15th Issue

ORBIT

September 1963

The Journal of the Rutherford High Energy Laboratory

On Tuesday 27th August 1963 the 7GeV Proton Synchrotron

NIMROD

reached design energy for the first time.

The Experimental Log for 27th August reads –

1723 hours	**Acceleration to 6·5GeV**
1830 hours	**Maximum energy of 8GeV attained**
1900 hours	**Acceleration of 10^{10} particles per pulse to 7GeV**

MESSAGE FROM THE CHAIRMAN OF THE GOVERNING BODY OF THE NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

'I send my congratulations to all those who have played a part in the very successful operation of Nimrod, and in its design and construction over the past six years.

In the early days we encountered some of the delays and disappointments which occur in nearly every great project. But you are now ahead of the time-table which was set in 1961 and the total cost of Nimrod will be within the forecast made then. These results have, I know, only been achieved by much hard work.

I am confident that you are all determined to achieve reliable operation at the full beam current and to provide for all the needs of high energy physics experiments. You will embark on this task with the encouragement of a job very well done.'

LORD BRIDGES.

MESSAGE FROM THE DIRECTOR

'The construction of Nimrod really started in July 1957, when Sir John Cockroft cut the first sod on the site and the bulldozers moved in. Although design work had been started earlier, no part of the machine had yet been ordered. As it happened, I did not witness this simple but important ceremony because I was visiting a potential contractor for an important component of the machine. Just over 6 years later, when acceleration to full energy (and beyond) was achieved for the first time, I was away on holiday in Ireland. I confess that when I fixed the date of my holiday (well in advance because of shipping reservations) I thought the machine would not be ready to operate until after my return. Thus I missed two of the more significant occasions in the history of Nimrod, although I was on hand during a substantial proportion of the intervening time.

The completion of Nimrod is, of course, an occasion of the utmost importance for everyone in the Laboratory, and not just for those who have worked so hard on it for so long. We can now work to spread throughout the Laboratory the virile research atmosphere which, so far as our main line of research is concerned, has been created and fostered around the P.L.A. The transition from construction to research is not an easy one and cannot be made to occur suddenly. But a start was made on it long ago, and increasing numbers of our people have been transferring their efforts from the machine to beam equipment, particle detection equipment and the preparation of experiments. That we can fulfil our purpose is assured by the rapid growth of university activity in this work in the last year or so. It now seems clear that progress in high energy research on Nimrod will be limited only by the capacity and performance of the machine, and not by the number of physicists in the universities and the Laboratory with good ideas for experiments and the will and energy to carry them through.

The next stage, which will occupy the rest of 1963 and a part of 1964, is to develop Nimrod into a reliable instrument with optimised performance,

and to adapt our individual skills and experience, and our organisation, to make the best use of it. We hope that from January 1964 we shall schedule Nimrod for high energy physics for half its running time, the remainder being devoted to machine development and commissioning its ancillary equipment. After the middle of 1964 the proportion of research time will be increased according to the needs of the programme and the performance of the machine. For the remainder of 1963 "unscheduled" particles will be available to high energy physicists during machine development time.

It is difficult, perhaps, for people not concerned with such a project as Nimrod to believe that it can be exciting when it lasts for 6 years and involves much drudgery for those who work on it. But it has been exciting, in the fullest sense because it has had its share of uncertainties and hazards to give the right taste to the many successes which were achieved periodically during the progress of the work. Indeed there were times, critical periods for some of the more hair-raising technical problems, when the excitement became almost too intense. We all have our particular memories, but for me the threshold of pain was reached at a certain moment in the history of the vacuum vessels.

I thank all who have contributed to this success for their hard work and devotion to the job; members of the Laboratory, colleagues in the universities, U.K.A.E.A. staff at A.E.R.E., Oxford, Risley, Tadley and the London Office, and our many contractors at home and abroad. We owe a special debt to the group and section leaders at the Laboratory who took responsibility, often very heavy, and must think especially at this time of John Wilkins, one of the principal creators of Nimrod, who tragically did not live to see the proof of his wisdom and the results of his hard work.'

T. G. PICKAVANCE.

In the Control Room

If all the expectancy which had been accumulating during the making of Nimrod had been present in the control room it would have burst. It's no good pretending that the atmosphere was proportionate to the occasion - it could not be - otherwise the crew would have burst too. Yet there was expectancy.

During the preceding two weeks the commissioning team had been making serious attempts to accelerate to 7 GeV. At the end of the second week there had been acceleration, but only a few times up on the injection energy of 15 MeV. Then during the afternoon of Tuesday 27th August there was very substantial progress. Nimrod went to about 3 GeV. In characteristically deflationary style the word went round that Nimrod had graduated from being the highest energy machine in Berkshire to the highest in England. The long reign of the synchrotron at Birmingham University had ended.

From then on the control room started to fill up. But getting a synchrotron to fire on all cylinders is inevitably a tedious process. The expectancy is there certainly, but you don't know what to do with it. At the most there seem to be about three people who really know what is going on and what they are supposed to be doing. This they do with an enviable purposefulness. The rest stand or sit around chatting or occasionally dropping into earnest technical discussion. One lean high-energy physicist was exceptional. He never ceased pacing between his own instruments and the awkwardly-placed beam measuring oscilloscope to demand an explanation in words of one syllable of the nature of the hold up.

It is all a question of luck. Not, of course, the machine's ability to accelerate but the precise moment at which it happens the first time. One is really prodding a great intractable mass of statistics. Far too many things must all work simultaneously for the machine to accelerate and it is beyond anyone's powers to predict it precisely.

Towards the end of the afternoon we seemed to

IN THE CONTROL ROOM - (cont'd)

be running short of luck. Nimrod was certainly stirring in his sleep but on the slow sweep of the oscilloscope the thick line which meant accelerated beam simply would not go far enough across. Two main forces were at work. In the long, dimly lit, control room, hunger and the prospect of a long evening's run were driving people away from the flickering oscilloscopes and winking lights to the more tangible satisfactions of the restaurant. But next door in the primary frequency room a modest Nimrod wizard was at last getting the hang of the frequency programme. Suddenly we noticed the thick bright line on successive traces was slowly but inexorably creeping out to the right. A click on the time-base control enabled us to pin point the 7 GeV position and watch the miracle happen. For a brief hypnotic interval the bright tongue of light reached out, stroke after stroke, to the full energy point. There was a restrained but heart-felt cheer, broad smiles everywhere and a few hand-shakes exchanged. Suddenly the "beam-off" button was pressed. It was necessary to proceed more cautiously in case we were creating a new radiation hazard. There followed a triumphant half-hour or so during which the energy was coaxed up to 8 GeV. We had crossed the watershed into high-energy physics.

T R WALSH.

People have often said to us
"If I could find a top quality
accelerator at a more
attractive price and
in a size that
suits me, I
would buy it."

So NIRNS introduce NIMROD,
A quality accelerator,
In a convenient size,
At a price you can afford.

NIMROD
-for physicists who know-
QUALITY - MATTERS - MOST

£140,000,000 for 20.

The Mythical Nimrod

L H Urwin

R L Whyl

There are three Nimrods known to us at the Rutherford Laboratory. Firstly the proton synchrotron, which has just produced a full energy beam for the first time and will shortly be used for fundamental nuclear studies; next the statuette which many hope will be the model for a larger sculpture, and thirdly the mythical figure of Nimrod, the legendary hunter from the ancient civilisations of the Middle East.

The Nimrod myth seems to have taken form in the lands of southern Mesopotamia, now Iraq, some 4,000 years B C This was the country of the Sumerians who built their cities of Eridu and Ur close to the banks of the Euphrates who invented writing and who developed a powerful civilisation contemporary with that of Egypt.

"And Cush begat Nimrod: he began to be a mighty one in the earth." (Genesis X:8) - so it is written in the early chapters of the Bible It continues: "He was a mighty hunter before the Lord: wherefore it is said even as Nimrod the mighty hunter before the Lord. And the beginning of his kingdom was Babel and Erech and Accad and Calneh, in the land of Shinar." This biblical passage seems to be one of the first references to Nimrod, though legends concerning the "mighty one" can be traced back to Sumerian times.(1)

THE MYTHICAL NIMROD - (cont'd)

Nimrod - from a legendary hunter descended from Noah, to a 7 GeV proton synchrotron accelerator. And here there appears to be misinterpretation of the biblical text. The text "in the earth" in fact means "in the whole of the earth", "in the entire world", as distinct from "inside the earth", which is the relevant detail as far as the accelerator is concerned. This is further substantiated on turning to Chronicles 1 : 10 where we find "And Cush begat Nimrod : he began to be mighty upon the earth."

What of the other legends surrounding Nimrod, however ? In the Koran it is related how Nimrod ascended on the backs of eagles whose pinions were burned by the sun. In Babylonian legend, Nimrod is a mythical Kassite king (biblical name Cush), who built or ruled Babylonia and adjoining lands. He was said to be a son of the national god Kashshu.

Orosius of Tarragona, a fifth century Christian writer, tells, in his "Seven Books Against the Pagans", of Nimrod and his Tower of Babel five and a half miles high, ten miles in circumference with a hundred brazen gates and four hundred and eighty storeys. He also reports that Nimrod's grandson Ninus built the city of Nineveh. This story closely resembles that told in the Midrash(2) which is the lengthiest source of information on Nimrod.

The Midrash relates the story of how Nimrod established himself as ruler of all Noah's descendants, and had built for himself a magnificent throne made of a gigantic gem set atop five other thrones of cedar wood, iron, copper, silver and gold in ascending order. From this ornate pyramid he held sway over his people.

The secret of Nimrod's power lay in the sacred garments which he first wore at the age of twenty. These were supposed to have been garments of skin made by God for Adam and Eve, and which were passed down from Noah's son Ham, to Cush, and then to Nimrod.

In time, Nimrod became so skilled in hunting and fighting, and was the victor of so many battles for his people, that he was crowned King and set about the business of governing his kingdom of Hebrew-speaking subjects. Now his power knew no bounds. He raised the Tower of Babel to revenge himself on God for drowning his ancestors, and to insure himself against any future deluge, His plan was to wage war against Heaven from the Tower and to destroy God. The tower was now seventy miles high, with seven stairways on the eastern side and seven on the western, and Nimrod's people were so consumed by their warmongering schemes that they grieved more if a brick fell from the top than if it were one of their fellow men.

Finally, the assault on the celestial powers began. The Midrash tells how, to deceive the people, God's angels caught the arrows fired at them, and threw them back covered with blood. Then Nimrod's archers cried for all to hear : "Now we have killed all the inhabitants of Heaven."(3) God was so incensed that he instructed his angels to confuse the speech of the people and from that moment none understood the language of the others. Confusion broke loose, work on the Tower was no longer possible and the builders deserted the city. The legend goes that Earth swallowed a third of the Tower and heavenly fire destroyed another third. (Some lofty mounds found near the ruins of Babylon may be part of this tower).

Although the builders of the Tower of Babel had dispersed, Nimrod maintained sovereignty over his kingdom and built more cities, taking the title of "Amraphel". His defeat and death were brought about by Esau when the two met out hunting. Esau killed Nimrod, took the holy garments from him and thenceforth was himself endowed with great strength and courage.

So goes the Hebrew legend of Nimrod, the mighty hunter who raised the Tower of Babel to challenge God in His Heaven.

Today, our project is obviously not in accordance with all the implications of the old story. What the name Nimrod does imply, however, is a link between the remote past and the present day. Nimrod, the mightiest hunter in the land, sought power and conquests on the battlefield. 6,000 years later another Nimrod prepares for the hunt, but now it is a search for knowledge and a conquest of the unknown. 6,000 years have brought about many changes, the arrows have increased in potency to 7 GeV, but what is far more important, they are no longer to be used for battle and destruction, but for exploring the nature of the universe.

Footnotes :

1. In fact, no certain historical traces of Nimrod have been found to date - Dr. Raphael Patai, Director of Research, Theodore Herzl Institute.
2. The Midrash are legendary explanations appended to Biblical stories and contained in Jewish, Hebrew or Aramaic sources dating from the 1st to the 10th century A.D.
3. Sepher Hayashar 22 - 31 ; Tanhuna Noah 18, 19.

(Further information can be found in "Hebrew Myths" by Robert Graves and Raphael Patai, to be published by Cassells & Co. Ltd.)

WHO SAID,

'RAFEL MAI AMECH ZABI ALMI' TO WHOM AND WHAT DO THE WORDS MEAN ?

THE HARWELL ACCELERATOR CONFERENCE

The following poem appeared in A.E.R.E. News on 23rd June, 1955. At the Conference, Scientists were discussing what type of accelerator to build in Britain.

A meeting at A.E.R.E.
On how to get some GeV
With no amount of trouble you
Can do this C.W.
C.G. has also had its fling
A Common-Garden kind of thing.
For Awful Gamble stands A.G.
But if it works or not we'll see.
If resonance we can't defy
The diamonds will just dot our tie.

F.F.A.G. must surely stand
For Fancy Frills are Always Grand.
Electrons I would rather leave
They lose more speed than they receive
The Linac would hardly win it,
Its house is fine but nothing in it.
Oh microgauss ! Oh millithou !
Oh megaquid (if funds allow) !
I get, when I attempt to guess
The C.R. double E.P.S.

The Dubna Conference

P D Dunn

The International Conference on High Energy Accelerators was held at Dubna, the Russian Accelerator Laboratory near Moscow, from 21st to 27th August. 300 scientists from 22 countries attended the Conference including members of the Rutherford Laboratory and the Electron Laboratory.

The Conference covered four fields – design studies for very high energy proton accelerators, storage ring designs, new ideas, and reports on existing machines and those under construction.

The greater part of the conference was spent on the application of existing machine concepts. For example, profiting from experience of the construction and operation of the present alternating gradient (A G) machines at C E R N and Brookhaven, it is now believed to be feasible to build machines of this type in the 200-300 GeV range and even up to 1,000 GeV. An interesting difference in the approach to these high energies appeared between the Russian teams and those from C E R N and the U S A. The Russian designs are aimed at reducing the aperture of the vacuum vessel and hence the weight of the magnet. In order to overcome the very tight tolerances which would result, one proposal, due to Mintz, incorporates 200 induction electrodes which measure vertical and radial betatron oscillations and apply a suitable magnetic orbit correction. This machine is known as the cybenetic accelerator and was described in ORBIT in September 1962. Other lining up techniques use heavy ion beams.

The U S A and C E R N designs employ apertures similar to those of the present A G machines and are designed for high currents, up to 10^{13} protons per pulse. The U S A team programme has been encouraged by the recent recommendations on high energy accelerators for the U S A in the Ramsey Report.

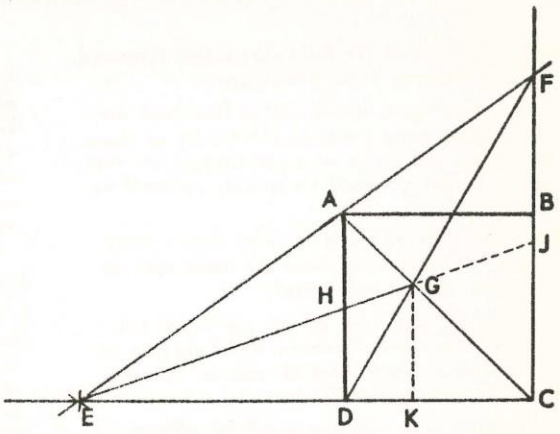
Although the greater part of the conference was concerned with the consolidation of existing techniques, some new ideas were put forward. One of these, the beehive or separated sector machine due to F. M. Russell of the Rutherford Laboratory was well received and was considered to justify further study. (An article on the 'Beehive Accelerator' will appear in ORBIT in the near future). Also the cross-bar structure, described by A. Carne of the Rutherford Laboratory, looks very promising as a structure for a high energy proton linear accelerator injector for the big machines. Another cyclotron project was suggested by Orlov in a most stimulating paper. Fainberg described some of his experimental work on plasma wave guides, though this is obviously in a very early stage.

The report that the Argonne Zero Gradient Synchrotron (Z G S) had achieved 10^{11} particles per pulse at 5 GeV was of great interest to us. The Nimrod news did not arrive until after the close of the conference but was received during the subsequent tour. The telegram which reached us stated – 7 GeV at 10^{13} particles per pulse – news which caused some surprise !

Also of relevance to Nimrod is the report by Lambertson on the results of the Bevatron rebuild. There appears to exist an upper limit to current, corresponding to 2×10^{12} particles. If higher currents (say 6×10^{12}) are injected the additional charge is lost during the first few milliseconds. This loss of mechanism is not understood but may be due to a spontaneous bunching similar to that found in certain travelling wave tubes.

Reports on the electron synchrotrons at Desy in Germany and at Yerevan in Russia, show construction well advanced. The Cambridge Electron Accelerator (CEA) in the U S A is reported to be operating so well that parts of the vacuum chamber require replacement every 300 hours due to radiation damage.

A SOLUTION TO THE PROBLEM ON PAGE 9 OF THE AUGUST ISSUE OF ORBIT.



Let the side of the square A B C D be 'a'. We are required to prove $AH = HD = \frac{a}{2}$

Put $EC = x$, $FC = y$.

Draw G K perpendicular to D C and put $DK = z$

The triangles A E D and F E C are similar therefore $\frac{AD}{ED} = \frac{FC}{EC}$

$$\frac{a}{x-a} = \frac{y}{x} \qquad \ldots\ldots (1)$$

The triangles D K G and D C F are similar, therefore $\frac{GK}{DK} = \frac{FC}{CD}$

Since A C is a diagonal, $GK = KC = a - z$ $\qquad \frac{a-z}{z} = \frac{y}{a} \qquad \ldots\ldots (2)$

Eliminating 'y' from (1) and (2) $\qquad \frac{ax}{(x-a)} = \frac{a(a-z)}{z}$

Multiplying across and dividing by 'a' $\qquad xz = (a-z)(x-a) \qquad \ldots\ldots (3)$

$$= ax - xz - a^2 + az$$

$$2xz = a(x-a+z) \qquad \ldots\ldots (4)$$

The triangles E D H and E K G are similar, therefore $\frac{HD}{ED} = \frac{GK}{EK}$

$$\frac{HD}{(x-a)} = \frac{(a-z)}{(x-a+z)}$$

$$HD = \frac{(a-z)(x-a)}{(x-a+z)}$$

From (3) and (4) $\qquad HD = \frac{xz.a}{2xz} = \frac{a}{2}$

therefore $\qquad \underline{\underline{HD = AH = \frac{a}{2}}}$.

STILL MORE ADDRESSES :

OVER THE PAST TWO MONTHS WE HAVE BEEN ADDRESSED AS – BROTHERHOOD HIGH ENERGY CO.; RUTHERFORD HIGH TEMPERATURE LABORATORY AND MESSRS. CONCRETE LTD., R 19 FIELD R 12. (YOU TELL ME). CORRESPONDENCE ALSO ARRIVED 'FOR THE ATTENTION OF MR. NIMROD, R.F. GROUP.'

'Give yourself a Shock and you'll feel younger'

Under this headline the following letter appeared in the Sunday Express some weeks ago –

' Thirty years ago a doctor called Overbeck discovered that the body lives on electricity at about 12 volts. When you arrive at a certain age, he said, you can no longer generate electricity yourself so you become old.

But if you give yourself 12 volts from a small dry-battery, you can keep about the same age, as far as I know, almost indefinitely.

I am now 84 years old, but no one would take me for more than about 65 years, and I am just as fit as ever I was. I have had an "intake" of electricity every morning for 20 years.

The method is to attach a wire with an aluminium hook to the positive side. This is looped round the big toe.

An aluminium comb is attached to the negative. With this the head and hair are combed on the opposite side. Then transfer, after about 5 – 7 minutes, to the other toe and side of head.

This treatment rejuvenates the brain and the the whole nervous system. Usually it "puts the clock back" about 10 years.

Major C.H.A. Hirtzel,
The Hermitage,
Pine Grove,
Weybridge,
Surrey.'

– – – –

Major Hirtzel, O.B.E., (Late R F C and R A F Engineer), Elec., Mech., Automotive and Aero Engineer, M.S.A.E.(U.S.A.), Freeman of Exeter, sent along the following additional information.

' Dr. Overbeck marketed a most elaborate apparatus before the last War, but this has disappeared.

Since my letter appeared in 'The Sunday Express' and I was interviewed and gave a demonstration on Television, I have been inundated with applications. Everyone over a certain age wants to 'put the clock back.' I have been making up a simple apparatus for my friends, which accomplishes this feat most effectively, but I have been caught so unexpectedly by this onslaught that it took a little time to get organised and to obtain the necessary batteries and aluminium combs. I have been compelled to set up a new business

I can only supply the set at two guineas, plus 5s.0d., postage and packing, (cash with order) and will do business in no other way. I have worked on this thing for many years and have put in a lot of time on the idea, which works ! In 20 years I have proved its efficiency. I am not much older than when I started. No-one will believe my age.'

– – – –

Also enclosed were 'Instructions for use of Rejuvenator.'

1. When the comb and hook are connected to the battery, they must not touch, otherwise, if there is a 'short circuit' the battery will be injured and shorten its life. If kept in a cool dry place, it will last almost indefinitely as, in ordinary use, nothing is taken out of it.
2. The aluminium comb is left usually connected to its negative socket.
3. Then keeping the aluminium hook well away from the comb, connect the plug (RED) to the other terminal. Hold one in each hand for a time. Then hook it round the big-toe, and gently comb the hair, commencing with the eye-brows and gradually work up to the back of the head and behind the ears.
4. When this has been done for about 5 to 7 minutes, change the hook over to the other toe and repeat the action by combing the opposite side of the head.
5. It can be done once or twice a day, to suit the patient, but it is extra soothing when tired or rheumatic pains are felt.
6. After about a month or two, your friends will notice that you appear more alert and youthful. The hair will also be improved enormously.
7. There is no 'SHOCK' ! In fact unless kept in one place for a longish period it can scarcely be felt at all. It cannot possibly do any harm unless it is overdone, when it might increase the blood-pressure.
8. If the patient suffers from 'INSOMNIA', it is very soothing and induces sleep.

MAGNETS RIPEN TOMATOES

POWERFUL MAGNETS MAKE TOMATOES RIPEN FASTER, TWO AMERICAN SCIENTISTS CLAIM IN A PAPER PUBLISHED IN 'NATURE'. SAMPLE TOMATOES WERE KEPT IN DARKENED 'RIPENING' CHAMBERS. SOME WERE PLACED BETWEEN THE POLES OF POWERFUL PERMANENT MAGNETS, WHILE THE REST RIPENED NORMALLY. THE 'MAGNETISED' TOMATOES WERE SOON ONE OR TWO DAYS AHEAD OF THEIR UNMAGNETISED FELLOWS.

THE ODDEST FEATURE OF THE EXPERIMENT IS THAT THE TOMATOES NEAR THE MAGNETS' SOUTH POLES RIPENED FASTER THAN THOSE NEAR THE NORTH POLES. THE SCIENTISTS, BOE AND SALUNKHE OF UTAH UNIVERSITY, SPECULATE THAT THE MAGNETS MAY AFFECT THE TOMATOES' RESPIRATION.

Outside Hours

Variable Stars and the Amateur Astronomer

R F Churchhouse

Although most of the stars have remained at constant brightness over a long period of time some have been known for centuries to be of variable brightness. The earliest such star was probably Algol, in the constellation of Perseus; the very name, which means "the demon", indicates what the ancient Arabs thought of it. Algol varies from magnitude 2.2 at maximum to 3.5 at a minimum in a regular period of about 2 days 21 hours. The change is easily seen and no telescope is required. Almost any star chart will show Algol and an observation a few hours before a minimum followed by a second observation at minimum will reveal the variation in which the star's light at minimum is only about 30% of its normal light. Minima of Algol are due at about 11.40p.m. (G.M.T.) on 12th October and at 8.30p.m. (G.M.T.) on 15th October. Earlier and later minima can be found by subtracting or adding multiples of the basic period which is close to 2 days 20 hours 49 minutes.

The variation in Algol's light is due to the presence of a smaller, darker companion star which comes between Algol and the Earth every 2 days 21 hours approximately and so cuts off some of the light. Algol is an example of an extrinsic variable, i.e. a star whose variation is caused by another star eclipsing it. Of much greater interest are the intrinsic variables whose variation is due to physical changes within the stars themselves. These are the stars which are observed by amateur variable star observers of the British Astronomical Association. The intrinsic variables include many sub-classes of stars some of which are quite erratic, some are semi-regular, and others are more or less regular.

The reasonably regular stars include the Long Period Variables. These stars are among the most common types of variables, although only a few can ever be seen without a telescope. They vary in brightness over a period of about a year and the total light change is usually about 4 or 5 magnitudes, which means that the light at minimum is only about 1% of the light at maximum. Thus a star such as Mira Ceti, which at maximum is easily visible to the naked eye, can only just be seen in a four inch telescope at minimum. Mira ("the marvellous") was the first long period variable to be discovered, by Fabricius on 13th August, 1596. Mira has a period of about 331 days. The intervals between successive maxima may be as short as 300 days or as long as 360. In addition, the brightness at maximum can vary by over a magnitude. Most of the long period variables are red giants and, at certain phases of the light curve, look very red indeed which makes it difficult to estimate how bright they are.

The erratic variables include stars which explode at pretty irregular intervals, the rise in brightness occurring in a few hours. Thus the dwarf-nova SS Cygni averages about 7 maxima a year, but in 1961 it produced about a dozen. When caught in the act of exploding it provides a fine sight: on 9th December 1961, when quite new to variable star observing, I had the good luck to see SS Cygni rise sharply between 6.00p.m. and 9.00p.m. SS Cygni, discovered in August 1896, is the most intensively studied star in the sky. Only by keeping a full record of its light curve for many years can we hope to find the explanation of its extraordinary behaviour. Other erratic variables include a class of stars, called the R Cr.B (for R Coronae Borealis) variables which are normally bright but occasionally plunge several magnitudes and then slowly recover. The interval between plunges may be 3 months or ten years and seems to be totally unpredictable. Another class of erratic variables includes the recurrent novae, about 6 or 7 are known. These remain quiet for decades and then rise spectacularly in a few hours, fading during a few weeks or months.

The study of variable stars provides very interesting and useful work for amateurs. The work is organised by the B.A.A. and anyone can join, a small telescope is all that is necessary. Excellent charts of the area of the sky near the variable are provided free. The method of estimating the brightness of the variable is as follows: find 2 stars near the variable one of which is brighter, A, and one of which is fainter, B, than the variable, V. Estimate the brightness of the variable in terms of these two e.g. "one-third of the way from A to B." The magnitudes of A and B being known, the magnitude of V is then estimated. Repeat, if possible, using 2 other stars C, D. This method, which seems crude, gives surprisingly good results after a little practice. Copies of all observations are sent to the B.A.A. every year and all results are collated, analysed and subsequently published.

At first there are a few hazards: the job of finding a faint star against the background of the Milky Way can be a test of patience; the temptation to stay indoors on a cold winter evening can be strong; the neighbours will at first regard you as an eccentric; but it is all well worthwhile. If anyone would like further information I will be glad to advise them.

On October 17th Dr. Churchhouse will be talking about Variable Stars in the Thursday Evening Lecture Series.

Personnel News

Suggestion Awards

The twelfth meeting of the Rutherford Laboratory Suggestion Awards Committee was held on Thursday, 22nd August, 1963 and awards totalling £19 were made.

An Award of £5 was made to Mr. T. Morgan for his proposals in respect of the provision of an access ladder for the radial crane in the Magnet Room.

An Award of £2 was made to Mr. A. Paley whose suggestion had prompted action to remove the hazard caused by the positioning of water taps immediately above electric cables.

An Award of £2 was made to Mr. A.M. Jackson for his proposed modifications to the fastenings of white Lab. Coats which previously could have occasioned some danger to the wearers, especially by the wearing of loose or open coats when operating machinery.

An Award of £2 was made to Mr. A.V. Wells in respect of his suggested adaptation of certain window fastenings which were a hazard to the safety of people passing by.

An Award of £4 was made to Mr. F. Abbott and Mr. B. Rowe for their design of a Flight Tube Connecting Flange which has now been adopted for use in Flight Tubes of the Injector and Inflector systems.

Encouragement Awards of £1 each were made to the following whose ideas, it was felt, merited recognition :-

Mr. M. Kershaw	- Radiation Protection, R.29.
Mr. D.A. Hutchings	- Non-Magnetic Screwdrivers.
Mr. P. Parry	- Lathe Chuck Hoist.
Mr. L.G. Denton	- Safety Precautions, Window Cleaners.

D G J ROSE

Comings and Goings

R. J. Baker joins High Energy Physics Engineering; V. C. Cloke and R. J. Elsey join Nimrod Engineering.

Dr. J. A. Hartigan and Dr. D. B. Russell join the Atlas Laboratory on fixed term appointments.

Miss B. Stokoe, B. E. Cooper, F. R. A. Hopgood, E. B. Fossey and G. L. Turner join the Atlas Laboratory.

Dr. B. V. Bugg joins High Energy Physics and E. C. Sedman joins Theoretical Physics on fixed term appointments.

Mrs. J. M. Stammers and B. P. G. Rowe have left us.

F. J. Welch has retired.

Dr. R. L. Clark has completed his fixed term appointment.

Congratulations to -

Pat Timmins of Travel Section on her marriage to David Rossiter on 31st August.

Frank James, of the Electron Laboratory, and his wife Ursula on the birth of a son Richard on 16th September.

A Date for your Diary

On Friday, 1st November an Informal Buffet Dance will be held in the Laboratory Restaurant.

Further details later.

THE OPENING SENTENCE OF THE ABOVE SECTION ON SUGGESTION AWARDS EMERGED FROM TYPING AS 'THE TWELFTH MEETING OF THE RUTHERFORD LABORATORY SUGGESTION AWARDS COMMITTEE WAS HELL ON THURSDAY, 22ND AUGUST . . . . .'

'THE OBJECT OF A MEETING IS NOT TO SOLVE THE PROBLEM IN HAND BUT TO IMPRESS THE PEOPLE THERE. AND FOR THIS PURPOSE, OF COURSE, THE LONGER THE MEETING THE BETTER. IF YOU ARE NEW TO BUSINESS, YOU HAVE SMALL INKLING OF THE MANY HAPPY HOURS WHICH LIE AHEAD, THE LITTLE GLOWS OF TRIUMPH, THE CAMARADERIE, AND THE TINGLING HEADY SENSATION OF HEARING YOUR OWN VOICE.'

'HOW TO SUCCEED IN BUSINESS WITHOUT REALLY TRYING'
SHEPHERD MEAD.