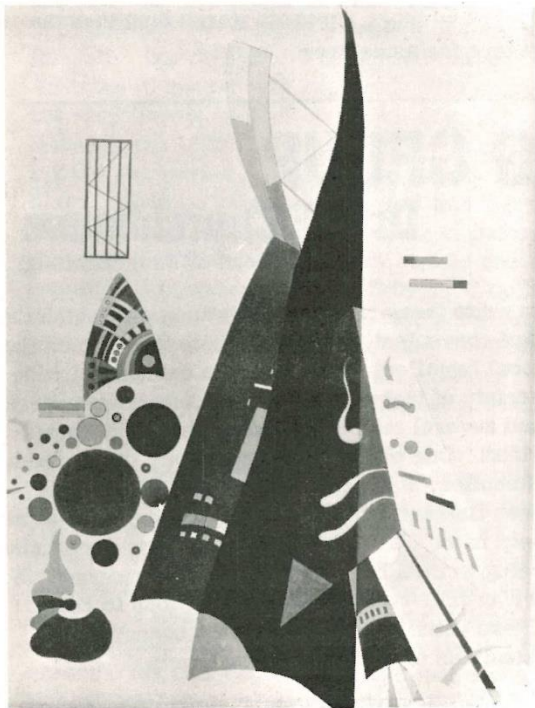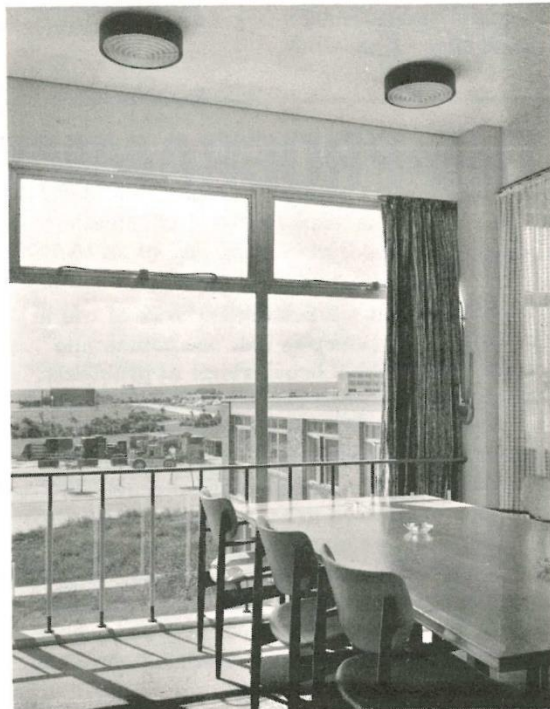enviroment for its work. We think it will be a
hit.

Miss Anne Pascoe with Mrs. Dorothy Phelps, Supervisor at the Data Preparation Room.

Á la Continental Airport

Part of an abstract painting which hangs in the Data Preparation Room.

A 'Think Room'. The Rutherford Laboratory can be seen through the window.

9

the jobs in an order which keeps the peripherals active. This may or may not be the order in which the jobs were presented and the operators, at any one moment, may not know which job is being worked on by the central processor. It is also possible to give jobs high or low priority by a simple operator request and other parts of the system may be inspected and controlled by similar requests.

The implications of operating a computer with such an advanced system of control have not been fully realised and it will require a good deal of experience before we can say whether this interesting experiment has been successful.

When Atlas is working for three shifts the number of jobs being processed per week is expected to be approximately 3000. Careful attention is needed to deal with this volume and special problems arise because of the very widely dispersed sources of work. The research workers in the Universities developing new programs are as interested in the turn round time in the early stages of a program development as in the total amount of time that the program may eventually need in production. We have therefore made arrangements to assist programmers to get as good a turn round time as possible.

The preparation of programs and data on 5, 7 or 8 track paper tape and on punched cards is another service. It is not intended that all users should have their work punched by the Atlas Laboratory and many users will carry out this job themselves. The punch section, consisting of eight operating staff, deal with the many different programming languages available on Atlas and carry out jobs such as reproducing cards, paper tape and editing paper tape. Some preparation equipment is available for the user to operate personally.

The keeping of accounts and the preparation of some important operating statistics is greatly assisted by the information from the Supervisor after each computing job has been completed. A.E.R.E. and Government Departments have to pay at an agreed rate but what this rate should be raises new problems because the operating system makes a straightforward assessment of machine time impractical. Various methods have been suggested to deal with this problem but there seems to be no general agreement on how it should be done. The preparation of some essential operating statistics will allow us to estimate the future demand and to improve the efficiency of the operating system. This may well become important when Atlas time becomes scarce as more research works turn to computers for assistance.

THE PROGRAMMING GROUP

Dr. R.F. Churchhouse
(Head of Programming)

One of the most interesting features of life in the Atlas Laboratory is that one comes into contact with such a broad range of problems, and an equally broad range of people. Large scale programs for the machine already being tested include Evolution of Star Clusters (for Professor Hoyle's group) and Molecular Biology (for Dr. Kendrew's group). Both of these programs could use many hours of Atlas time. At the other end of the scale is a job for the philosophers of Oxford University which requires only a few seconds of computing time - the decipherment of Wittgenstein's diary; I shall say more about this later.

It is quite obvious that the majority of Atlas users will do their own programming. They will want to write these programs in a language which they find convenient, often one which they use on their local (smaller) computer. To cater for a wide variety of tastes, half a dozen major compilers and several minor ones have already been provided. One of the most important, the Fortran Compiler, was started in A.E.R.E. and has been finished in the Atlas Laboratory with some help from I.C.T. A new Algol Compiler is also being written here and we are also responsible for an IPL-V compiler and additions to EMA. These activities are at present occupying the attentions of over half of the Group.

It is inevitable that some customers will come to us for advice on programming, numerical methods or availability of library subroutines.

Such an advisory service is another function of the Group and so also is the provision of Fortran training courses and the like.

Apart from these everyday activities we want to explore various fields of application of a large computer. A number of us are interested in Information Retrieval, Artificial Intelligence, Non-Linear Programming using a computer to discover new mathematical theorems, and other topics. The Fellowships, which Dr. Howlett has mentioned, were established to encourage people of high ability to extend the use of computers within their own lines of research. We already have three Fellows and several very interesting and promising new programs are being developed in collaboration with them. The two programs described below were both suggested by Dr. I. J. Good.

The first is the decipherment of the Wittgenstein diary. This is a tiny job so far as Atlas is concerned but it is unusual and yet a good example of a program where the computing is trivial and the preparation of input and output of vital importance. Ludwig Wittgenstein was an Austrian, born in 1889. He was one of a large family all of whom were obliged by their father to study engineering. In 1911 he went to Manchester for this purpose but, whilst in England, he decided that he was more interested in philosophy and became a student of Bertrand Russell. During the war he served in the Austrian Army and was captured. His short but very important book on philosophy, published in the 1920's, was probably written during the war period. At the same time he kept a diary, which he wrote in code, and this diary, about 200 manuscript pages, is now in Oxford. The code is known; it is a very simple one in which A is represented by Z, B by Y, C by X and so on but unfortunately the text is written in German script and is not too easy to read. Decipherment, though easy is very tedious. Apart from a few sentences it has not previously been deciphered.

The Atlas program takes 5 minutes to read in the 3000 cards which will hold the text, a few seconds to decipher it all and 3 minutes to print out the entire original text and the decipherment (which is of course in German) side by side. I tried to read some of the original script myself and found that I made about 20% errors; for this reason I decided that each line of the diary would be reproduced by one punched card which would include the date and line number. Had this not been done, editing

would have been a nightmare. Now, when the machine deciphers a page, a German scans the output and corrects obvious misreadings; the appropriate cards are re-punched and a second pass made and so on, until we have the best text we can achieve. We hope that the diary will prove to be of some philosophical or literary interest.

The second program is pretty well the antithesis of the first. The only feature they have in common is that both were suggested as jobs for Atlas by Dr. Good! In this case he suggested that we might like a job which could use up all of Atlas' spare time: a job of low priority which the machine would call in whenever it had a second (or more) to spare. The ideal job for such a purpose is one which has very little input and output but uses many hours of computing time. Such a job is our proposed Test of the Riemann Hypothesis program.

In 1859 the German mathematician G. F. B. Riemann (1820-1866) wrote a paper on "The number of primes less than a given number". In the course of this paper he was led to study the function

$$\zeta(s) = \sum_{n=1}^{\infty} n^{-s}$$

(now known as 'the Riemann Zeta Function),

11

for complex values of s. If $s = a + ib$, where $0 < a < 1$ and if $\zeta(a + ib) = 0$, Riemann conjectured that $a = \frac{1}{2}$, but remarked that he was unable to prove it. This is the famous Riemann Hypothesis: despite enormous efforts by hundreds of mathematicians in thousands of papers it remains neither proved nor disproved after 105 years. Many deep results have been proved and many important discoveries have been made in the attempts to settle the question so that, true or false, it has proved to be a valuable conjecture.

It is now know that the first 25000 or so zeros of $\zeta(s)$ in the appropriate region all satisfy the hypothesis, i.e. all have $a = \frac{1}{2}$. It therefore looks as if the hypothesis must be true. There are however grounds for believing that if the hypothesis is false the first case of failure may only occur when b (the imaginary part of s) is very large (say $b = 10^9$), and this is far beyond the points so far tested. We hope to test the hypothesis in a region of very large values of b. This will be an excellent low priority filler job for Atlas. If it found a zero with $a \neq \frac{1}{2}$ it would create the mathematical sensation of the century!

There are many more jobs scheduled for Atlas which fall in between these two extremes but I hope this gives some idea of what an interesting and exciting place the Atlas Laboratory is becoming.

'We are not destined to become a race of babysitters for computers'

Sir Leon Bagrit
Reith Lecture, BBC Home Service,
8 November.

"To convert the measurements of the tracks on two stereoscopic photographs into a complete description of a particle interaction inside a bubble-chamber takes the IBM 7090 computer at CERN about 15 seconds. What is normally neglected in statements of this kind is the fact that to write the "programme" for such a calculation has probably taken between 10 and 20 man years."

(CERN Courier)

One Sunday morning recently, H was faced again with the recurrent question from his sons, "What can we do?" He remembered an issue of the Daily Express which contained an article about a kite 'of traditional chinese design' and, a sucker for punishment, offered to make one.

Having overcome the first obstacle, which was to find the particular copy of the Daily Express, the construction of the kite looked, at first sight, child's-play.

"Let's see", said H, reading, "Sulphite paper can be bought from most stationers and split bamboo is available at most ironmongers".

He didn't mention having no idea what sulphite paper was and concentrated on the split bamboo the drawing calling for a piece 36 inches long and 1/8 inch square. An eighth of an inch square! The implications began to dawn - that was a mighty slender piece. Also, most ironmongers were at home in their gardens, having no doubt left their shops knee deep in split bamboo. An old garden cane, was soon procured as a substitute, but splitting it down to 1/8 inch square was quite another matter. For one thing there was a knobble every 9 inches and the knife seemed to take a new direction after each one eventually running out to the edge, leaving a miserable splinter of bark.

"Bamboo splitting is probably another of these long forgotten arts," said H, "I expect the Chinese could do it with one hand, while using the other to rub two pieces together to make a fire".

The only way was to saw the cane right down the middle and then plane away the softer inner wood (to plane off the knobbles on the outside weakens everything). The next piece required was 30 inches long for the backbone, also 1/8 sq. inch and this now looked too weak, so after 1300 years, H bodly unfroze the design for modification. The backbone section was increased to 1/8 inch x 3/8 inch tapering to 1/8 inch square at the ends - a decision amply justified by the subsequent performance of the kite. These pieces were easily assembled and everything was

swinging when the project went off the rails.

This was because H decided to ignore the drawing and make the curved pieces of the tail section by steaming pieces of cane to the correct curve.

"This is the way to do it," he said.

Much time was wasted in boiling water and waving the came about in the steam. It didn't work. The cane always broke at the crucial moment. It was now well into Sunday afternoon and two pairs of eyes told H that his reputation was suffering. Nothing was said, of course, but he knew it.

In the end he had to go back to the drawing and found that if the cane was planed right down to the bark, where the curves were required, it would bend quite easily. Some skill was required to get the two halves of the tail nice and symmetrical because no two pieces of cane are

the same (those wretched knobbles again).

The matter of the sulphite paper was carefully side-stepped (though this sort of thing is becoming much more difficult since H's elder son has learned to read) and some greaseproof paper dug out, which served admirably as a cover.

An expedition was immediately mounted to a hill near Swyncombe where a breeze can almost always be found. The launching took place after a slightly unorthodox count down by the younger son.

"One, two, three, ZERO," he shouted.

The kite went straight up in the stiff breeze and stood out rock steady at the full length of the line. The stability seemed to come from the dihedral produced by the flexing of the structure in the wind.

Very clever people these Chinese.

Thread

Cord

11"

11"

Thread

Split Bamboo Cane
30" long (⅛" square)

Sulphite paper

Split Bamboo Cane
36" long (⅛" square)
bent and held by
thread 34" long
(not allowing for loop
fixing each end)

Cord attachment
positions

Fixing thread

Bamboo Bark bent as
tail edge members
24" long (2 pieces)
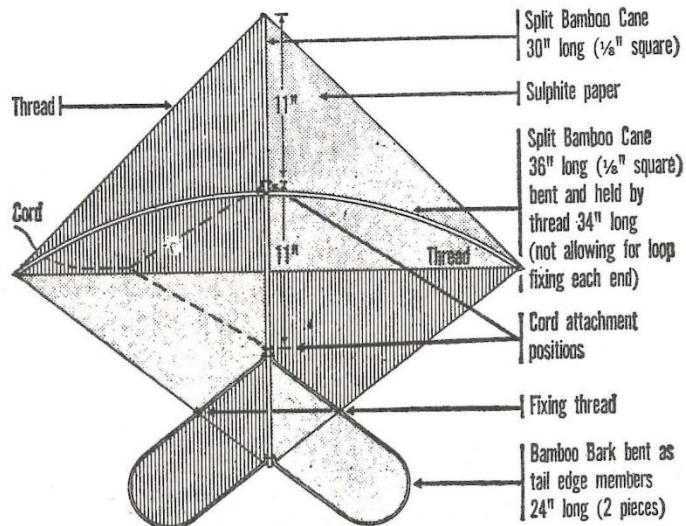
THIS is the plan of a traditional Chinese kite. The man who drew it is Mr. Peter Wong, who used to fly them in Hongkong, now an aircraft construction expert with a British firm.

None of the materials needed costs more than a few coppers. Sulphite paper can be bought from most stationers. Split bamboo is available at most ironmongers or handymen's shops. Pare it to get the bark.

Ordinary sewing cotton will do for the joints.

Start by making the frame and joining it together with cotton. Then glue on the paper.

13

Letters to the Editor

Sir,

In view of the recent additions, deletions and alterations to the just published Telephone Directory may I respectfully suggest that in future issues the printers should use triple spacing. Alternatively it might be cheaper in man-hours to reprint the complete Directory ?

MICRO PEN.

Sir,

The Laboratory's Training Officers offer the following comments on Mr.Kerr's letter in the September issue of ORBIT' regarding "Technical Tutorial Sessions".

Firstly, we entirely agree with the Editorial comment that it would be impracticable to deal adequately in Orbit with this type of subject. There are obvious difficulties with regard to the diversity of subjects and levels being studied.

In the past, Tutorial classes have been organised in certain subjects in collaboration with A.E.R.E. but have tended to lapse during the last twelve months due to insufficient support.

Apart from choice of subject matter there are also difficulties with such things as mutually convenient times for Tutors and Students but arrangements could be attempted if there is sufficient demand.

T.F.Gubbins
A.H.Fryer

Sir,

It is interesting to notice that in 1706 Newton wrote in the Opticks, page 394:

"There are therefore Agents in Nature able to make the Particles of Bodies stick together by very strong Attractions. And it is the Business of experimental Philosophy to find them out."

I suggest that we should have a plaque in the entrance hall of R1 bearing the above words.

E.R.Harrison

'Go away' ?

Overhearing two ardent horse lovers arguing over the respective merits of their mounts, a rich man offered to organise a race between them. However, his prize of £1,000 was to go to the second horse crossing the finishing line.

The race began with the horses doing a modest jog trot and half way round the course they came to a halt, neither rider being willing to set off again. They explained their predicament to an interested tramp lying at the side of the track. The tramp said two words.

A minute later the horses were racing like mad for the line. What were the two words the tramp said ?

No he didn't. For the correct answer, see bottom of page 16.

Standing room only :

Rutherford Laboratory Vacancy Notice L112 lists among the qualifications for the post of Shift Plant Assistant -

"The successful applicant will be required to stand for long periods ... "

PERSONNEL NEWS

Dr. Clarke

Dr.A.C.W.V.Clarke took up his appointment as Head of the National Institute Central Administration and Finance on November. He has been seconded from the Atomic Energy Authority and is a member of the N.I.R.N.S. Executive Committee. His office is in Building R25.

Dr. Clarke is 51 years of age and is married with two sons and a daughter. He was educated at Westminster School and King's College, London where he obtained his Doctorate in Engineering in 1938. He served in the Royal Engineers from 1935 to 1945 and afterwards started his career as an engineer in the Post Office. He joined the Atomic Energy Authority on its inception in 1954.

Comings and Goings

Dr. E Friedman joins PLA Nuclear Physics: S Gregory and M H Oubridge join PLA Engineering.

T N Gover joins Atlas Programming; J A Sargent joins Atlas Operations.

N K Crossley joins Central Engineering; P Pennington joins Nimrod Machine Engineering.

D A Wheeler joins High Magnetic Fields; Mrs E Ford and R P Jonsen join Theoretical Studies.

R B Thomson joins HEP Engineering; Miss T A Wells joins Personnel; R T Benbow joins Bubble Chamber Group.

M J Dorrill, B Higgins, W T Rose, S J Ruddle, G O E Shand, G.G.Vaughan and P L White join as Craft Apprentices.

* * * *

Miss M J Trigwell, D K Gibbs, M J Hackett, G H Horton, W J Hughes, B F O'Regan, P Whelan, J.H Medley and G Slaymaker have left us.

D.B.Gregson has transferred to the Daresbury Laboratory.

Suggestion Awards

At the twenty-first meeting of the Rutherford Laboratory Suggestion Awards Committee held on 28th October, 1964 the following awards were made:

£1 10s 0d. to G A Taylor whose suggestion to construct a pathway from R.18 north entrance to the car park has been adopted.

£1 10s 0d. to C D Moreton for his proposed modifications to the tail lift of a lorry which has been adopted.

£1 10s 0d. to J Townsend whose suggestion to modify the door closers in R.32 has been adopted.

B.Briscoe, Secretary.

Congratulations to–

Alan Astbury, N2 team, on his recent marriage.

Ted Wilson, Nimrod Beams Physics Group, and his wife Monica, on the birth of a son, Martin Andrew, on 29 October.

John Coupland, Variable Energy Cyclotron Group, on his marriage on 14 November.

Editorial Board

Bob Hopgood, Atlas Laboratory has succeeded C L Roberts (Robbie) also of the Atlas Laboratory on the Orbit Editorial Board.

John Wilkin's Prize

The John Wilkins Prizes for 1964 were presented by the Director at the Staff Meeting on 25 November.

The Engineering Apprentice Prize went to Frank Gold who chose "An Introduction to Transistor Circuits" and "Transistors: Theory and Circuitry". His citation read "Mr. Gold joined the Laboratory in September, 1963 and is at present undergoing training as an electrical student apprentice. He has maintained a very good standard throughout his first year both in practical and academic work and has shown that he is developing the personal qualities to be expected in a potential professional engineer. He has obtained two distinctions in his ONC examinations and is now reading for a B.Sc. in electrical engineering at Queen Mary College, London."

The Scientific Assistant Prize went to Christopher Ediss who chose "Radio Designers Handbook." His citation read "Mr. Ediss joined the Laboratory in September, 1961, as a Scientific Assistant and is now a member of the NIMROD Machine Physics Group. He has studied hard at Reading Technical College passing S2 (ONC) Chemistry and S3 (ONC) Applied Physics in 1961-62, A1 (HNC) Applied Physics in 1962-63 and A2 (HNC) Applied Physics in 1963-64. He is now studying endorsement subjects at HNC level leading to exemption from the Institute of Electronic and Radio Engineers examination. In July this year he was promoted to A.E.O. Mr. Ediss has well justified his selection for a John Wilkins Prize."

John Wilkins, a Senior Principal Scientist in charge of the Nimrod Magnet Group, died in a car accident on 17 October, 1962 while on official business in Zurich. He had made an outstanding contribution to the success of the Nimrod project. A sum of £100 was contributed to his Memorial Fund and the Trust Deed establishing the John Wilkins Prize was officially drawn up in 1963. It provides for prizes in the form of books to be presented each year to an engineering apprentice and a scientific assistant employed at the Laboratory.

Record Programmes

Programmes will be held every Tuesday in December at 12.30 p.m. in the Lecture Theatre.

1 Dec:	Brahms	Symphony No. 2
8 Dec:	Gershwin	Porgy and Bess (Overture)
	Prokofiev	Peter and the Wolf
	Bernstein	West Side Story (Ballet Music)
15 Dec:	Glenn Miller	Memorial Programme
		(To mark the twentieth anniversary of Glenn Miller's death on 15 December 1944)
22 Dec:	Handel	Messiah (Christmas Music)

Mark Tyrrel

Mark Tyrell is the first member of the Laboratory staff to be awarded a Diploma in Technology. After obtaining three A-levels at Norwich City Technical College, Mark joined A.E.R.E. as a Scientific Assistant in September, 1959 and started work in the Bubble Chamber Group of Accelerator Division. He continued with day-release studies and in 1960 was accepted by Borough Polytechnic for a sandwich course leading to a Dip.Tech. in Applied Physics. In January, 1961 Mark joined the Institute and later that year gained one of the first batch of Institute awards for full-time study. Mark has spent his industrial training periods in Radiological Protection, Bubble Chamber and Nimrod Beams Groups and has now joined the Nimrod General Physics Group. We wish him every success in his future career.

Answer from page 14: "Swop Horses".