9th Issue

ORBIT

March 1963

The Journal of the Rutherford High Energy Laboratory

The British National Hydrogen Bubble Chamber

M Snowden

Perhaps it was as a consequence of a mention of the bubble chamber in the House of Lords and the North Berks Herald on the same day that this article for ORBIT was requested with the idea of adding a little history and local colour to the recent press release.

Soon after the start of the excavation work for NIMROD representatives from Birmingham, Liverpool, London (Imperial College) and Oxford Universities met with Professor Butler as chairman to discuss plans for building a large hydrogen bubble chamber in this country. The size of chamber favoured at this meeting was 150 cms x 50 cms x 45 cms and a magnet power of 4 MW received a casual mention in the minutes. Surprisingly these figures still apply to the completed chamber now en route to CERN.

By mid-1958 working parties assembled at the Universities had carried the design to a stage where cost estimates could be submitted to DSIR. Soon afterwards the question of deciding at which University the bubble chamber should be constructed was resolved, the Rutherford Laboratory being also invited later in the year to arrange the supply of magnet power and cooling, high pressure hydrogen supply and purification and a safety vessel for containment of the hydrogen in the event of a failure of the chamber. Plans for housing the bubble chamber and ancilliary plant were therefore developed during 1959 and after a fleeting period on the site of the present Jellicoe Clumps the buildings settled down to their present positions with the Annexe adjoining the Experimental Area and the Plant Room alongside the Preparation Area.

The magnet was designed at Birmingham University and on tests here during 1961 gave more than 12,000 gauss over the volume of the chamber. It was shipped to CERN early in 1962 to allow more room in the Annexe for chamber tests and has now been reassembled and run at CERN. Movement of the complete magnet and chamber weighing over 300 tons is achieved by mounting the yoke on a number of assemblies of ball castors running on the hardened steel plate floor specially laid over the required part of the Annexe.

THE BRITISH NATIONAL HYDROGEN BUBBLE CHAMBER - (Cont'd)

Sceptics of this system of transportation were ready with suggested names for it had it not worked but in practice it has proved to be very satisfactory.

Approximately 3 KW of refrigeration at liquid hydrogen temperature was provided by the refrigerator which was installed early in 1961 in the Annexe and supplied with high pressure hydrogen from the Plant Room. Initial tests were made before the bubble chamber was ready, using a heat load, one of those rare occasions when catching cold is a pleasure.

The chamber body designed by the Liverpool team was machined from the largest Mg 3, aluminium alloy, casting made in this country and has a finished weight of 2.9 tons. Its super-smooth finish must be the envy of all film star bath manufacturers. Gaseous expansion from the top of the chamber via a 48 pipe manifold is used with diaphragm compressors for recirculation of the hydrogen.

A straight through optical system devised at Imperial College requires two large glass windows on the sides of the chamber which weigh almost a ton and are sealed by inflatable gaskets. Hydrogen shields connected to both window flanges afford protection in case of a window failure while heat losses are reduced to a minimum by using a further shield around the chamber maintained at liquid nitrogen temperature. The whole assembly is then surrounded by a large stainless steel vacuum tank weighing 23 ton and maintained at a pressure of 10^{-6} torr using conventional pumping arrangements.

Any fault resulting in rapid boil-off of the liquid hydrogen causes the chamber system to be connected via a 10" diameter vent line to a 4600 cu.ft. dump tank recessed in the earth mound outside the Annexe. Both the Plant Room and Annexe have detectors to indicate any hydrogen leaks and in the latter high speed fans can be switched in to give rapid ventilation. In the Plant Room however fresh air is the order of both day and night and 'Poor Tom's a' cold' was a frequent cry on the night shift this January.

The controls were designed at Imperial College, some being mounted on a platform over the Bubble Chamber and the remainder in the Control Room. Besides initiating the circuits involved in expansion and recompression of the bubble chamber the timing sequence must also flash the illumination system and operate the three stereo cameras used for photographing the bubble chamber tracks. During an experiment film will be exposed at the rate of over 3 kilometres per shift.

During the past three years the Universities built up a group of about twenty staff at the Rutherford Laboratory for commissioning and operation of the bubble chamber. After the initial testing of component parts the installation of the chamber was completed and cool down tests started late last year. It was not however until about the middle of the Big Freeze when most people were grumbling at temperatures of $-15^{\circ}C$ that sounds of rejoicing were heard in the Annexe at the sight of liquid hydrogen raining into the chamber at a temperature of $-246^{\circ}C$. Very soon visible evidence of success was afforded by photographing tracks formed by a pulsed gamma ray source; the second largest hydrogen bubble chamber in the world had worked.

It is now full speed ahead for CERN and already loads of equipment have left some by road and some by air from Abingdon. At CERN a special high momentum separated beam is being constructed in the new East Experimental Area for use with the British National Hydrogen Bubble Chamber which will stay in CERN for important experiments on the 25 GeV P.S., returning for experiments with NIMROD in 1964 using beams generated from the external proton beam.

Meanwhile the Heavy Liquid and Helium Bubble Chamber Projects are coming to the boil and their sponsors bubbling over with ideas for experiments. Others may quake at complement cuts and tremble at Treasury trends but bubble chambers live by expansion.

The Helium Refigerator

A liquid helium refrigerator costing over £100,000 which is the largest in the world has been ordered by NIRNS from the British Oxygen Company. The refrigerator is for use with the liquid-helium bubble chamber which is being constructed at the Rutherford Laboratory.

The refrigerator, running continuously, will keep £1000 worth of liquid helium at $-270^{\circ}C$, with an accuracy of $0.05^{\circ}C$, for as long as 30 days. Part of the mechanism used to reach these low temperatures, only $3^{\circ}C$ above absolute zero, is two tiny turbines, running at supersonic speeds. No oil could be used to lubricate the turbine bearings at these very low temperatures and at 350,000 revolutions per minute, lubrication is essential. So a film of helium gas is used to suspend the turbine spindles in mid-"air". The plant will be completely independant of pre-cooling fluids such as liquid nitrogen.

The helium bubble chamber itself is being designed and constructed by a joint team from Oxford University and the Rutherford Laboratory. It will be the biggest of its kind in the world and cost approximately £300,000.

The Accelerator World

Oxford Protest

Mr. P. A. Brunt, Dean of Oriel College and Editor of the 'Oxford Magazine' challenged the building of the new nuclear physics laboratory in Oxford in the latest issue of the magazine.

The new laboratory will house what we know as the Electrostatic Generator Project. Mr. Brunt pointed out that the first three phases of the development programme will provide 96,000 sq. ft. for the Nuclear Physics Department none of which provides space for undergraduate teaching. This comes in the forth phase at a date not yet fixed when 39,000 sq.ft. will be provided for a lecture room and teaching laboratories.

Mr. Brunt comments: "Perhaps the 'traditional balance of undergraduates and research' is not the right balance. But can it really be said that this department will not disturb it? And more than this, are we looking far enough ahead?

"What will happen when the machine under construction, tower and accelerator, becomes obsolescent? When is this likely to be? In five years, or in 15? We wonder if the Department of Scientific and Industrial Research intends to put up money for such apparatus in universities in the future, rather than in national research institutes. We should also like to be assured that the university will not be obliged to find money for the project which has not been earmarked for it, at the cost of starving other well-established science departments in their essential work.

"It is also worth casting an eye on the staffing of the physics departments ... The department of nuclear physics with the responsibility for teaching at most one fifth of the Honours syllabus has nearly two fifths of the staff, and far the greater proportion of its staff are senior research officers or research officers, who can indeed be called on to do some teaching ... But of course, the present nuclear physics staff will hardly suffice for the vast building projected. Already, we are told two new Chairs have been asked for."

On the 12th March Oxford University in Congregation accepted an offer from the Department of Scientific and Industrial Research to finance the establishment of two additional professorships in nuclear physics at Oxford. One will be in nuclear structure, the other in elementary particle physics.

Men of great ability were needed to fill the posts, said Mr. A. L. P. Norrington, President of Trinity College but as they were closely connected with the useful life of the new machines and equipment, they would lapse at the end of the tenure of the first holders. They bring the total of professorships concerned with physics to six, three of which are concerned with nuclear physics.

New Board Member

Professor C. F. Powell F.R.S., of Bristol University has been appointed to the Board of the National Institute in succession to Professor D. H. Wilkinson F.R.S., of Oxford University, whose term of office recently expired.

New Uses for Accelerators

A 4 MeV electron accelerator originally built for particle physics, at the Massachusetts Institute of Technology, is now being used to sterilise human bone grafts obtained from corpses.

Nine surgical centres send frozen cadaver bone to M.I.T. The bone is sealed in a plastic envelope and passes into the electron beam on a conveyor belt. Each side of the bone is exposed for 10 secs giving a total dose of about one million rads. It can then be stored frozen in the sealed plastic bag for many months. This enables a hospital to build up a 'bone bank'. It helps orthopaedic surgeons in reconstructive surgery without needing the elaborate sterilisation methods which were used before this technique became available.

A synchrocylotron accelerating protons up to 600 MeV is to be built for the NASA Space Radiation Effects Laboratory at Virginia, USA. The machine is to be used for advanced radiation studies in support of space missions. This will include investigation of the effects of radiation on spacecraft materials and components as well as studies of radiation shielding.

The project may have a total cost of more than 5½ million dollars which will cover also a 10 MeV electron accelerator. Completion of the new accelerator and the NASA Laboratory is scheduled for mid-1965.

Bevatron back on the air

The Bevatron (6.2 GeV proton accelerator at the Laurence Radiation Laboratory, Berkeley, California) is back in service after a long shut down. The shut down which began in July 1962, was to enable extensive modifications to be made to the accelerator to give increased beam intensity, new external beam facilities and other improvements.

The modifications included installation of an entire new injection system which gives 20 times the previous injected beam current at an energy of 19 MeV. External proton beams at full energy are now possible which will greatly increase the versatility of the machine. Previously the study of positively charged particles had to take place inside the magnet ring which was very cramped and inaccessible. The shielding has been increased, internal targets are now movable by remote control and the control system has been overhauled.

In 1954 when the Bevatron first came into service it was the largest and most powerful accelerator in the world and since that date many of the outstanding advances in high energy physics have resulted from work with this machine. The recent modifications bring the machine back into the front line of accelerator research and the latest news is that 1012 protons per pulse has been achieved.

Nimrod Power Supply

A paper on the magnet power supply was read at a meeting of the Institution of Electrical Engineers in London on 20th March. The paper was in three parts: General - P. Bowles, H. Hadley, M. J. Marchbanks, J. J. Wilkins. Rotating Machines - J. A. Fox, D. G. Taylor, R. Wilson. Mercury Arc Converters - K. Rollig, H. Hödle.

To maintain the protons in their circular orbit in Nimrod, while they are being accelerated, it is necessary for the magnetic field to increase uniformly to a maximum value which must occur at the time when the protons are ready for ejection. The increase in field takes 0.7 seconds after which the magnet current falls back to zero in about 0.8 seconds ready for the next pulse.

This successive charging and discharging of the magnet, about 26 times per minute would involve an enormous and unacceptable fluctuation of power from the National Grid if a direct power link to the magnet were made, something like 120 MVA. To avoid this heavy demand on the Grid and also to supply the magnet with the direct current which is required, a power plant of unusual complexity has been necessary. It comprises two flywheels, two alternators and two motors all solidly connected to make a set 100 feet long. The motors are connected to a Grid substation at Harwell and the alternators are connected through transformers and mercury arc converters to the magnet coils.

When the protons have been injected into the magnet ring the magnet current rises as energy is derived from running down the flywheels which in effect drive the alternators as generators. The fall in speed is only 4% achieved by having flywheels weighing about 30 tons each. The magnet current reaches a peak of about 10,000 amps.

During the current rise time the mercury arc converters act as rectifiers but at the peak magnet current, after the protons have been ejected the converters are made to work as inverters by control of their grids. This causes the magnet current to fall and the stored energy in the magnet flows back to the alternators which now act as a motor and bring back the speed of the flywheels to their original value.

By this means the heavy flow of energy is confined to the circuit between the magnet and the alternators and only the losses of the system need to be supplied from an external source. This is done by two induction motors connected to the Grid Supply and as a result the fluctuation of power taken from the Grid is reduced to about 8 MVA.

The paper presented to the IEE described the electrical and mechanical engineering problems which were involved in providing this complex power supply.

CERN Conference

Over a hundred physicists from many countries, including USA and Russia spent the last week of February attending a conference at CERN arranged to discuss the relation between High Energy Physics work and nuclear structure.

Professor Weisskopf, the Director of CERN in his opening remarks said 'The main purpose of this meeting is to bring together the two fields of study for their mutual benefit, to help them in their attempts to unravel the mysteries that still confront them.'

Professor Burcham from Birmingham University who is at the Rutherford Laboratory for a year, attented the conference.

Lord Hailsham's Speech

Extracts from the speech given by Lord Hailsham, Minister for Science, to the House of Lords on 27th February:-

'The equipment in various fields of fundamental work in nuclear physics is becoming very expensive and its life is very short - 10 or 15 years. If the study of experimental particles is to continue at its present pace, the provision of this equipment as a first class research tool, is an international matter. We have already co-operated in the European Organisation for Nuclear Research at Geneva (CERN) but the new generation of machines will be so enormous - certainly 100 GeV or maybe 300 GeV or even more - as to make effective construction and use, even by consortia of nations, next to impossible.

If this type of investigation is to continue I would like to see a world machine contributed to by the scientists and technologists of all nations, including if possible the Russians, which would form a focus for nuclear physics of the entire world. It would at least be as sensible as going to the moon and much more sensible than devising the sophisticated and satanic weapons of the nuclear arms race.'

Listed among the scientific accomplishments of the previous year were ..... inauguration at Manchester of our first Atlas Computer; proceeding with the construction of the British National Hydrogen Bubble Chamber; grant of £800,000 to Oxford for an accelerator in the Keble triangle; decision to provide an Electron Laboratory for NIRNS; provision for three more nuclear reactors for use in Universities .....

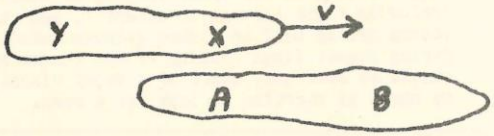
Lord Hailsham said - 'Above all, let us increase the numbers, the standards and the status of the profession of engineering. If the scientists are the intellectuals, the engineers are the artists and craftsmen of the scientific world. If the scientists are the discoverers of truth, the engineers are the creators of new wealth.'

Lecture on Relativity Theory

On Thursday, 14th March, Prof. H. Dingle, Emeritus Professor of the History and Philosophy of Science at the University of London, gave a lecture entitled "The Origin and Present State of the Special Relativity Theory".

After being welcomed by Dr. Pickavance, Prof. Dingle gave a brief historical resume of the development of the subject through the efforts of Ritz, Lorentz and Poincaré to reconcile Mechanics and Electromagnetism. Einstein's first papers on the subject, producing as they did the formulae of Lorentz from a different standpoint, did not attract much attention. However, after the publication of his General theory they assumed greater importance.

The speaker then gave an exposition of a version of the famous (or infamous?) "Clock paradox". This involves two observers in each of two relatively moving frames of reference and is designed to remove the objections of the introduction of acceleration in the earlier hypothetical experiments. The special theory apparently predicts a contradictory result for the comparative times in the two frames.



There are two observers A and B in a "fixed" system and two, X and Y, in a "moving" reference frame. The relative motion is such that $\sqrt{1-\beta^2}$ is 1/5. The clocks at A and X are synchronised when they pass. B's clock is synchronised with A's and Y's with X's since the pairs are in the same frames. When X passes B, B's clock shows 30 units while X shows 6 because of the time transformations. Y is then passing A and since his clock in synchronised with X's and A with B, the same position obtains. However arguing from the position of an observer in the "moving" frame in the same way it is found that A's clock shows 6 units while Y's shows 30 and this result is contradictory.

Prof. Dingle then went on to point out that if the result is accepted then the reconciliation fails and a new attempt is needed. Of the possible courses Prof. Dingle mentioned the possibility of retaining Newtonion mechanics and using an electromagnetic time; and the readoption of an ether theory although this seemed to introduce further difficulties.

In discussion the point was made that an ether theory could give a consistent result in the present experiment. There were also questions on the synchronisation of two moving clocks even although in the same place and whether the new paradox introduced more contentious points.

Dr. Pickavance thanked Prof. Dingle for his interesting lecture and commented on the lively discussion. Prof. Dingle gave every appearance of having enjoyed it as much as the audience.

Report on Nimrod

Extracts from the paper presented by Mr. Mullett to the Visiting Committee on 12th March.

Since October 1962, the main features of the master programme have remained unchanged. Target dates have been met and August of this year stands as the date for closing the machine for commissioning.

Injector

An extended installation period has just finished. It involved work on the ion source, re-arrangement of the quadrupoles and other components in the 650 keV drift space and installation of the components in the 15 MeV drift space and the inflector magnets. The inflector straight section box is also in place and much work has also been done on cabling and controls.

Within a remarkably short time after re-starting we had a 10 ma, 15 MeV beam as far as the shield wall, the bunching improvement factor being variously measured as 2.4 to 3.0. The lower figure is more believable. The overall acceptance without the buncher is as yet only 0.1 to 0.14 as compared with 0.25 previously. The components in the low energy drift space require optimisation.

Magnet and Power Supply

The magnet is now quite complete. Re-building after magnetic survey had its problems, particularly in getting pole pieces back where they came from. The analysis of survey data indicates that acceptable field shapes can be obtained up to 7.5 GeV. On flat top for long extraction (up to 1 sec) there is some initial fall in field but beyond this region we have good control over positive and negative slopes. For very low energy of extraction the negative slope cannot be obtained so that the only way of getting slow spill to an outside target would be to use the R.F. programme with the disadvantage of having the R.F. bunching left in the beam.

The whole of the power supply was used to power the whole of the magnet according to the programme. This significant and successful event passed almost unnoticed during the big freeze. The back-fire rate in excitrons is now on average 1 per hour and the lost time is 8 minutes per back-fire. It is generally believed that this situation is appreciably worse than in earlier running but since we have been driving the power supply very hard we cannot be precise. This rate is near to being a great nuisance and Brown Boveri will strip down a bad excitron to try to find an explanation.

Vacuum System

All ten outer vessels have been on site and tested for some time, the leak-rate being of the order of 100 lusecs as compared with an acceptance figure of 150. All ten inner vessels are on site and tested. The leak-rates range from 0.1 to 0.5 lusecs as compared with an acceptance figure of 0.6 lusecs. Closure plates have turned out to be very successful on the machine and ample spares are available whatever happens with header vessels.

Header vessels are still not in a happy state. No.1 was tested on site some time ago and has serious leaks. No.2 also had serious leaks, mainly at metal inserts which receive cover plate bolts. Repair techniques show promise of success. No.3 is at the factory and repairs which we have found necessary on No.2 are also being carried out on this vessel. No.4 is at the factory and a more extensive repair is to be carried out which should give a permanent cure of the troubles.

It is likely that only three of four headers will be ready in time for installation to meet the commissioning date. If this is so, the chosen octants will be 3, 4 and 6.

R.F. System

All the equipment is available and proved. The production R.F. drive unit now works happily into the cavity over the frequency band.

During recent magnet pulsing the whole system has been tested with the cavity installed in the ring. Considerable frequency pulling was experienced due to magnetic field in the straight section. This requires an increase in bias on the ferrite cores from 680 to 780 amps at the top frequency of 8 Mc/s. Fortunately this is within the range of both the Mark I and Mark II bias supplies. Enough R.F. power is available to deal with a beam loading of about 5×10^{12} protons per pulse. It will be some time before injection efficiency and R.F. trapping make the R.F. a limitation even if the space charge limit can be pushed up that far.

Final Stages of the Programme

From now until August the obvious installation has to be completed and in addition there are many monitoring and commissioning devices to be fitted. At the same time progressive commissioning will continue. In particular the injector will be run under variety of conditions, including right through to Octant 1, and the vacuum system will be linked between octants. During August final linking of the vacuum system should be done and, short of a major disaster, we shall be starting to look for a beam.

Correspondence from Massachusetts reached the Laboratory this month addressed to 'The Nat'l Inst for Rest in Nuclear Sci.' The Americans appear to have a dim view of our present rate of progress.

EDITORIAL

This is issue No.9 of Orbit and since 9 months is a standard productivity interval in human life it seems an appropriate time to look at what we have produced.

By now we have settled into a fairly regular pattern. Roughly speaking the journal is divided in to two parts. The first half serves to relay or amplify news on Laboratory or National Institute projects and to relay such news as comes our way relating to accelerators or high energy physics elsewhere. This is intended as a communication service. In the second half the theme swings to entertainment and a more general news service of one kind or another with 'Outside Hours', Personnel News, Editorial, correspondence and other items of more general interest.

At least this is how the Editor sees it.

But to say that the journal has settled into a regular pattern could be a way of saying that we have run out of fresh ideas and that ORBIT has stagnated. At present this is not true for ideas are still flowing free within the regular pattern and the pattern hasn't been established long enough to be exhausted.

However it is obvious that unless fresh influences can be brought to bear from time to time on the content of ORBIT there is a real danger of it becoming routine - the same methods of presentation, the same type of article, the same areas of discussion and so on ... Above everything else up to now, we have tried to keep the journal lively. This has taken precedence over presentation of material and even over vigorous selection of content, though these have received as much attention as possible. And we intend to continue this emphasis and to do what we can to stave off any stagnation before it overtakes us. The first move to this end is now being taken.

Immediately after circulation of each issue of ORBIT an editorial advisory panel meets for a discussion. The panel consists of T. R. Walsh (Injector Group) who acts as unofficial chairman, W. Galbraith (High Energy Physics), E. R. Harrison (Research), G. L. Cooper (Scientific Admin), F. M. Telling(Assistant to Chief Engineer) and H. C. Whitby (Injector Group), together with B. Southworth, Editor. These discussions are very informal and are mainly concerned with criticising the previous issue in detail, usually constructively. The Editor then presents his plan for the next issue which is commented on, added to and generally has the corners rounded off.

For the Editor the advisory panel serves a most important function. It is almost the only source of appraisal of each issue of ORBIT and it is also a fruitful source of ideas to be used in the future. And it is into the panel that fresh blood is to be periodically injected. After this issue W. Galbraith will vacate his position and be replaced by J. B. Marsh (P.L.A.). From now on this replacement process will take place every three months, each member being replaced after about a year's service.

We hope that this will prove to be one successful method of bringing freshness of content and approach to ORBIT in the months to come.

Letters to the Editor

Letters may be addressed to 'The Editor, ORBIT, Building R.1'. Pseudonyms are accepted provided the authors name is known to the Editor.

Sir,

The growth of Nimrod and the work involved in scientific and engineering skill completely bewilders me. As the last nut and bolt, so to speak are being put into place, it gives great credit to those whose task it is to make this machine function.

Also housed within the walls of the Rutherford High Energy Laboratory is yet another machine which scientific and engineering skill has produced to one's amazement - but the function differs.

By placing two pennies in a slot an end product is anticipated. But it appears that somewhere along the line, some one has slipped up. On one occasion, upon placing the required pennies in the slot I awaited the goods. To my amazement the liquid refreshment shot down into the waste receiver. Being fully prepared, I again placed two pennies in the slot and bent down to the little hatch provided but found that the aperture was too small to put one's head in.

Surely this little error could have been corrected at the planning stages.

Acidum Tannicum

P.S.

I have since been informed that there was no oversight at the planning stages. The machine concerned had run out of cups.

Sir,

I was filled with admiration for The Theorists when reading their letter appearing in the February issue of Orbit. Here were some scientists (what else could they be?) who were willing to ignore the mercenary attraction of the Suggestion Box and offer a brilliant suggestion out of simply love for anyone's work. At the present rate of exchange their suggestion would have been worth about £5 encouragement award.

Contd.

With such a selfless spirit moving amongst our scientists it becomes painful to present the undermentioned facts.

(a) The door could not revolve any other way since the PUSH signs, appearing on each door vane, are painted upon a name-plate which, alas, is integral with the door. It would, of course, be ludicrous to paint, "PULL", instead.

(b) The door could be fitted upside down but this would be too expensive to contemplate since it would mean demolishing the whole of the frontal aspect in order to release the spigots about which the door revolves. Imagine, also, the nuisance caused by people writing to Orbit complaining that they cannot read, "PUSH", upside down.

Yours, and theirs, sympathetically,

SPOON/2

Sir,

I was intrigued and more than a little alarmed at the letter, appearing in your columns, written by "The Theorists".

My observation of the sense of rotation of the door in R.1 entrance hall is that this is already in the anti-clockwise direction. One can conclude therefore that either -

(a) The Theorists are in fact Anti-theorists, i.e. those whose flat spin is opposed to the normal or

(b) The Theorists are of Antipodean origin or

(c) I am an Anti-being.

My personal belief is that (b) represents the truth since if (a) or (c) were true it is highly probable that the Theorists or myself would have met our own Anti-beings before now with mutual annihilation.

Neutrino

Sir,

Concerning the emblazened declaration on our new lab. coats - we know we work at the Rutherford High Energy Laboratory; visitors know they are at the Rutherford High Energy Laboratory.

Are we being groomed as car park attendants or petrol pump operatives, if so, let us be payed for advertising.

White coated worker

Sir,

So all that is left of my friend Alice is a Cheshire grin. How sad, for she had such a useful ability to ponderate.

Of course we all know that Nina can at least accelerate a discus most effectively, but it must be remembered that she became completely unstable in a considerable number of millinery Modes.

The Mad Hatter

Sir,

After the high-handed way in which Professor Merrison has been treated by those who would find names for his accelerator I hesitate to criticise his own choice. Nevertheless I feel I must point out that he has made a rather remarkable mistake: he has got the sex wrong.

As his own letter shows, he is a man of delicacy in these matters and it would ill become me, in substantiating my statement, to go into details which he himself would eschew. Therefore I will content myself with observing first that the function of an accelerator is to fertilise experiments, and that consequently it is male. It is the latter which are female (and often expected to be fruitful). Secondly it is no accident that the proper names Saturne and Nimrod, already attaching to accelerators, are masculine.

I earnestly beg Professor Merrison to reconsider this matter and save his accelerator from the inferiority complex which will almost certainly ensue if the little chap grows up with this questionmark upon his manhood.

T. R. Walsh

Alice Daresbury
An Innocent Victim of the Space Age

W. G. writes: Readers will learn with sorrow of the passing from the present scene of Alice Daresbury, an untimely victim of the space age. If ever a life was short but gay, this was hers. Originally launched into orbit about Christmas time, all went well for her return to earth until that last fantastic chance meeting in orbit, sometime in February, with Cosmonaut, Nina Alexandrova. Nina, unbeknown to us, had been shot into space some months earlier. In a successful attempt, directed to re-establishing Nina's unique orbital position, rockets were fired from the U.K. control and tracking station * in the North of England, and these passed so close to Alice Daresbury that she, alas, appears to have succumbed to the blasts of hot air. As a result, her orbit became violently perturbed and she has now wandered off into space - out of sight but not, we hope, like OPHELIA ⁂, out of mind. Our heart-felt sympathy is extended to all members of the Daresbury family, who probably will never fully realise their present loss. Those who knew and loved Alice mourn her passing.

* Yours acronymously: Main Establishment Regulating Re-orientation In Space Of Nina.

⁂ Other People Have Expressed Lukewarm Interest in Alice.

Who owns the Zebra?

A PROBLEM
FOR THE
LOGICAL

(Courtesy LIFE International;
copyright TIME inc. 1962)

The facts essential to solving the problem - which requires a combination of deduction, analysis and sheer persistence - are as follows:

1. There are five houses.
2. The Englishman lives in the red house.
3. The Spaniard owns the dog.
4. Coffee is drunk in the green house.
5. The Ukranian drinks tea.
6. The green house is immediately to the right of the ivory house.
7. The Old Gold smoker owns snails.
8. Kools are smoked in the yellow house.
9. Milk is drunk in the middle house.
10. The Norwegian lives in the first house.
11. The man who smokes Chesterfields lives in the house next to the man with the fox.
12. Kools are smoked in the house next to the house where the horse is kept.
13. The Lucky Strike smoker drinks orange juice.
14. The Japanese smokes Parliaments.
15. The Norwegian lives next to the blue house.

Now, who drinks water? Who owns the zebra?

In the interest of clarity, it must be added that each of the five houses is painted a different colour, their inhabitants are of different national extractions, own different pets, drink different beverages and smoke different brands of American cigarettes. One other thing: In Statement 6, right means your right.

A prize will be awarded to the first correct solution in writing reaching the Editor's Office (Room 2-2, Building R,1).

And the best of luck!

MORE ON COMPUTERS -

'Computers bring bigger profits' say the manufacturers trying to sell their machines. The following story illustrates just how big those profits can become.

The North Western Gas Board began to add up its customers bills by means of a computer and the money rolled in. Why? The computer added on the date to the bill. For example 3.3.63. became £3, 3s, 5s and 3d.

Apologising for the computers overeagerness, a Gas Board spokesman admitted that the computer could only work on the figures supplied to it and was not really to blame.

Outside Hours

Away From It All

P S Rogers

Most people agree that we live in a crowded age. Both time and space are in short supply. Life is increasingly one damn thing after another. In addition, there are so many of us that, if we wish to relax in the ways customarily held to be enjoyable, we must settle for doing so in the company of half the nation.

Now, much as we love our fellow-men (and, of course, women), pleasant as it is to be driving off for Easter and much as I appreciate the silver strand, there comes a time when one has to admit that enough is enough. By enough, I mean driving through the beautiful Devonshire lanes bumper to bumper, relaxing in a beach cafe over a cup of cold coffee served by an overworked student-waiter with someones elbow in your plate and a baby, not yours, having its napkins changed under your feet. On the Continent, the accents of Wigan and Cheltenham mingle with the sinister sibilants of the natives. Some wise guy recommends that jolly little place on the Costa Brava, you go to find five thousand other readers of the same paper relaxing on the beach there, with their transistor radios.

How to transform the pace down, how to avoid the pressure of population? Well, there's camping, and fishing. I do not wish to knock these excellent pastimes, although I am not in agreement with the school of campers who move a canvas replica of their entire house, kitchen-sink and all, out onto the windy heath, brother. For fishing, there is something rather acquisitive about it, it needs a lot of tackle and it's rather chilly. I feel that something even more unpopular is wanted. I know! Walking.

To wander with a map, to follow some cunning little dotted line on the Ordnance survey so that you come down from the middle of nowhere into the main street of some old town, to go along with only a vague notion of where you are going to sleep that night, to see in the distance a pleasant pub, and you with the thirst of ten miles on you, these are pleasures simple enough to be unattractive to the milling multitude.

There is, of course, the chore of doing the actual walking. This can, believe it or not, be enjoyable. Most people would surprise themselves once they got going. All this athletic clamour from the New Frontier and the resulting displays of vigour along the Brighton Road show what the most plethoric and chairborne of tycoons can do when roused.

But wandering is a state of mind rather than an athletic acheivment, a holiday from the directed thinking which our professional and social situation entails. Little planning, no rules. I suppose I could argue it round to say that it would improve your work to wander around with a rucksack for a bit, just as I once studied at home until my wife insisted on my going out for a drink. But this would be rather cart-and-horsing the whole thing. I wish to appeal to the sense of enjoyment.

Assuming you have the right sort of body, light and scraggy rather than dense and globular the physical movement takes care of itself, once the rhythm is established. There is a pleasure of contrast in the affair. By day, you are tough and Spartan, you subsist on rustic cheese and beer. You scramble over hedges and ditches, blown upon and blistered, nosing around for cunning little hidden lanes and rights-of-way obscured by farmers in their absent-minded way. You glimpse landscapes almost as good as Constable's and all for free. In the evening, if you have worked it well, you pull into some hostelry, stick your weary limbs under its mahogony and eat and drink of the best. How you will despise the carborne expense-accounters moodily toying with their grub! Such elemental pleasures as hot water, clean sheets, the morning cup of tea make an impact on senses swept clean by miles of open country.

But can we really bring back the carefree world of Borrow and Belloc in Britain's overcrowded countryside? All the main traffic arteries have networks of little roads crossing them at right-angles. Between any two points there are many alternative routes and the map will often reveal half-forgotten tracks, some going for miles. If walking can be said to have any rules or aims, it is to get around without using motor roads. A man I used to know made a practice of walking along Roman roads. Sometimes they peter out into fields, only to revive again further on as a bit of a B-road, then a lane, and so on. I remember one Easter walking for the whole morning along the Fosse Way, in bright sunshine, and only meeting a man on a horse.

Highlights? Well, nothing wonderful, but all pleasant to remember. Down the Wye Valley, deep in discussion with my companion so that I can only remember deep wooded valleys, ending up with a great meal and much beer in Hereford, and walking right into a concert by the Boyd Neel Orchestra, which made the perfect ending. Walking over the Dorset downs towards the sea and ending with a plunge into a warm sea in late October, from a deserted beach. Round a corner in Brittany and seeing all the children in wedding clothes going to celebrate their first communion, with a wonderful meal preparing in the inn opposite the village church. The Lakes, which can only really be appreciated on foot and the Yarrow Valley above it, with the Grey Mares Tail flowing over the edge of the hills.

Happy hiking to you, then! But take a mackintosh.

Personnel News

Suggestion Awards

The sixth meeting of the Rutherford Laboratory Suggestion Awards Committee was held on Monday, 18th March, 1963, and eighteen suggestions were considered.

An award in respect of his suggestion was made to:-

G. W. Scott £2 (Fire Notice in R.1)

An Encouragement Award in respect of a suggestion which although it may not be adopted, was considered by the Committee to merit recognition was made to:-

D. Dew £1 (Filters on Vacuum Pumps)

The Committee also considered the six entries submitted for the Safety Section's "Poster Competition" and awards were made to the following:-

J. G. Kerr	£2	D. Evans	£1
D. Rose	£2	S. Spanner	£1
R. Price	£2	D. Rose	£1

C. J. E. Macdonald
Secretary,
Suggestion Awards Committee

Comings and Goings

Mrs. J. Turnbull and Miss M. A. Burden join Administration.

R. Dounton joins High Energy Physics; Mrs. G. M. Parsons joins Industrial Chemistry.

A. J. Hunt and K. J. Gregory join Central Engineering.

J. F. Pinchin joins Nimrod Engineering.

Miss. A. M. Rowson joins the Atlas Laboratory.

G. Rutherford has left us.

Congatulations to -

Pat Timmins, Personnel Section, on her recent engagement to David Rassiter of the Royal Air Force.

Julie Haines, Reproduction Section, and Peter Mace, Magnet Group, on their marriage on 23rd March.

Roy Billinge, Injector Group, and his wife Rosemary on the birth of a son, Nicholas Andrew, on 23rd March.

Elizabeth Williams, General Administration, and her husband David on the birth of a son, Giles David Evan, on 21st February.

David Gray, Magnet Group and his wife Sybil on the birth of a daughter, Phillippa on 11th March.

A Date for your Diary

A Dinner Dance has been arranged at the 'Chicken in the Basket' Benson (Wallingford-Dorchester Road) for Friday, 3rd May.

Available space limits the number of tickets to 100 (i.e. 50 couples).

Tickets will cost 23/- including sherry before dinner and dinner wine.

Further details will be circulating soon.

Suggestion Schemes

C J E Macdonald

1963 has been declared "National Productivy Year" by the British Productivity Council and as part of its campaign March is "Ideas Month" dedicated to promoting suggestions for increased efficiency from all employees.

Why have suggestion schemes? Are they really more than just gimmicks to foster employee-management relations? Are they necessary - does anyone really benefit from them? And if we accept that they are worthwhile, how do they work?

Suggestion schemes are not new - as with so many other ideas, they originated in this country and have been taken up with greater enthusiasm in the U.S.A. William Denny and Bros. started the first scheme in their Dumbarton shipyard in 1880; a number of other firms are known to have had schemes before 1900 and today there are about 550 separate organisations in this country with live suggestion schemes. Naturally, the two World Wars, with their need for the ultimate use of manpower, stimulated suggestion schemes, but many lapsed in the immediate post-war periods. However, the last thirteen years has seen interest steadily increasing.

The question is often asked "Why employ trained specialists in various fields - and then go to the bother and expense of soliciting and paying for employee's ideas? Is the average employee really in a position to know more than the trained specialist can discover in his work?" I think there are several answers to these questions.

First, there are always "fringes" to every job and everyone's time is limited. Often time does not permit some aspects of a job to be considered, or certain lines of investigation to be pursued. Second, it is a fact that the person actually doing a job sometimes adopts a limited outlook, while the newcomer may bring a fresh mind to bear on the problems involved. Third, where people are working to pre-planned methods, prescribed by others, their familiarity with the work often gives scope for inventive talent. (These last two assertions might seem contradictory, but are amply supported by evidence). Fourth, there is evidence that a good working atmosphere can result from employees involvement in their work, by, for example, the full use of their powers of thought and invention. The knowledge that management values their ideas possibly helps employees to relate their position in and usefulness to the organisation more accurately.

Many firms have profited handsomely from their schemes. This is where the mass-production firms score heavily; quite simple ideas can sometimes give remarkable results. Du Pont's in the U.S.A. claim that their scheme brought them 20 million dollars extra profits in eight years and Ford's in the U.K. have claimed savings of £600,000 in one year. ESSO and I.C.I. also claim to have highly profitable schemes.

The highest award in this country so far is £1,400 at Esso's Fawley Refinery in 1962; I.C.I. recently paid £1,440 for a joint suggestion and Fords paid £500 for an improvement to the "Anglia" timing chain tensioner.

Who do suggestion schemes usually cater for? There are great variations - some firms accept suggestions from "works" or industrial employees only, others from all employees. Some have separate schemes for "staff" and "works" or for supervisors or managerial staff. The Inland Revenue have ruled that to be eligible for tax-free awards, suggestions must be outside the empolyee's normal duties and responsibilities.

How do suggestion schemes work? Every organisation has its own ideas and there are considerable differences of practice, but there are four discernible stages; receipt, assessment, considerations of award and payment.

The suggestion box is the common method of sending in suggestions, but some schemes use the internal mail, others the external, G.P.O. mail.

Methods of assessment also vary. One way is for some responsible person in the part of the organisation concerned with the adoption of the suggestions to assess it. Another is assessment by specially appointed investigators. One firm uses graduate apprentices to investigate and report on suggestions as part of their training.

Most schemes have a committee to consider awards; some committees are composed of management representatives only, others have employee representation as well. In a number of schemes, awards are considered by one man who may be the secretary or administrator of the scheme, or a manager or other executive, but some predetermined formula or code of practice is almost always used to assess awards.

The "concept of anonymity" is by no means universal; it is accepted completely in some schemes, but not in others. It does not appear to have any bearing on the successful operation of schemes.

Where does our own scheme stand in all this?

Suggestions arrive through several channels; most through the suggestion boxes (accompanied by an assortment of cigarette packets, cigarette ends, sweet papers and other debris!), some through the internal mail and a few are handed in personally.

Assessments are usually made by a senior person concerned with the adoption of the suggestion, but whenever possible, a second, independent, opinion is also sought. Safety suggestions are in addition always investigated by a member of Safety Section. The suggestions, with their assessments, are referred to the Awards Committee, which consists of a minimum of a Chairman and one member from the Official Side, one member from the Staff Side, one member from the

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Trade Union Side and the Secretary. Usually two members from each side are present.

Awards for adopted suggestions are assessed in accordance with the formula:- 10% of the first years estimated savings, plus up to a further 15% of the estimated savings for thought and preparation, plus up to a further 15% of the estimated savings for ingenuity and inventiveness. Safety suggestions of course have to be given more subjective consideration, the Committee is building up a code of practice in making awards for these and for other meritworthy ideas which for various reasons are not to be adopted. "Encouragement" awards are often given in these latter cases. The Committee have no power to press for the adoption of any suggestion, but they do refer back any assessment which they feel does not do it justice. Our highest awards so far have been one of £15 and another £10, but I hope that these will in the future not be regarded as exceptional.

We at the Rutherford Laboratory are in an unusual position compared with most other organisations. We have no end product and therefore the substantial savings possible in production firms are denied us. Theoretically almost all our employees are eligible, but so many are concerned in some way with the management of the Laboratory that scope for ideas outside of their normal duties are limited.

It is for these reasons that we have not adopted any "gimmicks" to promote suggestions in the month of March, preferring that there should be a natural flow of ideas rather than stimulate quantity at the expense of quality. Some firms, such as B.M.C. and Hoover have gone to quite exceptional lengths, with Mini-Minors and Continental Holidays as prizes for the best suggestions. We of course have to remember that money we hand out comes from the Treasury who are noted for their reluctant generosity; as a taxpayer I really cannot question their thrift! this does not mean that the amount of cash available for awards is drastically limited, only that we have to justify its expenditure to the Treasury auditors. The Awards Committee can award up to £100, but the Director may authorise greater amounts.

Our scheme has not been in being very long, but it has produced some good ideas. I hope it will continue to do so and that 1963 will prove that we too can play our part in National Productivity Year.

SAFETY in the use of Compressed Gas Cylinders

Incidents reported in Health and Safety Information No.148 (USAEC)

Three recent incidents with compressed gas cylinders:-

While servicing a large aeroplane inside a hanger an employee was transporting a carbon dioxide cylinder, with valve cap removed, across the hanger floor on a jeep. As he made a turn, the cylinder fell off, smashing the valve when it hit the floor. The cylinder took off like a jet-propelled missile, tore through several plane wings and fuselages, struck and broke the sprinkler system in several places, starting a flood by putting the sprinkler system out of commission and, finally streaked across the hanger and through the concrete block wall to the outside where it finally came to rest. In a matter of seconds, one seemingly minor unsafe practice resulted in over £170,000 worth of damage.

A similar accident occurred in a large chemical plant when a welder failed to secure his oxygen and acetylene cylinders. The oxygen cylinder fell over due to a pull on the hose and the valve struck the wall and sheared off. The oxygen cylinder took off, tearing out process lines and equipment, releasing flammable solvents, which ignited and started a raging fire. After ricocheting around the building, the cylinder finally drove itself through two brick walls and travelled some distance outside before it finally lost its force.

About 14,000 oxygen cylinders, stored in the open for more than a year, were destroyed by explosion and fire. One cylinder exploded, apparently due to the 90°F temperature, and started sympathetic explosions of adjacent closely stacked cylinders. All 14,000 cylinders exploded in less than five minutes!! Hot fragments from the exploding cylinders travelled as far as 100 yards through the air to cause ignition of other combustible materials stored in the vicinity and the fire involved a £157,500 loss. Investigators believe that the wide temperature changes were responsible for weakening the cylinder walls prior to the explosion.

These accidents point out the reasons for many of the common safeguards for safe handling and storage of compressed gas cylinders, such as: (i) limiting the number of units stored in one group; (ii) segregation of fuel and oxidizing gases; (iii) protection of cylinders from exposure to direct sunlight or heat; (iv) inspection for defective cylinders and valves; (v) keeping valve covers in place, except when cylinders are actually being used; (vi) securing all cylinders against falling or damage.