12th Issue

ORBIT

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The Journal of the Rutherford High Energy Laboratory

The Oxford Project

W D Allen

The Department of Scientific and Industrial Research is contributing over three quarters of a million pounds towards establishing a nuclear physics research centre at Oxford. The low energy, or nuclear structure, aspect of this centre will be primarily concerned with the operation and use of a pair of electrostatic generators: a horizontal tandem Van de Graaff, purchased from the High Voltage Engineering Corporation, and a vertical injector for the tandem, accelerating negative ions to energies of 8-10 MeV. The N.I.R.N.S. Electrostatic Generator Group are responsible for the design and construction of the vertical machine, and for commissioning the system as a whole, which should provide protons of 20 MeV and heavier particles of considerably higher energy.

It is not easy, even under the benign influence of the editor of 'Orbit', to bowdlerize a major project in a form which is both complete, and yet which is easily assimilable. The Group has recently issued a 'Progress Report' (NIRL/R/23) which sets out many of the design features of the injector, the studies of the ion source (upon whose versatility considerable demands are made) and of studies with the test machine in Hangar 10.2, A.E.R.E., in which a satisfactory stabilization scheme for a machine which has to run both positive and negative, has been developed. Enthusiasts who wish to know more should read NIRL/R/23: if still more, they are very welcome to visit Hangar 10.2. Below is a paraphrase of the introduction to the Progress Report.

Location

Expansion of the science block in Oxford is taking place in an area called the Keble Triangle with its base on Keble Road adjoining Keble College. Of the new buildings in this area Metallurgy has been built for some years, Engineering is nearing completion and Nuclear Physics will occupy the base of the triangle. Nuclear Physics at Oxford has now been separated from the Clarendon Laboratory and forms a completely independent department, under Professor D. H. Wilkinson who was on the board of the National Institute until earlier this year. The department will carry out research in both high and low energy nuclear physics, roughly one half of the effort being accounted for by low energy work centred on the Electrostatic Generator.

Electrostatic Generators: vices and virtues

An electrostatic generator is not a particularly efficient means of producing a given current of particles with an energy of a few million volts. For a given energy, a cyclotron

THE 'OXFORD PROJECT' (Contd.)

will produce more current more cheaply, and indeed the variable energy cyclotron is a competitor in the field. For nuclear physics, however, the electrostatic generator has several major and vital advantages: the chief of these are the precision (order of one part in 10,000) and flexibility (both in energy and in type of particle), although the comparatively small background radiation from the machine and the fact that the beam is normally continuous are also of value. Until 1958 the maximum voltage attained for any period with a machine was 8½ million volts, while 6-7 million was more normal: however, the advent of the tandem meant that protons of 12-14 million electron volts could be obtained. In a single ended machine, the insulating column extends from earth at one end to the high voltage terminal at the other end: the H.V. terminal is positive in most nuclear physics machines, and carries an ion source. In a tandem, the insulating column is continuous from one end to the other, and the terminal, now the 'centre terminal' is held at high positive potential. Negative ions, of, say, hydrogen, are injected at relatively low energy at one end, and accelerated to the centre: electrons are removed from the negative ions by a gas or foil stripper, and the positive particles are then further accelerated to the far end of the machine. Thus for hydrogen, if the voltage on the centre terminal is 6 million volts the particles develop energy to 6 MeV as H^- ions and a further 6 MeV as H^+ (protons), and so emerge with an energy of 12 million electron volts. For oxygen, multiple electron stripping can take place, giving ions with more than one charge, and the particles can emerge with energy in the range 30-40 MeV.

Each advance in energy range considerably widens the fields open to experiment. The advance from the 1 MV Cockcroft Walton to 5 MeV Van de Graaff greatly widened the horizon; the advent of the tandem doubled the available energy range and introduced in addition the range of experiments available with heavy ions of energy 30-50 MeV. There is presumably a limit to this process, and presumably the case for electrostatic generators with their special properties of precision and flexibility, must at some energy begin to weaken. However, for energies up to 20-30 MeV the case is very strong. 17 MeV is the Coulomb barrier for the heaviest element so that 20-25 MeV is necessary to ensure that nuclear reactions in uranium can be studied with some energy reserve in hand for the emergent particle. As a second example, we may take stripping: in a typical example, heavy nuclei are bombarded by fast deuterons, and from some of those which pass close to the nucleus, the neutron is trapped or 'stripped', leaving the proton to escape to the detector. Stripping is most readily understood as a peripheral interaction; studies based on stripping have yielded much useful information on properties of nuclear levels. Yet at low energies, the part played by the Coulomb electrostatic repulsion field are a major complication: it is hardly feasible to use 1 MeV deuterons as a general tool for stripping studies. A precision source of particles, with energy well above the Coulomb barrier for most elements, will certainly widen and deepen the range of the experiments. In a different field, the tandem has been a very useful source of heavy ions such as oxygen in the range 20-40 MeV: experiments with these particles would be considerably widened in scope if the maximum particle energy could be increased to 70-80 MeV.

A precision source of 20 MeV protons

It is a curious fact about the present situation that the goal of increased energy of an electrostatic generator installation can be achieved in a variety of ways, some of which will be exploited at different laboratories. In the Oxford Project, it has been decided to seek increased energy by developing a compound system. The High Voltage Corporation of Burlington, Mass., U.S.A., are providing a standard E.N. type tandem; a horizontal machine guaranteed to operate at 6 MV on the centre terminal. The N.I.R.N.S. team will provide ion source and magnet, but the machine proper will be standard. The ion source will operate effectively at earth potential. However, we shall also inject negative ions from an ion source which is at the top terminal of a large vertical machine running negative and designed, constructed and commissioned by the N.I.R.N.S. group. Since we require the ion source of this machine to have considerable flexibility, it will be necessary to allow a fairly ample volume (5 foot in diameter by 9 foot high) to house it. The pressure vessel of the vertical machine (40 foot long by 13 foot in diameter) is housed in a tower. Negative ions from the top terminal will be accelerated through voltages of 8-10 MV., deflected through 90° by a 6 foot radius magnet and injected into the tandem. In this way, beams of protons of 20 MeV energy, and of oxygen and sulphur ions of 60-80 MeV energy will be realized.

As well as the 'combined operation' in which both machines: a tandem, with its usual range of facilities, and a vertical electrostatic generator. As an independent machine, the usefulness of the latter will be very largely limited to the light elements (hydrogen, helium) for which positive operation is in many ways preferable. For example, low energies with protons can be reached more easily by using H_3^+: higher currents are more readily available (He^- is available only at very low intensities): strippers to produce He^{++} can be incorporated. Therefore, the vertical machine is designed to run positive and negative, and the magnet at its base is designed to rotate so that a beam of particles can be directed into various flight tubes in a separate target room. From the technical point of view, the provision of positive as well as negative beams of particles does not appear to present major difficulties.

Present status

If you visit the Keble triangle (half way between the Clarendon Laboratory and the Nuclear Physics Laboratory, 21, Banbury Road) you will see a lot of construction going on. The tall building is Engineering, just complete. The Nuclear Structure project is now fairly well above ground, and the basement is within a few months of completion. The gas storage vessel is in place, the vertical magnet about to be installed, and the tandem due for installation in July. At Harwell, the horizontal magnet has been available for several months: many of the components of the injector ion source are available, while the tests of the tandem ion source are due at the end of the month. The pot, in fact, is about to boil.

"This is a well-known factory town which also has a university, and the college buildings are well worth looking at." - Description of Oxford in a guide to England for Swedes.

The Accelerator World

Contracts with HVEC

Contracts for over 8½ million dollars have been placed with the United States company, High Voltage Engineering Corp., for three Tandem Van de Graaff accelerators. The U.S. Atomic Energy Commission has ordered two for nuclear structure research which are to be installed at the University of Minnesota and Yale University. The third machine has been ordered by Atomic Energy of Canada, Ltd., for the Chalk River Nuclear Laboratory in Ontario. Yale University will receive the first of the accelerators in 1965.

Each machine is a 20 MeV model known as the 'Emperor' which almost doubles the energy of HVEC's successful 12 MeV version. They also provide a 20 fold increase in beam current, up to 20 or at some voltages 25 microamperes. The design also allows for the addition of a third accelerating stage at a later date if required.

The machine is 81 foot long with an 18 foot diameter pressure vessel and weighs 187 tons. Inside the tank an 80 foot insulated bridge structure, made of glass and metal laminations, supports the voltage generator, acceleration tube and high voltage terminal components. The use of this bridge structure allows apparatus to be installed which will provide a wide variety of bombarding particles, including those of the heavy elements.

American Accelerator Proposals

An 18-year high-energy physics programme, involving an average cost of $445 million per year, has been recommended for the USA in a report prepared by a panel of scientists convened by the Atomic Energy Commission General Advisory Committee and President Kennedy's Science Advisory Committee.

The report, which is now under consideration by the two bodies, recommends inter alia that the federal government:

1) Authorise construction, by the Lawrence Radiation Laboratory, of a high energy proton accelerator of approximately 200 GeV.
2) Authorise construction of storage rings at the Brookhaven National Laboratory, following preliminary studies.
3) Support intensive design studies at the Brookhaven National Laboratory for an accelerator in the 600-1,000 GeV range, with a request for authorisation to follow in about five or six years.
4) Authorise construction of a 12.5 BeV high intensity accelerator by MURA in fiscal year 1965.
5) Support the construction of the proposed 10 BeV Cornell electron accelerator, including plans leading to its development as a nationally available facility.
6) Support the development and construction of electron-positron storage rings.
7) Provide strong support for the development and utilisation of new techniques of particle detection, data reduction, and data analysis.
8) Close down or reduce the level of operation of accelerators which become relatively unproductive.

Discussing the first four of these proposed measures, the panel of scientists puts forward its view that while "reasonably complete exploration can be obtained only by higher energy accelerators", a programme devoted entirely to the higher energy levels would be unbalanced and "would unduly neglect the scientific frontiers that can be attained by much higher intensities at lower energies". The proposed construction of the high intensity machine at Madison, Wisconsin - would, it is hoped, provide an answer to this latter need.

Princeton - Pennsylvania

Construction began in May on a large new laboratory facility which will triple the available space for research experiments with the recently completed Princeton-Pennsylvania University Accelerator. To be known as 'the external beam facility' the new work at Princeton University's Forrestal Research Centre will make available a full energy extracted beam from the synchrotron. The total cost will be over 8 million dollars.

The Princeton-Pennsylvania Accelerator was built at a cost of 12 million dollars largely supplied by the USA Atomic Energy Commission with contributions from the two Universities. Its special feature is the high pulse rate of 19 per second and it first performed at full energy of 3 GeV in April.

ALICE has been used before!

An 'encouraging advance' in the investigation of thermonuclear techniques was reported on April 15th in Physical Review letters by scientists from Livermore, California. The research, part of the USAs 'Project Sherwood' programme, exploring the behaviour of hot ionised gases in strong magnetic fields, represents the first results from one of a new generation of machines.

And the machine was called - ALICE. (This was a name suggested for the electron synchrotron at Daresbury which was finally named NINA).

'Astron' Accelerator (from 'The Magnet')

An electron linear accelerator designed to produce the most intense particle beam ever attempted, has begun operation at the Lawrence Radiation Laboratory. Construction took 3 years at a cost of 4.8 million dollars.

The accelerator is part of the USA 'Project Sherwood' programme of research into thermonuclear fusion, and will be used in experiments on the 'Astron' concept of heating and containing hot plasmas. The machine specifications are 4-5 MeV energy; 200 amperes beam current; ½ microsecond pulse length; up to 60 pulses per second. The electrons at full energy, are injected into a solenoidal field where theydescribe helical orbits and accumulate to form a cylindrical layer, called the 'E-layer'. The E-layer should produce a second internal magnetic field and the two fields together it is hoped, will establish a closed pattern of magnetic field lines to contain a hot plasma.

The accelerator itself is the first large scale linear 'magnetic induction' accelerator to be built. The electric fields which accelerate the beam are generated by rapidly changing magnetic flux induced in a ferromagnetic nickel-iron alloy. The ferromagnetic is biased to saturation in one direction applying a slow pulse of current and then is rapidly pulsed to saturation in the opposite direction, generating electric field at voltage gaps in the accelerating column. A series of 333 of these ferromagnetic cores are distributed along the accelerator.

The commissioning work so far has achieved beam currents of 120 amperes at 4 MeV and it is expected to reach full beam current of 200 amperes in the near future. The accelerator besides serving in the 'Astron' experiments will be available for work requiring very intense elctron beams.

CERN Studies

A study group on new accelerators based at CERN are concerned with two projects. One is the study of a possible large proton synchrotron with a maximum energy of 150 to 300 GeV and we hope to carry an article on this topic in August when the study will be presented as a report to the CERN Council. The second is a study of storage rings which might be built in association with the present 28 GeV proton synchrotron at CERN.

In pursuing the second topic a model storage ring 8 metres in diameter has been built for electrons. The 2 MeV Van de Graff injector for this model is now complete and tests are underway. These will be used to investigate the problems involved in the design and operation of the large storage rings for protons.

Nimrod

The implosion of a window on Octant 1 has caused some reorganisation in the final stages of construction and in the commissioning work.

The overall situation is most encouraging. A proton beam from the Injector was successfully steered for the first time through the Inflector system into Straight 1 on Friday, 24th May. 15 MeV beam currents of more than 2 milliamps with 120 microsecond pulse lengths have been passed through the Inflector.

Orion

The components for the ORION computer arrived on 30th, 31st May and 5th June. They were assembled by Friday, 7th June and the computer switched on during the following weekend. Commissioning and acceptance tests are now underway and may be complete by the end of July so that operation will commence sometime in August.

To date, the core store has been tested and one drum is working to test the circuitry of the central computor. Peripheral devices, tape units, teletype punches etc., are being tested in conjunction with the main work on the computer.

Administration personnel (chiefly L.A.O.s) have recently started assisting in the operation of the Injector and a volunteer at a time joins the crew on the Injector supplying clerical effort.

From all accounts they are enjoying the experience of seeing 'how the other half live' and maybe this additional knowledge of how scientists and engineers tick will give further insight into how to administer them!

Future Thursday Evening Lectures

July 4th: The World Hazard of Strontium 90
Dr. J. F. Loutit

July 11th: The Place of Speculation in Science
Dr. I. J. Good

(5.30 p.m., Main Conference Room, R.1)

A Breathing Apparatus Exercise was held in the NIMROD service tunnels in May in conjunction with the Reading and Berkshire Fire Brigade. Fireman and appliances from A.E.R.E., Abingdon, Didcot, Reading and Wantage took part. Six dummies placed in various difficult positions in the tunnels were recovered under emergency conditions. The whole exercise was conducted from a mobile control unit. It was clearly demonstrated that a system of communication is essential and the NIRNS breathing apparatus has this feature incorporated.

EDITORIAL

A Year in ORBIT

When the 1st Issue of ORBIT appeared in July 1962 it is doubtful if any of the Editorial Board were really confident that the journal would see the year through. Certainly none of us knew the form it would eventually take and none of us could estimate the extent of support the journal would command. We were all amateurs attempting something completely new to us, sustained only by a conviction that what we were doing was worthwhile, something we hoped would meet a need in the life of the Rutherford Laboratory.

With a year behind us we can look around at what has been achieved.

Only a fledgling editor could have ventured in the Editorial of the second issue 'we feel that within the limits we set ourselves, ORBIT looked and read reasonably well,' for with the 12th issue we believe the organisation of material and layout of pages has greatly improved within those same limits. But this is half the satisfaction of editing the journal - if we can not look back at this present issue at the end of the second year with the same raised eyebrows that examine our earliest efforts, we will be disappointed.

Despite the excellent efforts of Reproduction Section one area of criticsm all along has been the reproduction of our material. Reproduction always try to provide the best possible job with the resources available. In fact Reproduction Section go to great lengths month after month to meet the journal 'deadline', inspite of the fact that they must often get tired of the sight of the Editor and the journal.

There is no doubt that when a piece of writing is not attractively presented people will not go out of their way to read it unless it is a topic they are particularly interested in. Half our job is to create interest, but some content may not be read because of its comparatively poor superficial appearance. In these days of mass absorption of television and weekly journals of all types everyone is confronted day after day with material excellently presented by professional journalists and top class design men. The impact must be enormous though it may not often be realised. Most people will not be able to analyse why a page of a journal is immediately attractive and readable ('Hey, Fred! Come and look at this cunning devil's use of 6 point Baskerville type in them crossheads on this page'), but they are aware of it. We must do our best to cater for this awareness. This whole matter is now 'sub judice' and there may be some development before long.

As for the material of the journal - several people have requested an index and one listing the main articles of the first twelve months of publication is included at the back of this issue. A glance at the list will indicate that a lot of ground has been covered. It is inevitable with such a variety of people at the Rutherford Laboratory that we can't please all of the people all of the time. But if you ever think 'what on earth has he put this thing in for?' ask yourself whether someone in the next office isn't lapping it up. ORBIT is not for the top floor of R.1 or the far corner of R.12, but for the whole of the Rutherford Laboratory and this covers a wide range of intellectual attainment and a wide range of interests. If you personally read avidly every article we include, we are probably not doing what we intend, for another class of people will read little or nothing.

To put it bluntly some material goes into the journal that does not appeal to the Editor either in content or in style - it goes in because many other people will be interested. This statement is probably anathema to the professional Editor. A large number of the Editors we have met since venturing into ORBIT receive their material and themselves entirely rewrite it. This certainly brings the professional touch to everything in the journal. It conveys the essential information usually in the minimum number of words in a style easily assimilated, directed straight at the mind of the 'average man'. It is also, except with the most exceptional writer, death to the English Language and death to the variety of expression that brings over human personalities. Some of the blunders in taste and style that have appeared in ORBIT would be avoided by this approach, but the variety and spirit in writing that sometimes appears would go as well. To pin point what we are talking about pick up a copy of the Readers Digest - any copy, they are all the same. That publication has the biggest circulation list in the world. Its content is plum in the centre of middle class thought. No anarchical deviation is tolerated. It is obviously extensively edited - every article reads the same, whether it is 'My Dog Taught Me to Pray' or 'The Ruthless Supression of Outer Mongolia'. It is the utmost in journalistic competance and has its enormous circulation to prove it. We need much more of this professional ability but would hate to loose altogether the 'amateur' flavour.

Where do we stand now? Very little comment percolates back to the Editor from the Rutherford Laboratory itself. We get a general impression that people think it is worthwhile, appreciate the communication service, enjoy the leisure type articles and will even stop work to find 'Who Owns the Zebra?'! We are probably by now an accepted part of Laboratory life and we hope an enjoyable and useful part. From outside the Laboratory, true to the 'prophet is never recognised in his own country' routine, praise has been plentiful. Other accelerator laboratories and the Universities we are associated with in England receive a copy of ORBIT each month and an excellent advertisment hoarding could be compiled from their comments - 'We enjoy ORBIT keep it coming' (Stanford); '...always much enjoy reading it' (Abingdon School); 'Congratulations on your journal, the style is nice and the content informative' (CERN); '...your excellent magazine' (Liverpool); 'We welcome the coming of ORBIT' (CERN) (translated from the French) and even '...the only regular reminder we have of the existence and vitality of the Rutherford Laboratory is your delightful publication' (Stanford). To be fair we did also have, following the 1st Issue, 'We hate ORBIT' (member of Rutherford Laboratory at CERN).

And that is enough introspection even for a year in ORBIT. The position of Editor has brought

its frustrations, and, believe it or not, some hard work, but more often than not great pleasure and satisfaction. Our sincere thanks are due to all those who have helped to make the first year a successful one.

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,

I was very glad to read your observation in the May issue of ORBIT on the dangers of specialisation and the need to communicate specialised knowledge to a wider audience. They have prompted me to more particular consideration which may be directly relevant to the N.I.R.N.S.

It seems to me that Nuclear Science is particularly difficult to communicate, and in wondering why this is so I have been tempted to put forward the hypothesis that, in general, those who try to communicate it don't really understand it themselves. Having said this I must hastily add a qualification. Of course they understand it in a certain sense. But perhaps this understanding is of the kind which is acquired by a process of "indoctrination", rather than by real thinking.

If I am asked what I mean by real thinking I should begin by referring to the kind of understanding which enables one to relate a subject to the "broader context" referred to in your Editorial.

I should add that I have not overlooked the hypothesis that Nuclear Scientists are cleverer than others including myself. But for the present I ask "Do they really understand?".

T. R. Walsh

Sir,

May I enter the semantic discussion on 'Restaurant' or 'Canteen' for the exciting new building nearing completion at the Laboratory.

I hold that it is a matter of fact and not a matter of personal preference whether a building is a restaurant or a canteen. The true name is dictated by the type of service provided and since the type to be offered at our Laboratory is laid down in some detail in the last issue of ORBIT I feel the appropriate name should be obvious.

Consulting the 'Concise Oxford' I found the following information:-

Canteen - Provision and liquor shop in campor barracks; bar, lunch counter in large public and private institutions.

Restaurant - Place where meals or refreshments may be had.

Cafe - Coffee house, restaurant (especially foreign 'cafe chantant' with music and entertainments, often in open air).

Cafeteria - Restaurant in which customers fetch what they want from the counters.

In view of the self-service nature of our establishment, one thing is quite sure by examining the definition of cafeteria - it is certainly not a restaurant. Without more detailed definitions of the four categories it looks as if we have a canteen or a cafeteria with the odds on the latter.

GOURMAND

A member of the scientific community recently required a small quantity of plastacine to hold a thermometer in a pool of mercury in a brass block whose temperature was being measured. A simple matter. But withdrawing a block of plastacine from Stores he was confronted with the following instructions

'BEFORE you begin to fashion anything, take a piece in the hand and play with it. Roll it into long rolls, plait it, bend it, twist it, coil it round your finger, and roughly form spiral shells, rings, letters and simple forms such as Anchors, etc. Flatten the rolls into bands and rings. Rotate it in the hands into balls and beads, large and small; arrange them into patterns then press them flat and hollow, press and draw finger down at the same time to elongate them, put little beads into and between the hollows of the larger ones. Flatten the larger balls between fingers and thumbs into thin discs and plates, turn up edges or indent them with the finger into ornamental shapes and designs. Keep on trying to do things and you will succeed.'

The experiment took a little longer than anticipated.

'Join our club for holiday parachuting. 147a, Cemetry Road, Sheffield.'
Personal Colomn, Daily Telegraph, 23 May.

'£1million paid for paintings - By our own Reporter'.
Manchester Guardian, 12 June.

The Architecture of the Rutherford Laboratory Restaurant

G W Dixon

At the initial discussions on the design of a New Restaurant for the Rutherford Laboratory, the Client (N.I.R.N.S.) said they would like the building to take on a distinctive shape, which, if linked eventually to a lecture theatre and library building, would, as a whole complex, express itself as a focal point on the site. This influenced the siting of the building so that it would become a distinctive feature as one entered the establishment through its main gates.

It was also felt that a circular structure would reflect, in shape, the main Nimrod machine. The development, therefore, proceeded on these lines. If a circular structure had to be built it should remain a single unit of accommodation, complete and expressive in itself; for the dramatic effect would be lost if the circle were sub-divided into smaller units of accommodation. Hence the main cafeteria filled the full circle, with ancillary wings to house kitchen/utility area and the foyer/cloakroom accommodation. The latter could also form a link to any future lecture theatre. A siting was chosen on the brow of the hill. The architects became enthusiastic about the circular shape; this seemed to reflect the shape of the Berkshire Downs in this particular area, and from the large windows of the cafeteria one would be able to enjoy the full panorama of the countryside.

The circular structure was given a folded, plated roof so that the considerably number of 'static' roof lines which were formed would give a suggestion of the circular movement of the Nimrod machine.

The Pleasures of Old

ORBIT, May 1963, page 10: '...the lovely cheap buses which run all through the country lanes each morning and startle the villagers with their purple and orange flashes.'

I well remember the excitement of my first Peasant Shoot. For months before, our game-keeper Tom, would go early in the morning to spread nutritious kitchen scraps from the Lodge along the banks of the Thames. At dawn the Villagers would gather, their purple and orange flashes making a vivid splash of colour against the green fields, and swoop on the scraps fighting among themselves, letting forth their suprisingly uncouth calls. A fascinating sight to see. By the time of the Shoot they were plump and ripe for the kill.

Father used to love these Shoots and invited his friends from miles around to share in his excitement. On this particular morning quite a crowd of us descended from the Lodge onto the fields flanking the Thames at the edge of our estate. We stood in line by the hedge waiting tense and silent for the Villagers to rise. The first thin, watery rays of the sun glinted blue on the barrels of our freshly oiled guns and spread the fields with a flickering carpet of diamonds as they caught the cold drops of dew.

The first Villagers rose suddenly into view near the reeds and my heart pounded as my fingers damp with perspiration tightened round my gun. But Father gave no sign though I could see his eyes shining eagerly. Breathless minutes passed while the complete circle of the sun rose clear of the gentle hill to the East and the soft hum of the awakening hedges and fields grew. By now more Villagers had appeared and it couldn't be long before Father's hand fell to give the signal; everyone was half turned to watch him.

Abruptly his hand rose and fell. The full line of guns straightened. A tattoo of shattering barks tore the morning calm. The startled cries of the Villagers still echo in my ears and the thrill of finding their bright purple and orange colouring in my sights to send them thudding lifeless to the earth will live with me forever.

Those were great days. Now of course the true Villager is almost extinct. Their luminous hues no longer delight the eye in every county of England and it is only the far less appealing Red Spotted Villager that can be found in abundance. A few excellent specimens are preserved at Whipsnade and small communities still breed in the country lanes of Berkshire. But these are constantly disturbed by passing traffic. The ruthless advance of modern civilisation seems destined to destroy them altogether. It makes me very sad.

From the English version of a Japanese Safety Magazine:-

Slippery roads: Go soothingly in the grease mud, as there lurk the skid demons. Press the brake of the foot as you roll around the corners to save from collapse and tie up.

On encountering pedestrians: When a passenger on the hoof hove in sight, tootle the horn trumpet him, melodiously at first. If he still obstacle your passage, tootle him with vigour and express by work of mouth in warning, "Hi! Hi!".

You are not safe anywhere:-

Ricky Eaton had spent four years, which were completely accident free, at the Rutherford Laboratory with Central Engineering Services. Recently he transferred to Safety Section.

On the first morning in his new post, he was sitting quietly in his office when something fell from a shelf onto his head. Ricky was taken to hospital for attention but is now back at work fit and well.

SPARTACUS among the Nuclear Men

Reprinted from a feature by 'Spartacus' in the Sunday Guardian
dated August 13th, 2056

The other day I went down to Berkshire to call on one of our oldest Research Establishments which is this year celebrating it's centenary. It is almost exactly a hundred years ago that the Rutherford High Energy Laboratory officially came into existence and I thought it would be interesting to find out how they are faring in the rapidly changing conditions of today.

I arrived on a glorious summer afternoon which showed the delightful wooded site to it's best advantage. There is nothing remaining of the second world war airfield and the site of the old Atomic Energy Research Establishment is now taken up by a large nuclear power station to meet the high power demand of the accelerator plant. The Laboratory buildings are ranged elegantly on either side as you cross the bridge which takes the M527 Birmingham-Chilton Road over a three mile long 'Superconducting Linear Accelerator for Protons', (known as SLAP). This machine is an extension of the oldest of the machines at the laboratory, the PLA, as it is still affectionately called, which has a long history of scientific work behind it. I spoke to the present officer in charge, Dr. Brian Churchward, in his dignified office with the long list of past scientific officers written in gold on the oak panelled walls.

"Yes, some people say we're redundant - the work we do is no longer fashionable - it's all this psychic stuff these days - but we feel that our long tradition of experimental physics is still valuable today. These chaps who do everything with computers - well, it's all very well but they have no 'feel' for their subjects at all you know. We now have approval for the new accelerator near Mars and we've had to overcome a lot of opposition. The same arguments were used against the old 'World Accelerator' but the degree of international co-operation achieved then made it well worth while".

I went over to the 'Nimrod' buildings, past the ivy covered cooling towers and the restaurant with it's ancient moat, to talk to another member of the senior staff, Dr. John, 'Sandy', Ivatt.

"Staffing? - no, we have no difficulty at all. Our scientific and engineering officers are mostly from the Grammar Schools and 'red-brick' universities, or from overseas - we prefer Cambridge of course. Public Schools? - well we have had some of their people here, but there are none just now. The public schools are not yet turning out the sort of chap that we need - I think it's important for a man to feel comfortable with his brother officers. At the present time we are receiving an embarrassingly large number of applications and we have recently increased the height requirement by an inch and one eighth which is keeping the short list at a reasonable size".

Dr. Ivatt took me down to the 'Nimrod' Complex which is, of course, greatly extended from the original small 7 GEV machine. I was surprised to learn that the actual accelerator and its associated storage rings, huge though it is, occupies only about a quarter of the total space, the remainder being taken up by the enormous computer facilities required to cope with the output of experimental results.

"Yes, in the early days people completely underestimated the sheer volume of data that comes out of a machine of this sort. The original 'Nimrod' fed it's results straight into a computer - 'Atlas', I think it was called - but that would be quite inadequate today. The computer is now the biggest and most expensive part of the installation and the limit on size is not any difficulty in accelerating particles to higher energies but the problem of building a computer big enough to handle the results. That's one of the big advantages of the Mars Accelerator - the accelerator proper will be built in space and the planet's surface used for the computer - it's about the nearest place with enough room, now that our own sea bed is all used up for food production.

As we walked round the old Nimrod magnet ring, Dr. Ivatt explained that it now formed part of the 'injector' of the present machine and I found it hard to believe that some of the equipment, burnished from decades of polishing, was a hundred years old.

"Some people scoff at our 'spit and polish' but we think this is the best turned out machine in the world".

Later, I was lucky enough to be present in the Control Room to see the time honoured ceremony of 'Start Up'. After the long, complex count down, a procedure carried out with the impressive precision which only comes from intensive training and discipline, the final interlocks were completed. The different officers and men, each in his distinctive and immaculate overall, executed their duties with perfect timing until the final climax when the great machine was pronounced 'On The Air'.

Before leaving, I asked Don Greasly, a senior administrator, what the future holds for this, our oldest Establishment.

"To many people, of course, we are an anachronism, something which should have been scrapped long ago - the modern, fashionable researches tend to use no 'apparatus' at all in the traditional sense - either they use a computer or it's some piece of psychical research which just requires a tape recorder and a darkened room - but we believe that traditional skills and disciplines should not be recklessly abandoned. These big projects of ours are the most complex, and the most difficult co-operative undertakings ever seen - they require many skills, which might otherwise languish, a great deal of experience, discipline and self-sacrifice on the part of everybody concerned. We feel that these things are important and valuable and well worth preserving for the future".

Personnel News

Suggestion Awards

Awards totalling £30 were made to the authors of suggestions considered at the Eigth and Ninth meeting of the Rutherford Laboratory Suggestions Awards Committee.

Encouragement Awards of £1 each were made to the following personnel in respect of their suggestions which, although they may not be put into practice, were considered by the Committee to merit some recognition:-

Mr. C. Wallis	Mr. B. P. G. Rowe
Mr. S. J. Worley	Mr. A. Holcroft
Mr. J. Lowsley	Mr. B. Southworth
Mr. C. D. Moreton	Mr. T. Morgan

Awards in recognition of suggestions of which the Committee recommended implementation were also made as follows:-

Mr. L. R. Hart	£4
Mr. J. E. Purling	£4
Mr. P. Seager	£2
Mr. J. McHugh	£3
Mr. C. Gascoigne	£5
Mr. C. Humphrey	£4

D. G. J. Rose, Secretary

Congratulations to

Valerie Pryor, Typing Pool, on her marriage to Ernest Westbrook on 4th May.

David Lord, Bubble Chamber Group, and his wife Shirley on the birth of a daughter, Sara Corinna, on 15th May.

E. R. Harrison, Research, has been replaced on the ORBIT Editorial Board by C. L. Roberts, Atlas Laboratory.

OPEN DAY, scheduled for 13th July, has been cancelled.

Comings and Goings

Dr. R. F. Churchhouse has been appointed Head of Programming at the Atlas Laboratory.

G. Howard, J. H. Hunt, J. Lennon and A. T. McCormack join Central Engineering.

F. Colman, A. Jones, B. Sizer and G. M. Slaymaker join Nimrod Engineering.

D. Evans and G. B. Stapleton join Industrial Chemistry; A. S. Carrol and R. S. Gilmore join High Energy Physics.

Miss G. Belton and Miss J. A. I'Anson join Administration; Miss J. Smith joins Secretarial and Typing.

Miss A. J. Gillies and Miss A. E. Pascoe join Atlas Laboratory.

C. A. Brooks, Mrs. P. Glen, Mrs. Q. E. Tame and A. B. Hulbert have left us.

DERECK SHARP

We record with great sorrow the death of Dereck Sharp on 11th June. Dereck had been undergoing treatment at the Radcliffe Infirmary Oxford for several months.

He joined the Atomic Energy Authority seven and a half years ago and moved to the Rutherford Laboratory as a member of Construction Group in September 1958. His work here has been mainly concerned with the Injector and he built up a big circle of friends. A group of people representing the Authority and the National Institute attended the funeral on 14th June.

Our sympathy goes to his sister and all his relatives and friends.

Jim Dixon, the sculptor of the Nimrod model displayed in the Entrance Hall to R.1 a few months ago has recently completed a painting under the title 'The Three Ages of Nimrod'. This can be seen on the wall of the Alternator House (R.3) on the left entering by the personnel or main door. Jim Dixon has written the following description -

'A painting worth doing, should have something to say and be pleasant to look at. These things I have tried to do, without recourse to outright abstraction, preferring to retain the symbolic. The name "NIMROD", has for me become synonymous with "ESPIRIT-DE-CORPS", in a similar sense to that we experienced in the armed forces. That spirit is the key note of the painting.

At the extreme left I have symbolised the great age of the Roman Era as seen as a hot barren land and ruined temple. We still lean towards this past age, as shown in the diagonal division between this and the next phase of the present machine, built in our electronic age. Our present project at the Rutherford Laboratory is shown by the tall administrative offices, the power supply surging with energy, the massive concrete block on its great springs, the maze of electronics, the magnet drawing its power and the curved arcs from the catacombs beneath. The great spirit of "Nimrod" is symbolised by an ethereal god-like figure encompassing all. The present I have taken as May 1963, and the seven month embryo nestling within the eight octants is not yet quite ready to commence its own new existance. The mound effect of green sward over the magnet is accomplished by the use of modern mastic transparency media. The future is symbolised on the right, as I see it a clean straight road stretching on and on into the field of nuclear science available to our researchers. The aura at the top is symbolic of the set backs and trials we have undergone, but now smoothing out into a bright clear sky.'

The BUPA

T Evans

It has been decided to open our pages to welfare, non profit making organisations who wish to relay information on the services they provide which are available to Rutherford Laboratory personnel. Tudor Evans, Group Secretary of the BUPA describes the work of the Association.

Not all members of our staff may be aware that to help those who, in the event of serious illness, would like to be able to have private treatment for themselves and their families, we operate a Group with the British United Provident Association.

Some may not know about BUPA. Others, already individual subscribers, may not realise that if they are under 65 years of age they may apply to transfer their registration to our Group and thereby pay less for the same cover.

In this brief reminder about BUPA you will find some details of the benefits provided, of the subscriptions attached to the various scales of benefit and of the substantial advantages you enjoy through Group rather than individual-membership.

What is BUPA?

The British United Provident Association exists for one purpose only - to help its subscribers to the greatest possible extent in meeting the expense of private treatment for themselves and their dependants in the event of serious illness or injury. It is a non-profit making organisation working solely for the benefit of its subscribers. Its President is Lord Nuffield. Its Governors receive no remuneration of any kind. Its policy is to keep subscriptions at the lowest possible level compatible with the ability to make realistic payments to subscribers overtaken by illness or injury.

Since its foundation in 1947 BUPA has expanded rapidly and now covers nearly 1,000,000 people in the United Kingdom. Although for many years no less than 85% of its subscription income has been paid out in claims, it has been able to accumulate reserves which now stand at about £1,200,000. It has also largely financed the Nuffield Nursing Homes Trust - charity devoted to increasing and improving nursing home facilities throughout the country.

These results have been achieved by an efficient and economical administration which absorbs only 10% of subscription revenue - compared with the average of 30% considered satisfactory by commercial standards. They explain why it is that among insurance companies themselves (and who should be better judges of value for money in schemes of this kind?) there are no fewer than 70 BUPA Groups.

Benefits

To provide adequate cover in accordance with varying individual requirements there are at present five scales of benefit numbered 7 to 11. If, for example, you are a subscriber under Scale 10 you are entitled to grants of up to 34 guineas a week for accommodation in a hospital or nursing home and up to 100 guineas for each major operation. There are many other benefits obtainable and if your wife and children (up to 18 years of age) are included in this registration, each will be entitled to similar benefits.

If you elect to receive in-patient treatment free under the National Health Service a special grant is payable towards other expenses directly associated with the illness, such as convalescence, which would otherwise be outside the scope of the schedule of benefits.

Cover against the cost of private general practitioner treatment can be secured by payment of an additional subscription by any subscriber under 55 years of age.

Although you must normally be resident in the United Kingdom to be eligible for enrolment, you and your dependants are protected during temporary absences abroad (either on business or pleasure) in exactly the same way as you would be in the U.K.

Why a Group?

If, being under 65 years of age, you apply to join our Group and are accepted, you will enjoy two important concessions: (1) You will pay 20% less than the standard rate of subscription for whatever scale you select. (2) You will become eligible for benefit immediately on acceptance, i.e. you will not be subject to the normal 3 months' 'waiting period'.

If you are already an individual subscriber to BUPA and under 65 years of age, you may apply to transfer your registration to our Group. On acceptance any balance of your current subscription will be refunded. The only proviso is that if you are registered under one of the closed scales (2 to 6) it will be necessary for you to transfer, on joining the Group, to one of the open scales (7 to 11).

Subscriptions

These are graded according to age and the scale of benefits selected. Full particulars will be found in the brochure but if, for example you decide on scale 10 (bearing in mind maintenance costs in this area are between 30-40 guineas) and are between 30 and 49 years of age, your monthly subscription after deducting the 20% Group concession is £1.1.0. To include your wife you pay an additional 10s.5d. and to include all your children (up to 18 years of age) a further 7s.0d.

Members of our staff who are interested in joining will need more information than we have been able to include here. A descriptive brochure and an application form can be obtained from the Group Secretary Mr. Tudor Evans, Building R.20, (Ext.400).

'I have seen many tin boxes with scales and clock hands on them, surely most exciting instruments. Supposing I understood how they work - do you think this would make a better Minister of me?'- Herr Hans Lenz, W. German Minister for Science and Research.

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