13th Issue

ORBIT

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The Journal of the Rutherford High Energy Laboratory

The PLANET Project

A P Banford

PLANET stands for Proton Linear Accelerator operating Near the Extreme Temperature and is the nickname of an idea for improving the performance of a P.L.A. by using superconducting resonators in place of the usual copper ones. The April issue of ORBIT carried 3 articles dealing with the P.L.A., all of which mentioned the inconvenient pulsed nature of the proton beam which is only on for one percent of the time. In contrast to NIMROD, in which the pulsed output is an unavoidable consequence of the acceleration mechanism of synchrotrons, the conventional P.L.A. could deliver a continuous beam were it not for the practical difficulties of generating large amounts of radio-frequency (r.f.) power.

The resonant cavities or "liners" of the Rutherford Laboratory P.L.A. are made from copper which, (apart from silver which is only marginally superior) is the best conductor of electricity at normal temperatures. Even so, an instantaneous power of 3.5 megawatts at 200 megacycles per second is required to accelerate the protons to 50 MeV in a length of 100 ft., and in order to keep the mean power consumption within reasonable bounds the r.f. power. and hence the proton beam, must be pulsed. Almost all of this 3.5 megawatts of r.f. power is dissipated as heat in the metallic walls of the liners. If we could somehow make the electrical resistance of the liner surfaces smaller, the r.f. power requirements would be reduced and it might be feasible to run the machine with a continuous output.

Such a reduction of surface resistance could be achieved simply by cooling the copper liners to a low temperature. However, it turns out that the power requirements can only be reduced to about one-tenth of their former value however cold the resonator is made, and to achieve a really dramatic and worthwhile power reduction it is necessary to use superconducting resonators.

The phenomenon of superconductivity was discovered about 50 years ago. It is the abrupt and total disappearance of resistance to direct electric currents which occurs when certain materials are cooled to very low temperatures. These materials or superconductors comprise about 20 metallic elements (including lead, tin, zinc, mercury, aluminium and cadmium) and several hundred intermetallic alloys and compounds. Among the common metals which do not superconduct are copper, silver and iron. By means of steady magnetic fields it is possible to set up circulating electric currents in a superconducting ring. Such persistent currents have been observed to circulate without

any measurable decrease in strength for periods of up to 2½ years so that it is fair to say that for steady currents the resistance really is zero. There are many theories of varying degrees of complexity, which can explain many of the details of the way superconductors behave, but no-one yet knows why some materials superconduct and others don't.

The term "very low temperatures" in this context means temperatures within a few degrees of absolute zero which is -273° C (524 degrees of frost). Temperatures measured from the absolute zero are expressed in degrees Kelvin (K) which are the same size as Centigrade degrees : hence the normal boiling point of liquid helium, -268.8° C is 4.2° K. At this temperature all other substances are solid, the last survivor, hydrogen, freezing at 14° K. Liquid helium is an expensive commodity - its price of 45/- a pint puts it in the same class as heavy water and Scotch. It also boils away all too easily on account of its miserably low latent heat of evaporation which volume for volume is only one thousandth that of water. Thus, in order to keep a low temperature rig or "cryostat" as cold as possible, excellent heat insulation is of prime importance.

The temperature below which a material is superconducting is known as its critical temperature (Tc) : typical values are 1.1° K (aluminium) 3.8° K (tin) 7.2° K (lead) and 9.0° K (niobium). Higher transition temperatures (up to 18° K) are exhibited by some of the more exotic alloys and compounds, which can withstand very intense magnetic fields before their superconductivity is destroyed. So it would appear that as soon as a liner made of superconducting material were cooled below its Tc, all its resistive losses would vanish, and one could run a P.L.A. on the power needed for the beam acceleration alone.

This is incorrect since the zero resistance only occurs for steady (d.c.) currents, whereas in a P.L.A. the currents alternate at the driving frequency of 200 Mc/s or thereabouts. For reasons that cannot be gone into here, it turns out that superconductors display a non-zero resistance for alternating currents, increasing as the frequency increases. Fortunately, in the region of frequencies of hundreds of mega-cycles per second, there is still a large drop in resistance when a material goes superconducting. Calculations based on published r.f. measurements with ultra - pure superconducting tin predict a total r.f. loss of only 30 watts for a PLA with lead resonators at 4.2° K. This PLA would be otherwise identical to the existing Rutherford Laboratory 50 MeV P.L.A. which with its copper resonators has an r.f. loss of 3.5 megawatts. Even allowing for the additional r.f. power fed into the beam, the total is still small enough to permit continuous operation which also results in a simpler and cheaper r.f. system. On the other hand it is now necessary to provide a helium refrigerator so that a superconducting P.L.A. would be no cheaper to build and operate than a conventional P.L.A. However the advantages of a continuous output of protons are tremendous and fully justify the interest being shown in the idea both at the Rutherford Laboratory and elsewhere.

Turning now to the practical aspects, there is, of course, a world of difference between getting good results on small, pure specimens in the laboratory and repeating these results over areas of thousands of square feet in an actual accelerator. So, for some time now, work has been going on in the P.L.A. group on the r.f. properties of superconducting specimens prepared by methods (e.g. electroplating) which would be suitable for large areas.

The best results can be summed up by saying that if they were reproduced in a 50 MeV P.L.A. the r.f. losses would be about 200 watts. Although, as expected, this figure is higher than the 30 watts deduced for ultra - pure surfaces, it is still sufficiently low for continuous operation. These results of ours have been obtained from a large number of small and simple resonant devices which have served both to weed out a few non-runners and to indicate which surface treatments give the best results. The next steps, to be taken very shortly, will be to introduce successively further touches of realism such as larger areas, joints and higher power levels.

As yet there is no proposal to actually build a PLANET type accelerator. No fundamental reason why the idea should not be workable has so far become apparent and it may well be possible to formulate a scheme for a PLANET in a few years time should the state of nuclear physics at that time justify it. Such a machine would be a completely new one, not an extension of the existing P L A. A 600 MeV machine built as a π- meson factory would be about a thousand feet long and would fit comfortably between here and the existing A 34. The proposed new section of this road further to the east would facilitate any extension at a later date. but we cannot claim that this consideration had any influence on the A 34 proposals.

". . . . there is now a basic new advance coming to help fundamental physics : the high magnetic fields which can be obtained with superconducting coils and very low temperatures."

Prof. W. Jentschke, Director of the Hamburg Institute of Experimental Physics in his concluding address to the 1962 International Conference on Instrumentation for High Energy Physics.

The Oxford High Magnetic Field Conference

A considerable amount of effort is now being devoted to the production of high magnetic fields, to meet the growing demands of plasma, nuclear, and solid state physicists. This work was given a tremendous impetus in 1961, when the unexpected discovery of a number of materials which remain superconducting in fields up to 200 kilogauss opened up the possibility of producing steady fields of this order with negligible power consumption. The construction of these superconducting magnets formed the central theme of the Oxford Conference, organised by the Institute of Physics at the Clarendon Laboratory from July 10th - 12th. Other topics included the production of high fields by conventional techniques and properties of materials in high fields.

In some ways, little real progress seemed to have been made since the 1961 conference at M.I.T. Two speakers gave almost exact duplicates of their 1961 papers, and the enormous 250 kilogauss, 16 megawatt, solenoid at M I.T. is still only entering the testing stage (the inner section has burned out twice). However, substantial developments were reported in superconducting magnet construction; although the reasons why superconducting wire behaves differently in large coils than in short samples are still only partly understood, considerable progress has been made by the trick of coating the wire with copper, and solenoids have been made giving up to 45 kilogauss in a 6 inch bore. The highest field generated by a superconductor is now 101 kilogauss, in a very small coil of niobium - tin.

A notable improvement at this conference was the continuous availability of free coffee throughout the sessions, providing a welcome refuge from incomprehensible Dutch accents and considerably facilitating exchange of information with our American friends. But large scale research at low temperatures can be frustrating, time consuming, and very costly, and it was only the scientists from the large American companies, such as Westinghouse and Avco Everett, who could be said to have any information of real value to exchange. One of the Rutherford Laboratory contingent expressed surprise that so many Americans should have travelled 3,000 miles just to talk to each other. Still more information was extracted at an impromptu evening session in which the enthusiasts, revitalised by a lengthy beer break, were able to continue the discussion up to 11 p.m.

We return to work with a sense of relief that everyone else experiences the same frustrations and problems as we do, but sadly reflecting on the limitations of our "large" 6 inch diameter cryostat compared with the 24 inch cryostat used at Avco - Everett.

P. F. S.

The Accelerator World

CERN

An extracted proton beam has been achieved on the CERN proton synchrotron. This is the first time a beam of such high energy, 25 GeV, has been extracted from an accelerator. Another significant improvement in the machine is the performance of the Injector which can now feed the synchrotron with 50 MeV pulses of 60 milliamps.

These two achievements were significant in the first neutrino experiments which took place a few weeks ago. With an extracted proton beam of 7.10^{n} particles at 24 GeV, focussed to a 2 millimetre square image, the opening run of two days produced 40 neutrino events in the spark chamber and 8 in the bubble chamber. The indications are that the neutrino observations at CERN will be some 50 times as plentiful as those produced elsewhere.

Another recent experimental success was the determination of the relative parity of the sigma and lambda hyperons. To handle the ever increasing mass of data from the CERN experiments a 7090 electronic computer will be installed in September.

Delegates from the 13 member states of the CERN Council met at the end of June. Professor Weisskopf, Director General, in presenting his report again said the CERN is not yet in a position to exploit to the full all its installations; sufficient funds are not yet available to permit the complete use of all the research potential represented by the current machines. A Committee set up to consider the future of CERN has suggested a growth of the annual budget of 13% for the next two years, falling off to something over 10% for the following two years.

The Council took note of a report by the European Committee on Future Accelerators. Recommendations included construction of proton storage rings in association with the CERN proton synchrotron and also of a new very large accelerator. The Director General said '.....high energy physics has proved even more fruitful than was expected by the creators of CERN and....much more powerful accelerators can and should be built to continue this work without putting too great a strain on the financial resources of Europe or, what is equally important, taking more than a just share of its scientific potential.'

The American Proposals

Some more detail of the 'expensive and restrained' 18 year programme, averaging 445 million expenditure per year, recommended for the U S A. (the main recommendations were given in the June issue of ORBIT):

Recommendation 8 reads - Continue to support accelerators in operation or under construction, as well as their associated research programmes, without neglecting the need for new facilities. Recognise the special need for expansion in operating and research budgets of the newest accelerators before they come into full operation.

Recommendation 10 reads - Close down or reduce the level of operation of accelerators which become relatively unproductive. The prime considerations in continuing an accelerator programme are its scientific significance, the suitability of the machine relative to other available machines, the capacity of the group to carry out the proposed programme and the provision of adequate support for research programmes elsewhere. Additional factors are the educational function served by the accelerator and its use in preparing experiments for more costly facilities.

In a discussion of the recommendations the report said: 'The programme contemplated over the next 18 years devotes roughly five sixths of the funds to the operation, research and improvement programmes of existing facilities and of the new facilities when the latter are operating. Roughly one sixth of the funds is devoted to the actual construction costs associated with the new accelerators. We thus do not assign absolute priority to the support of existing machines; rather we believe that at any spending level, there must be balance between new construction and support of operating machines in order to prevent obsolescence of the programme....'

Nucleon Structure Conference

An International Conference on Nucleon Structure was held at Stanford University from 24th to 27th June. Over the past few years the electron has been the most useful probe of nucleon structure, and much notable work has been done at Stanford using the 1 GeV electron linac; now the Cornell electron synchrotron, the 6 GeV Cambridge electron synchrotron and the Orsay electron linac are all working in this field. Conferees were also able to see the earthworks for the Stanford two mile electron linear accelerator, SLAC, which in 1966-67 should deliver over 10^{14} electrons per second at 20 GeV energy.

Experiments on electron (and positron) scattering from nucleons confirmed that, within the present energy range, the exchange of 2 photons between the electron and the nucleon is not important and also confirmed that the photon does not behave as a Regge particle. New results on nuclear form factors came from Cornell, Harvard, Orsay and Stanford. The latest Brookhaven results on high energy anti-proton and K-meson scattering on protons showed that the diffraction peak for these processes does not shrink, thus further invalidating the simple Regge pole picture of high energy processes. However theoretical papers showed that analysis in the angular momentum plane is still very much with us, as also are the symmetry theories of particles and resonances.

R.G.M.

Heavy Liquid Bubble Chamber

The University of Michigan has announced a programme for the construction of what will be the world's largest heavy liquid bubble chamber. Containing freon, propane or a mixture of these two, the chamber will be 40 inches in diameter and 26 inches deep, surrounded by a 300 ton magnet giving a field of 40,000 gauss. The magnet is being assembled at Argonne and in 1964 the chamber will be taken to Argonne for use with the 12.5 GeV Zero Gradient Synchrotron.

The University of Michigan has also commenced construction of a 50 MeV variable energy sector focussed cyclotron on the University campus.

'PLA to buy hydrofoil launch?' Headline in The Guardian 9th July.

In view of the financial difficultes, this would seem a wholly unjustifiable purchase at the present time – unless perhaps the Port of London Authority are not affected.

EDITORIAL

The goal of years of work has almost been reached. Within the next month all systems should be GO to accelerate proton beams in NIMROD.

On 22nd July a fortnight's intensive programme of operation on the Power Supply was concluded. In general the performance of the whole plant was very satisfactory. The output voltage and current were gradually increased over the two weeks finishing with 10,500 amps peak current and 100% volts on the rectifiers which had previously been subjected to a special ageing process in an attempt to reduce the backfire rate. The backfire rate on previous runs had been higher than could be reasonably tolerated – in the latest tests none occurred up to 90% volts and at 100% volts, 10,500 amps, only five occurred, which is a considerable improvement. Brown Boveri are continuing their investigations into the cause of these backfires.

The pulsing tests were carried on with the Power Supply putting power into Octants 8, 1. 2 and 3 and the opportunity was taken to feed beams from the Injector into the Octants under actual operating conditions. This work was most encouraging – the proton beam was steered to the end of Octant 3 and there was every indication that, had the complete machine been available, it would have travelled round the ring without difficulty. The vacuum system was reliable; the timing system worked satisfactorily at first go; beam monitoring equipment was tested; much control work was done from the Main Control Room. The achromatic inflector system passed particle beams as high as 22 milliamps with a 50 microsecond pulse length into the magnet ring with the Octants pulsing and preliminary tests have confirmed its achromatic property. (An 'achromatic' system is an arrangement of magnets and electrostatic lenses which bends particles of different energy through the same angle).

The performance of the Injector as a whole has steadily improved. A new type of R F ion source looks capable of delivering much higher beam currents (around 100 milliamps). The prebuncher, which 'bunches' the particles coming from the D C gun so that more of them will arrive at the linac at the right time to be accelerated, is now working well after some initial trouble from multipactor. Successful operation of the prebuncher together with the new type of ion source has resulted in high 'transmission factors' in the linac : for example, from a beam of 42 milliamps fed into the linac a beam of 24 milliamps emerged accelerated to 15 MeV. This was the highest 15 MeV beam observed to date but when the higher currents are drawn from the ion source we can hope for beams well beyond this figure.

With the Power Supply run completed, Octants 8, 1, 2 and 3, were let up to air for some final installation work. The complete ring of the vacuum system is being connected up at the same time. By the first week in August, with any luck, all the construction and installation work necessary for accelerating beams will be complete. The vacuum system will be tested and everything should be ready for a series of experiments with the proton beam travelling full circle round the magnet ring. It will then remain to successfully bring in the R F Cavity in Straight 8, which will give the circulating beam a series of voltage kicks to accelerate the protons up to 7 GeV.

Everyone in the Laboratory will be wishing the NIMROD team well as they embark on this last stage in the building of NIMROD.

Due to the sudden increase in the load on the typing and reproduction services within the Laboratory the burden of producing ORBIT has become too much for them to bear. We have therefore moved to reproduction outside the Laboratory, using the most economical means available.

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 am appalled at the callous way in which your thinly disguised correspondent describes his participation in the "sport" of peasant shooting. His evident delight in this despicable method of putting down these defenceless creatures does him little credit. Modern science has for long past provided simple, humane methods of dealing with these innocents, information on which I would be glad to supply free of charge on personal application.

My society, the Royal Society for the Prevention of Cruelty to Peasants, has for years striven, without any Government subsidy, to stamp out these wicked practices, and like the R.S.P.C.A. takes pride in the recognition afforded by the Royal prefix. We, too, were accorded this honour about 50 years ago, whereas the poor old N.S.P.C.C. comes nowhere in this respect : puts things in their proper perspective, eh?

M. R. Harold.

LETTERS TO THE EDITOR - (cont'd.)

Sir,

Since criticisms of our new restaurant / cafeteria /eating house will doubtless come thick and fast from the aspiring gourmets, allow me to say a few words in praise of this facility. The architecture is imaginative and striking, the atmosphere one of airy cleanliness and the food good, at a reasonable price.

Inevitably, the biggest problem will be overcrowding. This being so, I would venture to suggest that those people with food neurosis, who cannot possibly be satisfied, should dine elsewhere.

Boeuf bouillé et carottes.

oooOOOo

Visit to the Soviet Union

P G Murphy

A reciprocal visit to the U.S.S.R., following the visit of the Russian party to Great Britain in 1962, took place in June. Three members of the Rutherford Laboratory, L.B. Mullett, G.H. Stafford and P.G. Murphy and five physicists from A.E.R.E., E. Bretscher, B. Rose, E.R. Rae, D.L. Allen and R.J.N. Phillips went on a two week tour of the Soviet nuclear physics laboratories.

The first Laboratory visited was the Institute for Theoretical and Experimental Physics, Moscow. Here there is a 7 GeV strong-focussing proton synchrotron, which has a high gradient, achieved by means of a neutral pole. At present it gives 10^{10} protons per pulse at 1 pulse every 5 seconds. There are plans to replace the 4 MeV Van der Graaff injector by a 20 MeV linac. Several heavy liquid bubble chambers and one hydrogen bubble chamber (55 cms.) were set up for experiments and a 1.5 m hydrogen chamber is under construction. All the chambers in use and some spark chamber experiments were set up in pion beams.

Kurchatov Atomic Energy Institute, Moscow.
As well as atomic energy work, this institute was carrying out research in a number of more academic fields. Two remarkable instruments were an α-particle spectrometer and a γ-ray spectrometer both of high resolution.

We flew from Moscow to Kharkov, a city which had been completely wiped out in the war but is now rebuilt with a population of 900,000. Here we visited the Kharkov Physico-Technical Institute, where there are a number of linear accelerators – 20 MeV protons; 3, 30, 90 MeV electrons and a heavy ion machine. A most impressive 2 GeV electron linac is nearing completion. This machine is driven by 50 klystrons, each delivering 20 megawatts.

After Kharkov our next stop was Leningrad. another city devastated in the war. Now the many palaces, churches, opera houses, etc. have been meticulously restored. Spires have been re-gilded and even the painting in the ceiling of the re-built opera house has been reproduced as it was before the bombing. In Leningrad we visited the Ioffe Institute. This laboratory contained the first Soviet cyclotron, now used to accelerate heavy ions. Other work was in progress on photonuclear spectroscopy, β-ray spectroscopy, other low energy nuclear physics and plasma physics. Here we met Komar (one of the recent Russian visitors to this country) who told us about progress on the 70 GeV proton synchrotron being built at Serpukov (near Moscow). The foundations and experimental area are completed and the 120 magnet sections have been specified and ordered. They have a duoplasmatron source which gives 400 ma of hydrogen ions at 750 KeV.

We flew back to Moscow and on to Yerevan, the capital of Armenia. The heat in Yerevan was tremendous and fifty kilometres away, in Turkey, we could see the white peaks of Mount Ararat. The principal activity in the laboratories of the Armenian Academy of Sciences is the construction of a 6 GeV electron synchrotron, similar to the Daresbury machine. The foundations were just being completed. We also visited Prof. Alikhanian's cosmic ray laboratory on Mount Aragats. This was equipped with several very large electromagnets to deflect cosmic ray particles. A group at this laboratory had developed a remarkable spark chamber with a 20 cm. gap between the plates; when placed between the poles of a magnet the sparks followed the curved tracks of charged particles. We finished our visit to Yerevan with a vast Armenian banquet at the mountain station.

The party then returned to Moscow to visit the best known of the Russian accelerator laboratories at Dubna where the 10 GeV synchrophasotron (a weak-focussing proton synchrotron) and a 680 MeV synchrocyclotron are in operation. The 10 GeV machine gives 3×10^{10} protons per pulse at one pulse per 9 seconds. A number of separated beams were set up for use with bubble chambers; a most interesting beam was under construction using an R F separator to give 5 GeV/c antiprotons. A 2 metre propane bubble chamber and a 1.5 metre liquid hydrogen bubble chamber were also under construction. The synchrocyclotron had a large number of experiments around it, particularly for measuring the parameters of proton-proton scattering. This machine runs 145 hours per

VISIT TO THE SOVIET UNION - (cont'd.)

week for experiments.

Our final visit was to the Lebedev Institute in Moscow. A large amount of work was going on here principally on photoproduction, neutron physics and Van de Graaff work. It was interesting to meet Cherenkov, famous for his effect.

Throughout our tour we were treated with great hospitality. We were taken on most interesting sight-seeing trips everywhere we went and were treated to many banquets. At Kharkov we were met at the airport at 10p.m. by the director, Professor Sinelnikov, his wife and half a dozen senior staff members. This and the banquet at Yerevan were perhaps the most memorable and enjoyable events of the trip. We were kept in good humour by our extremely charming interpretress, Donna, and insulated from all bureaucratic difficulties by our guide Mr. Ogurtsov, who seemed to have universal power over airline officials, traffic policemen, etc.

Letter from East Africa

D Orr

David Orr came to what was then the Accelerator Division of AERE in 1956 after taking his first degree at University College, London. He received a Ph.D. for his research work here and in 1961 took up a post as lecturer at Makerere University College, Kampala, Uganda.

After five very pleasant and enjoyable years at Harwell, why go off to the semi-unknown of an African University?

Makerere with almost 1,000 students studying for University of London degrees is some 600 miles from the Indian Ocean with the Congo 200 miles to the west. The College is positioned on a hill site of about 300 acres – large enough to accommodate the various University buildings, all the students (in six residential halls) and the majority of the staff houses.

Climatically, East Africa has much to commend it; in Kampala the temperature is invariably between 60 and 80° F and yet within manageable distances are glaciers on the Mountains of the Moon and the perpetual snows of Kilimanjaro. On the doorstep, too, is one of the world's largest lakes – Lake Victoria – and many and varied game parks. Politically, the indications are that changes will be made sufficiently slowly to avoid any major flare up.

What about teaching and research work in a Physics Department of half a dozen senior staff? An average teaching load is three lectures with supervision of three practical classes a week; heavy by British University standards but necessary until more research students, who can help with the demonstration work, are forthcoming. Progress in research is slow for two main reasons – firstly, the number of people actively interested in a particular research topic is often one or at the most two; secondly, the delivery time for quite ordinary equipment is at least six months. One realises that the much maligned Harwell stores system is in fact an excellent institution. The first step to overcome the lack of cohesion in research at Makerere lies in a proposal to establish Geophysics as the unifying discipline within the Physics Department; cosmic ray measurements have been made for some time and it is hoped that earth current recordings will be added and a seismological and geomagnetic observatory set up.

Graduates from Makerere can look forward to a reasonable variety of jobs in East Africa, recent ones have obtained posts in the Meteorological Office, the Post Office and Telecommunications Department, the Agricultural Research Stations (Soil Physics), the Factory Inspectorate, the Geological and Lands and Survey Departments, with several oil firms, the Treasury and other Government Departments. A few study abroad for a higher degree and some teach.

In general, wives enjoy the East African environment. They either tend to have larger families than their English counterparts or they go out to work – some manage to do both, this is made easier by the fact that it is possible to afford help in the house.

To return to my opening question – the idea was first planted by the Rector of St. Aldate's Church, Oxford and, to begin with, I resisted it strongly. Gradually however I became attracted by the possibility and decided to take the important step. I have found the preparation and delivery of a course of lectures very satisfying and instructive. It may be that others in the Rutherford Laboratory have a similar temperament and would welcome the opportunity of doing some teaching as well as research. It seems a pity that the very considerable store of expert knowledge at the Rutherford Laboratory has such a comparatively small audience. Would it not be possible to site a Technical University or College of Advanced Technology, call it what you will, at Harwell? The benefits would be numerous; to mention only two – there would be a steady stream of graduates who would have had a better training than that received in the science faculties of many universities and most technical colleges; also the people giving the courses would be stimulated themselves by preparing the lectures and would be more effective in their own research or development projects.

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The Fall of Man

E Eaton
SAFETY SECTION

20 – 20 – 20. . . . not the vital statistics of a straight actress but the percentage of lost time accidents at NIRNS in the following categories (a) Electric shock, (b) Using machinery and (c) Handling goods. They total 60% of lost time accidents which occurred in 1962. The remainder - 40% is caused by persons falling or striking against objects. Over 20,000 accidents a year in British Industry are caused by falls and these are only the accidents which, because they result in absences from work for more than 3 days, are by law, reported to the Factory Inspectorate.

All accidents have a cause. They are either the result of an unsafe act or the result of an unsafe condition. More often than not the two aspects are present simultaneously. In any event both the unsafe act and the unsafe condition are the result of human failing. 'Persons falling' is a very frequent type of accident and can be divided into the following groups :-

1. Floor level falls: causes – slippery surfaces; Obstructed and untidy floor surfaces; sloping surfaces; irregular floor surfaces; obscured vision through bad lighting, escaping steam etc.; badly worn footwear or running.

2. Falls on stairs: causes – bad lighting; insecure holds due to worn or damaged treads and handrails.

3. Falls from heights: causes – ladders slipping etc. (Always use the right ladder for the job and "foot" or secure it at the correct angle - 1 foot out of the vertical for every 4 feet in height. At heights use the walk ways and a safety belt.)

4. Falls into holes, trenches, sumps, etc.: causes – bad lighting, dilapidated footwear, slippery or irregular floor surfaces, taking of short cuts or by unsafe practices. This type of accident frequently causes injuries and carries with it not only the obvious results of a fall but also the possibility of burns, suffocation or drowning.

Because of the nature of its work the Rutherford Laboratory has many 'obstructions'. Despite work at design stage to minimise them, some have not been eliminated. Many have been shielded by rubber pads but personnel should familiarise themselves with these hazards and take care when negotiating narrow apertures, tunnels or corners, particularly when carrying a load.

It is the duty of the employer both in Common Law and (in certain areas or for certain types of work) in Statute Law to provide safe working conditions but the law does not absolve the employee from the responsibility of acting safely. Although the Factories Acts do not apply to the whole of the Laboratory they are the agreed minimum standards for safety. A requirement is that no person shall wilfully and without reasonable cause do anything to endanger himself or others.

An employer or employee may be prosecuted for his negligence and may be liable for damages. If contributory negligence can be proved against the injured person his compensation, if any, may be reduced. A workman was recently prosecuted when he caused an accident to himself resulting in a broken knee. Its hard luck being injured in an accident; its even harder luck being prosecuted for it. The old motto 'Non eum qualis eram ne oedas malis' – 'Misfortune has befallen me, I am not the man I was' need not refer to us if we apply the modern motto 'Watch it mate'.

Step into their shoes any day between 10.00 and 11.30 a.m:-

From 29th July, safety shoes of various sizes, styles and colours will be on sale from Safety Section, Building R 16.

'The successful automation of neutron diffraction measurements has been successfully achieved by scientists at the Atomic Energy Research Establishment at Harwell. The new equipment enables 56 measurements to be taken in 12 hours compared with the previous 30 a week by manual method. The automatic system can be left working for 25 hours a day if required.'

Electronics Weekly, June 19th, 1963

'But the crisis in British science of which the exodus of so many highly qualified men is only one symptom is not merely a matter of too little money. Equally serious is the misdirection of the limited funds available : for example the disproportionate expenditure on nuclear physics.'

Comment, The Observer, 21st July.

Personnel News

Suggestion Awards

At the tenth meeting of the Rutherford Laboratory Suggestions Awards Committee held on Monday 8th July, 1963, awards totalling £13 were made.

Some suggestions, although they may not be adopted in their present form, were considered by the Committee to merit recognition and Encouragement Awards of £1 were made to the following:-

Mr. R.W. Roberts
Mr. M. Edwards
Mr. W. Hayes & Mr. J.C.V. Clark - (Joint Suggestion)

An Award of £5 was made to Mr. G. Render in respect of his proposals relating to a method of accurately determining the position of Inflector Plates. This idea has now been adopted and proved to be most successful.

An Award of £3 was made to Mr. J. Vanstone for his proposed elimination of a Safety Hazard in connection with the pedestrian gate in the fence on the west side of the Rutherford Laboratory site (Road 8 - Dido Road). The Committee was advised that this gate is now to be suitably adapted.

An Award of £2 was made to Mr. R.W. Roberts in recognition of his proposed modification to be made to the metal shields protecting the electric light bulbs in the Magnet Water Alarm System. This modification would facilitate the removal of the protective shields necessary for bulb replacement.

D.G.J. Rose, Secretary.

Comings and Goings

Dr. D. Jones joins High Energy Physics;
M.J. Bolton and Miss C.M. Pitson join Theoretical Physics.

Miss J.M. Page joins the Atlas Laboratory;
J.R. Lanning joins Bubble Chamber Group.

A. Hudson joins Central Engineering;
J.D. Nicholson and K.G. Cox join Nimrod Engineering.

* * * * *

W.W. Rezetter and M.R.P. Williams have left us.

* * * * *

We extend a welcome to
Mrs. D.E. Jones of Personnel Section who returned to the Laboratory on 22nd July after an illness lasting from the end of 1962.

'There is a large experimental program on. to determine production of kaons by nuclear collisions and by photons, scattering and interaction of these mesons with nuclei, etc.....
But just between us theoretical physicists: What do we do with all these data? We can't do anything. We are facing a very serious problem and we need a revolutionary idea.'

R P. Feynman
'The Theory of Fundamental Processes'

Congratulations to -

Alan Gilleard, Central Engineering Design, married on 29th June.

Harry Lane, Injector Group, and his wife Gladys on the birth of a son, David, on 18th June.

Dereck Moore, Nimrod Engineering, and his wife Jean on the birth of a daughter, Lisa Katherine, on 27th June.

How garbled can our address become? Two of the latest are:-

From Chicago -

'National Lab.
Horevell,
Dedeob,
Berkshire.'

From Q V F Ltd, Stoke-on-Trent -

'National Institute for Research in Dairying,
Nuclear Science,
A E R E,
Harwell, Berkshire.'

By The Way

S H Spanner

Some of us who travel the road to Reading may be unacquainted with the villages and landmarks passed on the way, and the following is written as an attempt to relieve the boredom of at least one journey to and from the Rutherford Laboratory, through a part of Berkshire where a thousand and more years of history are apparent in the hills alone.

Leaving Chilton Church on our right and the prominent tumuli in the tilled field beyond, we turn towards Blewbury down the ancient Icknield Way. This hillside road travels up from Lockinge, duplicating and, in parts, superseding the open Ridgeway throughout Berkshire. Over to our left is the open vista of the Downs, crowned on the horizon by the Sinodu Hills, topped with those twin mysteries the Wittenham Clumps, a group of beeches surmounting two ancient hill forts, one ringed by a massive moat.

Blewbury is a beautiful place with streams crossed by many bridges and Saxon built wattle and daub thatched walls. Its history began with St. Birinum, believed to have preached some 1300 years ago on the Churn Hill nearby. Here lived 'Blewbury Jones' mentioned by Charles Dickens in 'Our Mutual Friend', the vicar who on a stipend of £80 lived, so they say, on 2/6d. per week and died leaving £18,000. Here too lived the writer of 'The Wind in the Willows', Kenneth Grahame.

Ahead of us is the ancient rampart of Blewburton Hill. Tradition has it that Ethelred and Alfred fought the Danes hereabouts. This hill fort covers seven acres and is the only one in Berkshire sufficiently excavated to enable some interpretation of its history to be made. In its shadow lie the twin villages of Aston Tirrold and Aston Upthorpe where John Slade, maker of the first blotting paper, lived.

The road to Streatley takes us along the Icknield Way, bordered by hills of Baldon, Riddle, Lollington and Kingstanding, with the ancient earthwork, Lowbury Hill, in the background. Streatley is at the western entrance to the Downs, and is mentioned in the chronicles of Abingdon Abbey in 687. Through here marched William the Conqueror on his roundabout route from Hastings, and a road sign points to Aldworth where the 14th century De La Beche tombs "The Giants" crowd the church, and the ancient yew of twenty-seven feet girth graces the exterior.

Lower Basildon was at one time a place of some importance with a prehistoric track and the site of a Roman Villa; and was the home of Jethro Tull who, in early 1700, invented the seed drill. The baroque lodge gates of Basildon Park can be seen from the main road.

Down Shooters Hill on the way into Pangbourne are the ornate riverside houses built when boating on the river was fashionable, and christened 'The Seven Deadly Sins' by those who considered decoration immoral. Near the river has been found a Mesolithic site, and at Bere Court the Duke of Northumberland lived, whose son married Lady Jane Grey, and who was subsequently executed.

And so we leave Pangbourne on the last lap of our journey down the old Pangbourne Lane passing Purley Hall on our right with its rustic flint lodge, one time home of Warwick Hastings. Leaving behind us the ancient hills and earthworks we head towards the modern 'works' – the office block.

Many educators expect engineering enrolments to pick up It will, they say, if only we stop calling every successful rocket launching a 'scientific achievement' and every fizzle an 'engineering failure'

"Educating the Engineer"
David Allison, 'Science and Technology',
June, 1963.

There is now an even more up-to-date way of upsetting committee meetings than by tapping your contact lenses with a pencil : buy a pair of empty frames and nonchalantly rub your eye through them.

Katherine Whitehorn,
'The Observer' May 19th.