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NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

Rutherford Laboratory Bulletin No.1

March 1959

This short Bulletin will appear at approximately monthly intervals, in response to requests by members of the staff. It is intended to include brief items of news concerning the Rutherford Laboratory and the National Institute.

Harlequin competition

A competition was recently held, through the columns of Harlequin, to attempt to find a name for the 7 GeV proton synchrotron and a Common Seal for the Institute. 47 names were submitted, of which HEPTATRON was adjudged the best. This was suggested independently by Mr. E. R. Harrison and Mr. C. R. Reed. Rather few designs were offered for a Common Seal, and the prize was shared between Mr. T. R. Walsh and Mr. J. D. H. Hughes since each design had a feature which appealed to us. A design incorporating these features will be prepared shortly, to see whether it is suitable for use by the Institute. No commitment was made to use any of the names or designs, and no decision has yet been made to adopt a name for the machine.

Building programme

It is already apparent that the existing plans do not provide enough laboratory and office accommodation for the Rutherford Laboratory, and a scheme for expansion is being prepared. If this scheme is approved it is hoped to place contracts during 1959, but working conditions are bound to be rather uncomfortable for a long time. Mr. Louth will act as "space administrator", and staff are asked to co-operate with him during this difficult period.

Accelerator research

The electron cyclotron, designed for studies of particle motion in ridge-field (AVF) cyclotrons, has produced a beam after much hard work by Mr. Lawson and his group and the engineering staff who have been concerned with this project.

Proton linear accelerator

The proton linear accelerator will be taken over by the National Institute on 1st April, 1959. This date was chosen to coincide with the beginning of a new financial year, and not for any other reason. The land on which the Rutherford Laboratory stands will also be handed over, at a somewhat later date on account of legal formalities.

National Institute Staff

Two new members of staff have joined the Secretary, Dr. Willis. They are Mr. G. L. Cooper (scientific administration) and Mr. A. Miller (finance). Vacancies are being advertised for several experimental nuclear physicists, for research with the P.L.A. and preparation of experiments on the 7 GeV machine.

University visitors

The first university visitors will soon be coming to prepare their experimental programmes on the P.L.A. Another small party will come within the next few months to test the large glass windows for the liquid hydrogen bubble chamber, which will be erected at the Rutherford Laboratory by a university group beginning early next year.

Symposium on accelerators

It is planned to hold a two day meeting in the summer, to discuss the design of accelerators in rather general terms (from the users' point of view) and to consider possible future programmes.

Items for inclusion in the Bulletin

Items of news for the Bulletin should be sent to Mr. G. L. Cooper.

T. G. Pickavance

Rutherford High Energy Laboratory,
Building 412.10,
11th March, 1959

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

Rutherford Laboratory Bulletin No.2

June 19597 GeV Proton Synchrotron

The Board of the Institute have agreed to the proposed name NIMROD ("A mighty one in the Earth" - Genesis X 8-12). This has been chosen in preference to HEPTATRON, the winning entry in the recently held competition. (see current issue of Harlequin); the name was proposed by Dr. W. Galbraith after the closing date of the competition. A full description of NIMROD is given in the April number of Nuclear Engineering. In three separate papers, the principle of the machine, its engineering aspects and the civil engineering involved are described. The work of the National Institute is also described in the current number of Harlequin.

Magnet Sectors are now arriving at the rate of approximately one a day. After testing they are to be stored at Grove Airfield (adjacent to the Wantage Radiation Laboratory) until installation in the Magnet Hall can commence. The sectors were in the news on May 8th following a press conference on the previous day organised by J. Sankey Ltd. Mr. J. J. Wilkins attended on behalf of the A.E.A.

The concreting of the Magnet Hall is now completed and the Control Building is about finished. The experimental area is nearly all roofed. In general the accelerator buildings are still 5-6 weeks behind programme, but the laboratory and office buildings are up to time.

Building Programme

The Phase II building programme has been approved in principle by the Treasury and instructions have been given to the architects to begin detailed designs. This is the scheme for expansion at the Rutherford Laboratory and includes laboratory and office accommodation for an additional 200 non-industrial staff.

Proton Linear Accelerator

After much intensive effort, tank 2 has given its first beam of 30 MeV protons. This was achieved around 5.30 a.m. on Saturday 23rd May.

Proton Model Accelerator

A full energy $4\frac{1}{2}$ MeV beam has been obtained from the Proton Model Accelerator in Hangar 7. This is a facility for studying the central regions of the magnet in the proposed conversion of the Harwell Cyclotron to constant frequency operation using spiral ridge fields.

University Visitors

The first teams of visitors from universities have arrived. Mr. Giles and Mr. Thomas from Kings College, London are preparing their experimental programme on the P.L.A. and Dr. Thetford and Miss Probst from Imperial College, London have arrived to begin their testing programme on the glass windows for the large National liquid hydrogen bubble chamber. The latter work is being carried out within A.E.R.E. in Building S.39.

Symposium on High Energy Accelerators

It has now been decided to hold the Symposium on the 2nd and 3rd July. Upwards of 60 to 70 visitors from universities are expected to attend. The revised draft programme includes a talk by Professor Devons of Manchester University on the production of high quality meson beams.

Physical Society Visit

A large party of members of the Physical Society visited the Rutherford Laboratory on Saturday April 11th. The visitors had been attending a three day Conference on Nuclear Physics held at Oxford University. They were shown the model of NIMROD, the magnet sector testing rig and the P.L.A. They were also shown the Tandem Generator, the Synchrocyclotron and Bepo.

Library

The number of books on the shelves of the local library has dwindled to a very low number. Many books have been out on loan for considerable periods; others have been lost without trace. It has been decided to have a check on all Library stock, (Mr. P. Wroath a new member of Dr. Stafford's Group will assist in this), and staff are asked to co-operate by returning all outstanding loans before the end of June. A new system of recording loans will be started shortly. Details of this will be posted in the Library.

G. L. Cooper

Rutherford High Energy Laboratory,
Building 412.10
5th June, 1959.

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NOV. 11, 1959

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

Rutherford Laboratory Bulletin No. 3.

Nimrod

A notable stage in the construction of Nimrod has been reached with the completion of the magnet room. This is generally agreed to be a very impressive building by all who have seen it, including such notable visitors as the Chancellor of the Exchequer (2nd September) and the Chairman of the United States Atomic Energy Commission (20th October.)

Good progress has also been made with the experimental area which should be weathertight by the end of the year. In addition to agreed extensions to this area to accommodate the large hydrogen bubble chamber and associated plant, plans are already being discussed for a new experimental area lying between the main and parasitic areas into which additional primary proton beams could be extracted. This would add to the flexibility of operation of the machine.

Other notable building work includes the new cooling towers and the buildings for housing the electrical converter plant. Both the Laboratory and Office block and the extension to the preparation area have been completed. A new committee known as the Rutherford Laboratory Building Committee has been set up under the chairmanship of Mr. Bowles to supervise all new building work associated with the Institute.

The design of the injector is well advanced and the majority of items have now reached the manufacturing stage. The drift tube assemblies are the last major items of plant to be ordered and a contract for their manufacture has been given to B.O. Morris Limited, of Coventry. Over 150 magnet sectors have been delivered and tested and are now being stored in the magnet room. Trial installations of the first sectors have begun. A contract has been placed with the English Electric Co., for the manufacture of the main pole pieces for the magnet.

The R.F. cavity has been delivered and also all the ferrite frames. Some difficulty was experienced initially with weak joints between the ferrite blocks composing the frames, but improved joining techniques are being developed. The design of the outer vessel of the vacuum chamber is complete and good progress is being made at Marston's in developing a suitable fabrication technique. It has been decided to install separate roughing pumps to reduce the pressure in the outer vacuum chamber rather than use the same pumps for initial evacuation of both inner and outer chambers. This will provide additional pumping capacity in the event of unduly high out-gassing rates being experienced.

The estimated total cost of Nimrod currently stands at the figure of £8.298 million.

50 MeV Proton Linear Accelerator

A 50 MeV beam was first obtained on 12th July. Subsequent tests have indicated that the R.F. power supplies are at their present stage of development incapable of reliably supplying the necessary power level to all three tanks. It has, therefore, been decided temporarily to disconnect tank 3 and use the two triodes then available in parallel to feed tank 2. A 30 MeV beam at full duty cycle should be available for research by January. A 50 MeV beam cannot be expected until the middle of 1960 because of the work involved in supplying the necessary power from a second parallel pair of triodes for tank 3. However, the klystron which is under development could if quickly successful produce the necessary power for a 50 MeV beam before that time.

On the occasions when the P.L.A. has operated it appears to produce a very stable proton beam which should be very satisfactory for nuclear physics experiments. The maximum proton current so far achieved is 2.5µA mean (without buncher) which is up to design specification.

Nuclear Equipment

A new committee known as the Nuclear Equipment Project Committee has been set up under the chairmanship of Mr. Mullett to consider all matters relating to experimental facilities at the Rutherford Laboratory. Its immediate concern is the large Hydrogen Bubble Chamber which is being designed as an inter-university project, and in particular, the extensive services which will be needed when the Chamber is installed at the Laboratory. General problems of beam handling for Nimrod are also receiving attention.

The latest project is for a heavy liquid bubble chamber to supplement the hydrogen bubble chamber. The basic design of such a chamber has been carried out at University College, London under Professor Massey. The N.I.R.N.S. have recently agreed to support this work, and are seeking Treasury sanction.

Research reactors

There is a growing demand by universities for research reactors. These are required for teaching purposes and also to provide neutron irradiation facilities for the study of a wide range of topics in physics, chemistry, engineering and medicine. Although it is not yet certain which Government organisation will provide these reactors, the N.I.R.N.S. are assessing the requirements of universities in the light of what is commercially available.

Meanwhile the A.E.R.L. have agreed to allow university staff who wish to carry out neutron irradiation experiments to use the Harwell research reactors, and the N.I.R.N.S. are sponsoring the attachment of such staff to the A.E.R.L. for this purpose. The first of these, Mr. G. S. Lawrence of Leeds University, arrived towards the end of October and he will study the recoil effects of neutron irradiations on gaseous halogen compounds. He is attached to Chemistry Division, A.E.R.L. and will use the Bepo reactor. He is being advised in all matters relating to the use of the reactor by Mr. C. J. England of the A.E.R.L. Reactor Division, who has been appointed as part-time research liaison officer to the Institute.

New Staff.

The first two nuclear physicists recruited directly by the Institute have taken up their duties. Dr. C. J. Batty who comes from Birmingham University has joined the P.L.A. Group and Dr. P. J. Duke from Bristol University is working on Nimrod beam extraction problems.

Several members of the P.L.A. Group have now been formally seconded to the Institute from the A.E.A. New secondments have also been made to the Institute Secretariat. Mrs. M. A. Le Cren will assist the Secretary in personnel matters and Mr. P. P. Marston will carry out general clerical duties. Mrs. P. J. McWilliam has joined as National Institute Librarian.

G. L. Cooper.

Rutherford High Energy Laboratory,
Building 412.
17th November, 1959.

APPENDIX

ACCELERATOR NEWS BULLETIN No.1

Note: The following news items relevant to accelerator developments have been collected by Mr. A. Foskett of the A.E.R.L. Information Office. It is intended to include such items as an appendix to future issues of the Rutherford Laboratory Bulletin.

Congress Fails to Authorise Stanford Accelerator

A number of sticky but not insoluble problems have forced a delay of several months at least in the 15-BeV linear accelerator proposed for construction at Stanford University. The Joint Committee on Atomic Energy failed to authorize the \$105-million project before Congress adjourned this year because of:

1) differences of opinion on arrangements for purchasing the linac's power supply; 2) patent and royalty troubles involving the machine's klystron tubes; and 3) a possible conflict-of-interest in the fact that project director Ed Ginston is board chairman of Varian Associates, a royalty-owner on klystron tubes. A.E.C. will use the next few months to try to clear the way for Congressional authorization early next year.

(Nucleonics Vol.17.No.10. October, 1959)

Accelerator for Radiation Processing

Costs of radiation processing are reduced to "1/4 of their present level", with its new L-band linear accelerator, according to Applied Radiation Corp., Walnut Creek, Calif. This is based on the use of a one section machine (14MeV), designed specifically for production processing. Initial capital investment for a one section machine is approximately \$170,000. The result of three years of development, the new accelerator was placed on test by Applied Radiation this past July. Data produced during the theoretical design and experimental testing have resulted in the company receiving orders for the three largest linear accelerators ever sold in the U.S. Each machine was sold for approximately one million dollars. The first will be delivered to Yale University. This is a five section unit designed to produce 28kW of power and the highest energy (77.eV) of any commercial linear accelerator. The second is being constructed for Rensselaer Polytechnic Institute. With a maximum power of 48kW, it is believed that it will be the most powerful accelerator of any kind, in the world, when it is placed in operation late in 1960. The third accelerator is for the University of California Radiation Laboratory at Livermore, Calif. This machine will have a 30 microsecond pulse - six times longer than can be obtained in any linear accelerator today.

(Atomic Energy Newsletter Vol.22.No.5. 13/10/59)

Mullard Equipment

Mullard Equipment are building a 4-million electron-volt linear accelerator for X-ray treatment of deep-seated tumours for the Cancer Institute Board of Victoria, Australia. This is the fourth medical linear accelerator to be built by Mullards, the other three having been supplied to the U.S.A.

(Nuclear Engineering, November, 1959)

High Voltage Engineering

High Voltage Engineering have developed two new high energy microwave linear accelerators capable of generating intense X-ray outputs for radiographic inspection of materials. One is an 8.eV, model LR-3 designed for inspection of thick sections of steel and complex mechanical and electronic assemblies of the nuclear and missile industries and the other model LR-4 is a 15 eV

type, is designed for examination of solid rocket propellents.

(Nuclear Engineering, November, 1959)

Radiation Monitoring for Accelerators

Electronic Instruments have developed a special survey trolley for monitoring radiation from the 50 MeV proton linear accelerator and the 600 MeV synchro-cyclotron at CERN. Designed by CERN the trolley contains two Vibron does rate meters, one with a tissue equivalent ionization chamber and one with an argon chamber. Portable meters for slow neutrons, fast neutrons and gamma rays are also carried and the trolley is equipped with a battery and motor generator which enabled it to be used in areas remote from mains power supplies.

(Nuclear Engineering, November, 1959)

May, 1960. *GB*

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

Rutherford Laboratory Bulletin No. 4

The National Institute

Some changes have been made in the membership of the N.I.R.N.S. Board. Professor J. Diamond has retired and his place as a university member filled by Sir John Cockcroft. Two new A.E.A. members have joined the Board, Sir William Penney and Sir Alan Hitchman, who replaces Sir Donald Perrott. Both University Grants Committee members have been changed, Sir Keith Murray and Professor Brambell coming in in place of Sir George Thomson and Mr. Grindley. The remaining members of the Board had been reappointed.

The Physics Committee of the Institute which advises the Board on matters relating to new physics projects, has been enlarged and now acts as a consultative panel for nuclear research advising both the Institute and the D.S.I.R.

Lord Bridges, Chairman of the National Institute, has been appointed Chancellor of the University of Reading in succession to Lord Templewood.

The Proton Linear Accelerator

In the last few weeks, the P.L.A. has come into full operational use at 30 MeV and has for the first time been scheduled for a nuclear physics experiment. The device of coupling two triode valves in parallel to feed R.F. power into Tank 2 - meanwhile disconnecting Tank 3 - has proved successful and it is expected that in a few months' time it will be possible to bring Tank 3 back into operation and so raise the energy up to the full 50 MeV. The polarised proton ion source, developed as a joint project with the Clarendon Laboratory, has been successfully erected and tested and should be in operation by mid-year. It has given good evidence of polarisation.

Plans have been proposed for considerable building extensions in the P.L.A. area. These comprise:

- (a) considerable modifications and extensions to the existing laboratories and workshop,
- (b) a 6,000 sq. ft. extension to the experimental area, and
- (c) a new medium-activity radiochemical laboratory.

The latter is intended not only for university workers on the P.L.A. (and later possibly Nimrod) but also for university chemists who come to Harwell under N.I.R.N.S. sponsorship to carry out irradiation experiments using the A.E.R.E. research reactors. These laboratories will be managed on behalf of the National Institute by the A.E.R.E. Chemistry Division. The total cost of these building extensions is around £200,000 and providing Treasury approval is obtained work should start well before the end of the year.

Nimrod

On the 4th May the last magnet sector was delivered to the Rutherford Laboratory. In view of the early production difficulties encountered by the manufacturers the fact that delivery was completed within the target date set by the programme is regarded as a very notable achievement. To mark the successful completion of the contract, the Chairman of J. Sankey & Sons Ltd. and a party of 30 from the Manor Works, where the sectors had been made, were invited on the 26th April for a tour of the Laboratory.

Apart from the magnet sectors, the following major items of plant have also been delivered: the vacuum vessel for the injector (the liner for the injector is expected in June), the modulators for the injector, and the

first 50 ft. long copper coils for the magnet (these are being stored in the experimental area).

A re-assessment has been carried out of the overall programme for Nimrod. The original target date for completion had been December, 1961, but it has become increasingly apparent of late that this could no longer be met, and the final date for completion has now been put back 6 months to July, 1962. There are several reasons for this: severe shortages of building labour, delays in supplies of stainless steel required for the octant-end brackets, and design difficulties over the magnet pole pieces and the vacuum vessel. Some concern has also been expressed over the integrity of the foundation block of the motor alternator and consequently some alterations have been made in design, although this should not cause any serious delay in the construction programme.

Arrangements for Research on Nimrod

Considerable attention is being given to how the beams from Nimrod will be used in experiments. A large investment of plant for beam handling will be required and as a first step the Institute have given their approval to a preliminary scheme costing £1 million for the provision of items such as internal target mechanisms, beam guiding, focusing and analysing equipment, magnets, quadrupoles and particle separators.

The university teams who will eventually work with Nimrod are being encouraged to participate in the development of the equipment they will be using. For example, the Institute are sponsoring a three year programme of work at the Clarendon Laboratory, Oxford, with the object of determining more precisely the use to which counting devices can be put in studies of elementary particle reactions. The investigation will examine the degree to which counter systems can be developed to recognise interactions that at the moment are regarded as more properly lying in the province of the bubble chamber. If successful, considerable advantages would accrue from the very high rates at which data can be digested by electronic counting devices as compared with bubble chambers.

Another university project sponsored by the Institute, this time at Imperial College, is for research on scintillation chambers, instruments for revealing the tracks of particles passing through scintillating media. A vital requirement for success, which has previously not proved feasible, is some means of intensifying the image produced by the primary scintillations by a very high order of gain. An important break-through in the design of image intensifying tubes has, however, recently been made at Imperial College, and these new techniques will be used in the work on scintillation chambers.

A considerable effort is also being made by the universities in the design and construction of the two large bubble chambers to be used on Nimrod, the National Hydrogen Bubble Chamber (a D.S.I.R.-sponsored inter-university project) and the Heavy Liquid Bubble Chamber (a University College project, financed through N.I.R.N.S., which has recently received Treasury approval). Some of the university team working on the Hydrogen Bubble Chamber are already at the Laboratory and the numbers will very shortly be strengthened.

Adequate means of interpreting bubble chamber photographs is essential and for this purpose the Institute have recently approved a proposal to spend £50,000 on track measuring equipment (both automatic and manual) together with 6 scanning machines.

Rutherford Laboratory Computer

During the last six months, an evaluation has been made of the future computing needs of the National Institute once Nimrod is operational. Of particular concern is the need to be able to handle the considerable volume of data coming from the bubble chambers. It has been decided that the Rutherford Laboratory should have its own computer, and of the various types available, the one chosen is the ORION made by Ferranti. This is a new machine (the first model will not be ready until 1961), and has had many improvements over earlier models incorporated into its design, e.g. it is fully transistorised

and therefore has the advantage of being compact and requires less cooling. The computer should be installed and ready for use in time for the first operation of Nimrod. The cost of the computer together with the building to house it (which will be sited adjacent to the new Contemporary Office Buildings), will be approximately £400,000.

Buildings

The completion and occupation of the Laboratory and Office Block (Building 470.1) has eased the accommodation problem but there is still a pressing need for further office space, and to meet our immediate requirements a suite of contemporary offices is being erected at the south-east corner of the site. These will cover an area of 12,500 sq. ft. and will accommodate 120 non-industrial staff. They should be ready for occupation by July.

The frame of a second Arcon building built onto the end of the existing Arcon, has been erected and the foundations of the 'Link' building joining this to the Laboratory and Office Block have been laid. These will provide extra accommodation for engineering and workshop staff.

When Nimrod is in operation a large proportion of the nuclear physicists in the country will be involved in experimental work at the Rutherford Laboratory and it will be necessary for them to visit the Laboratory quite frequently to discuss their work collectively. There will also be regular lectures and series of colloquia involving audiences of 100 or more. To meet this need the National Institute have given their approval in principle to a proposal that a lecture hall seating 150 to 200 should be built at the Rutherford Laboratory. It is also planned to incorporate a canteen in the same building.

Other new building proposals include plans for extending the existing Control Room building to provide additional counting rooms, plans for extending the P.L.A. area (see above for details) and a scheme for building 48 houses in Abingdon for new National Institute staff.

Modifications have been completed to Coseners House, the ex-A.E.R.E. hostel in Abingdon, which has been taken over by the Institute for the use of visitors to the Rutherford Laboratory. It is expected to be ready to receive its first visitors in June.

Research Reactors

In addition to accelerators, the National Institute are also concerned with the provision of research reactors for use by university staff. It has now been agreed that the role of the Institute in this connection should be to formulate advice to the Government regarding the number of reactors to be provided and where they should go. The D.S.I.R. would carry the responsibility of financing the various reactor projects. The first proposals have already been made for reactors to be sited in the London area and the north of England.

Staff

The third nuclear physicist to join the National Institute is Dr. P. G. Murphy from Liverpool University. Both he and Dr. P. J. Duke, who joined the Institute last October, are in the U.S.A. for periods of duty of about a year each - Murphy to work on the Bevatron and Duke on the Cosmotron - with the object of acquiring experience for use with Nimrod.

The first consultants to the National Institute have been appointed. They are Dr. J. Hamilton of Cambridge University who has recently given a series of lectures on strange particles at the Rutherford Laboratory, and Dr. P. T. Matthews of Imperial College, London University.

The Recreational Association of A.E.R.E. has agreed that National Institute staff and attached visitors from universities will be entitled to join the Association and have full use of the amenities provided. A.E.R.E. staff who transfer to the Institute under the scheme recently announced will be able to retain their membership.

APPENDIX

Accelerator News Bulletin No. 2

(compiled mainly from items supplied by the A.E.R.E. Information Office)

1. C.E.R.N. Proton Synchrotron

The most important recent event is of course the completion and first operation of the 25 GeV proton synchrotron at C.E.R.N. This is the culmination of six years' work by a team representing the twelve founder member states of C.E.R.N. The cost of the machine is £13 million. A measure of the achievement is the fact that it took only six hours from first switching on the R.F. to obtaining a high intensity beam (10^{10} ppp) at peak energy.

2. Breakdown of the Cosmotron

Failure of the main generator supplying current to the magnet has caused a breakdown of the Brookhaven Cosmotron. A short circuit has occurred which not only burned out some of the windings in the stator but has also removed a quantity of copper. It is estimated that the machine will be out of operation for at least three months.

3. Stanford Linear Accelerator

The future of the Stanford 15-45 GeV linear accelerator project received a severe set-back last month when the U.S. Senate Joint Committee on Atomic Energy refused to ratify at present a request from the Administration to spend \$107 million over the next six years on construction of this machine. The Committee cut back this figure drastically to \$3 million to cover the cost of design studies only.

New U.S. Cyclotrons

The U.S. has begun construction of two big cyclotrons for completion in 1961 at Oak Ridge National Laboratory and Lawrence Radiation Laboratory, Berkeley. The 76 inch Oak Ridge Relativistic Isochronous Cyclotron (ORIC) costing \$3.7 million, will be capable of accelerating protons up to 75 MeV and various ions up to 100 MeV; it will be the third at ORNL. The spiral ridge, 88 inch cyclotron at Berkeley will have capability for accelerating a variety of particles at large beam currents though not at particularly high energies: alphas, up to 120 MeV; deuterons, 60 MeV; protons, 30 MeV; and heavy atoms such as carbon and nitrogen, 10-15 MeV.

Cyclotron Research

A magnetic field plotting system which now makes it possible to evaluate the detailed performance of a cyclotron before it is built has been developed and placed in operation, according to a report by the Oak Ridge National Laboratory. With the accurate field measuring equipment developed at the Laboratory and with codes or routines also developed there for processing the data in fast computers, a given magnetic field configuration is now evaluated in approximately 36 hours.

Czech Cyclotron

The first Czechoslovak cyclotron, delivered by the Soviet Union under the treaty of assistance in the development of nuclear research, has been put into operation at the Institute of Nuclear Research of the Czechoslovak Academy of Sciences at Rez near Prague.

The Czechoslovak news agency, Ceteka, said the cyclotron was assembled at Rez by Czechoslovak workers under the supervision of Soviet experts.

100 MeV Accelerator at Turin University

The new 100 MeV electronsynchrotron, the third in power in Europe, after the Frascati and Glasgow machines, was inaugurated at Turin on 28th November. The accelerator is at the College of Physics of Turin University. Funds for its construction were provided by the National Research Council, Turin University and by Fiat.

Hamburg Synchrotron

An agreement between the West German Government and the City-State of Hamburg on the erection of a 6 GeV electronsynchrotron has been signed in Hamburg. The accelerator will be West Germany's most powerful. It is being built on the former airfield of Bahrenfeld, near Hamburg. The synchrotron will be used for basic research and for training physicists. The Federal Government will pay 85 per cent of the total cost of 60 million D-marks and Hamburg will contribute the rest.

Accelerators at Strasbourg

A "number" of particle accelerators will be installed in the Nuclear Research Institute at Strasbourg this year, according to M. Jean Coulomb, Head of the French National Centre for Scientific Research.

Tandem Accelerators

Purchase of three 12 MeV Tandem Van de Graff positive-ion accelerators from High Voltage Engineering Corporation has been announced by the U.S.A.E.C. The accelerators will be installed at Argonne National Laboratory, Oak Ridge National Laboratory and at the Rice Institute. Total cost of the 3 machines, components and accessories, plus installation, is \$3,333,510. Delivery of the accelerators to the 3 research centres will take about 18 months.

Linear Accelerator for Weld Inspection

A 4.3 MeV linear accelerator is the subject of a development contract placed by the U.K.A.E.A. with Mullard Equipment Ltd. The machine will be used for weld examination and will be capable of producing a high definition radiograph of a 6 in. thick steel specimen in 100 seconds. The accelerator is intended for use on site during construction of nuclear power stations and will have power supply and control equipment mounted in a separate transportable cabin.

RUTHERFORD LABORATORY BULLETIN NO. 5

for the week beginning Monday, 10th October, 1960.

Future issues of the Rutherford Laboratory Bulletin will be issued weekly. Items for inclusion should be sent to Mr. B. E. Kingdon, Building R.1.

Staff Movements

✓ Mr. E. R. Harrison has returned from a 15-month attachment at C.E.R.N., where he was working with the Accelerator Research Section, and has joined the Direct Conversion Group, Building 10.23, Ext. 3585.

Consultant

✓ Professor A. Salam of the Imperial College of Science & Technology has been appointed a consultant to the National Institute under the sponsorship of Dr. G. H. Stafford.

Extra-Mural Research

✓ An agreement has been signed with Southampton University under which the Institute will finance a two-year programme of research, under the direction of Professor Hutchinson, to develop gas-filled Cherenkov chambers for use with 'Nimrod' and apparatus for the digital recording of visual displays.

P.L.A.

The programme scheduled for the P.L.A. during the current week is as follows:

<u>Date</u>	<u>Team</u>	<u>Experiment</u>
11th, 12th October	A.E.R.E. (Dr. Cavanagh)	Time-of-flight survey, and total cross-sections for protons.
14th-17th October	Clarendon Lab. (Dr. Clegg)	Measurement of capture gamma rays.

✓ Mr. R. S. Gilmore of Queen's University, Belfast, has joined the P.L.A. Nuclear Physics team under Dr. Thresher for a two-year attachment.

Lecture

The Theoretical Group will hold a colloquium on Monday, 17th October, at 11 a.m. in the Conference Room, Building R.1, when Dr. T. H. Skyrme (A.E.R.E.) will speak on "The Language and Methods of Field Theory."

ACCELERATOR NEWSGreat Britain

✓ A new 10 cm. klystron, developed by Mullard Limited, gives a peak output of 10 MW with a power gain greater than 50 dB. It is among the largest tubes of its kind in the world, and is intended for use in linear accelerators for medical, industrial and research purposes, and in high-power radar systems.

U.S.A.

✓ The United States National Bureau of Standards has placed a contract with the High Voltage Engineering Corporation for the construction of a 150 MeV electron linear accelerator. The electron beam current will have a peak value of 0.25A, and the pulse duration will be variable from 0.1 to 6 μ .sec. The estimated cost is \$1.7 million.

Japan

✓ The Tokyo Shibaura Electric Company (Toshiba) have started work on a 25 MeV linear accelerator, the largest machine of its kind in Japan. It is expected to be completed by April 1961, and the maximum output will be 10 kW. The accelerator will be used for technological irradiation experiments.

G. L. COOPER

7th October, 1960.

MSG.

RUTHERFORD LABORATORY BULLETIN NO. 6

for the week beginning Monday, 17th October, 1960.

Staff Complement

✓ The General Purposes Committee of the Institute, at their meeting on October 7th, approved a total complement of 672 for the Rutherford Laboratory for 1961/62. The complement for 1960/61 is 581, and the present strength is 424.

Advisory Council on Scientific Policy

✓ Reference to the National Institute is made in the recently published Annual Report of the Advisory Council on Scientific Policy for 1959/60 (para. 39, "Organisation of Scientific Research"). A copy of the Report may be seen in the N.I.R.N.S. Library, Building R.1.

P.L.A.

The programme scheduled for the P.L.A. during the current week is as follows:

	<u>Date</u>	<u>Team</u>	<u>Experiment</u>
x	16th, 17th October	Clarendon Lab. (Dr. Clegg)	Measurement of capture gamma-rays.
	19th - 21st October	N.I.R.N.S. (Dr. Batty)	Neutron time-of-flight

Visits Abroad

✓ Dr. D. J. Thompson and Mr. F. Harden will visit Messrs. Phillips at Eindhoven, Holland, from 17th to 19th October, to discuss the bonding of ferrite frames for the Nimrod accelerating unit.

Sandwich Course Awards

✓ Applications are invited for U.K.A.E.A. awards for Sandwich Courses at Technical Colleges, starting early in 1961. Details of these awards are given in the A.E.A.'s AGN 40/56. All young Rutherford Laboratory staff are eligible to apply. Further information and application forms, which should be submitted before 28th October, may be obtained from the Central Training Office, Building 328/T, Ext. 3331.

Library Notice

✓ The following periodical is missing from the N.I.R.N.S. Library, Building R.1. Will the person responsible kindly return it immediately.

Reviews of Modern Physics, Vol. 30, No. 2, Part II, April, 1958, Copy No. 13.

Internal Events

Mon., 17th Oct. 11 a.m., Conf. Room, Bldg. R.1	Theor. Group Colloquium.	Dr. T. H. Skyrme (A.E.R.E.)	"The Language Methods of Field Theory."
Wed., 19th Oct., 2 p.m., Conf. Room, Bldg. R.1.	P.L.A. Group Nuclear Physics Seminar	Dr. P. S. Fisher (Clarendon Lab.)	"Gamma-Rays from Proton capture Reactions"

External Event/.....

External Event

The British Institution of Radio Engineers Symposium on "New Components" will take place on Oct. 26th-27th at the School of Pharmacy, Brunswick Square, London, W.C.1. Further details are displayed on the Library Notice Board, Building R.1.

G. L. Cooper

14th October, 1960.

RUTHERFORD LABORATORY BULLETIN NO. 7for the week beginning Monday, 24th October, 1960Membership of the Institute

Professor P. M. S. Blackett's term of office as a Member of the Institute came to an end on 30th September. Professor P. I. Dee takes his place. The present membership is:

✓ Lord Bridges (Chairman), Sir Robert Aitken, Professor F. W. R. Brambell, Sir John Cockcroft, Professor P. I. Dee, Sir Alan Hitchman, Sir William Hodge, Sir Harrie Massey, Sir Harry Melville, Professor N. F. Mott, Sir James Mountford, Sir Keith Murray, Professor R. E. Peierls, Sir William Penney, Sir Basil Schonland, Professor D. H. Wilkinson.

Visits Abroad

✓ Mr. H. Hadley will be in Switzerland on 23rd-25th October, for discussions at C.E.R.N.

Safety Notice

Staff are reminded of the circular, dated 19th September, regarding the replacement of open-type radiant heaters by convector models, at the recommendation of the A.E.R.E. Fire Committee. To date, only two replies have been received. Would any member of staff at present using a radiant heater please notify Mr. J. Rodgers, Building R.12, Ext. 2677, as soon as possible.

Lectures

- Gen?
- ✓
- Conferences & Training?
- (a) The P.L.A. Group is to hold a series of lectures, primarily intended for junior staff working on the P.L.A. The first five or six lectures, given by Mr. K. Batchelor, will cover Radio Frequency Theory and Measurements, and these will be followed by others given by Dr. C. J. Batty on Nuclear Physics Experiments with the P.L.A. The first lecture is on "Coaxial Line Theory", and will be held in the P.L.A. Conference Room, Building R.12, at 11 a.m. on Friday, 28th October.
- (b) The Theoretical Group will hold a colloquium on Monday, 31st October, at 11 a.m. in the Conference Room, Building R.1, when Professor A. Salam of Imperial College will speak on "Weak Interactions."

P.L.A.

X The Programme scheduled for the P.L.A. during the current week is as follows:

<u>Date</u>	<u>Team</u>	<u>Experiment</u>
24th-26th October	University College, London/N.I.R.N.S. (Dr. Thresher)	Measurement of Spin Correlation in p.p. scattering.
28th-29th October	Glasgow (Mr. Lord)	General study of processes of form A (p.He) B.
30th October	A.W.R.E. (Dr. Perkin)	Study of p. γ reactions in Pd. and Th.

External Events /

External Events

Tuesday,
25th October,
6.30 p.m.
Manson House,
26 Portland Place,
London, W.1.

Society of
Instrument
Technology.

L. S. Yoxall,
Esq.

"Instrumentation,
Past, Present,
and Future"

Wednesday,
26th October,
7 p.m.
College of Advanced
Technology,
Gosta Green,
Birmingham.

Lecture,
Inst. Physics
and Phys. Soc.,
Midland Branch.

Dr. L. Riddiford,
(Birmingham
University)

"High Energy
Physics"

G. L. COOPER

24th October, 1960.

MSG.

Mr. B. Kingdon.
R.20.

RUTHERFORD LABORATORY BULLETIN NO.8

for the week commencing Monday, 31st October, 1960

Staff Movements

✓ Mr. J. D. Lawson has returned to the Laboratory after his period of attachment at Stanford University, U.S.A., to resume his duties with the Accelerator research group. His office is in Building R.1 - Telephone Extension 3196/31.

Visits Abroad

✓ Mr. A. J. Egginton and Mr. A. T. Gresham will visit C.E.R.N. from 30th October to 2nd November, for discussions on beam transport equipment.

✓ Mr. T. G. Walker, who has recently joined the Institute as a member of the Nuclear Physics research group, will visit C.E.R.N. from 7th-10th November, for discussions concerning his forthcoming attachment there.

P.L.A.

X The Programme scheduled for the P.L.A. during the current week is as follows:-

<u>Date</u>	<u>Team</u>	<u>Experiment</u>
30th October	A.W.R.E. (Dr. Perkin)	Study of p.γ reactions in Pd. and Th.
1st-3rd November	King's College (Dr. Burge)	(a) Total reaction cross-sections for protons. (b) Elastic and inelastic proton scattering.
4th November	Exeter (Dr. Rosser)	Proton irradiation of neodymium isotopes.

INTERNAL EVENTS

Monday, 31st October, 11 a.m. Conference Room, Building R.1	Theor. Group Colloquium	Professor A. Salam (Imperial College)	"Weak Interactions"
Friday, 4th November, 11 a.m., P.L.A. Conference Room, Building R.12	P.L.A. Group Lecture	Mr. K. Batchelor	"Coaxial Line Theory" (2nd Lecture)

Courses & Training!

G. L. COOPER

28th October, 1960.

MSG.

RUTHERFORD LABORATORY BULLETIN NO. 9

for the week commencing Monday, 7th November, 1960

Distinguished Visitors

✓ H.M. Queen Frederika of Greece, accompanied by Group Captain M. Franciscos (Air Attache at the Greek Embassy in London), Lady Makins, Sir William and Lady Penney, and Sir Basil and Lady Schonland, will visit the National Institute on Wednesday, 9th November, at 12.20 p.m.

Extra-Mural Research

✓ Agreements have been signed with Oxford University under which the Institute will finance the following research projects to be carried out by the University on behalf of the Laboratory:

- (a) A 3-year investigation of the feasibility of scintillation counter matrices for the evaluation of elementary particle reactions; estimated cost - £13,800.
- (b) A 3-year study of methods for producing intense separated particle beams from 'Nimrod'; estimated cost - £20,000.
- (c) A one-year programme for the further development of methods of producing polarised proton beams for the P.L.A.; estimated cost - £1,300. (This is a continuation of earlier work supported by A.E.R.E.)

Hydrogen Bubble Chamber

✓ A major item of equipment was delivered to the Laboratory on 2nd November, and is now being installed. This is the Safety Vessel for the British National Hydrogen Bubble Chamber. The vessel, which acts as a reservoir for the hydrogen gas formed in the event of failure of operation, is 42 ft. long, 12 ft. in diameter, and weighs 29 tons. It was built by Messrs. G. A. Harvey Limited, of Greenwich.

Training Award

✓ Mr. P. D. Wroath of the P.L.A. Nuclear Physics team has been awarded a prize as Best Student in the O.N.C., S.1 Applied Physics course at Oxford College of Technology. The award was donated by the Pressed Steel Company, Cowley.

Correspondence with Firms

Staff are asked to note that correspondence with firms should clearly indicate the person to whom the firm's reply is to be directed, otherwise delays in receipt will inevitably occur.

The following letters are awaiting collection, and the staff for whom they are intended should contact Mr. E. Newberry, Building R.1 -

- ✓ (a) From Messrs. Hopkin and Williams Ltd., Chemical Manufacturers, Chadwell Heath, Essex. Quotation for Silicone products. (Enquiry dated 22nd September, 1960, Ref: 28/23/1/16).
- (b) From Messrs. Ferranti Limited, Hollinwood, Lancs. Quotation for charging units for capacitor banks. (Enquiry dated 5th October, 1960).
- (c) From Messrs. Taylor Electrical Instruments Ltd., Slough, Bucks. Catalogues of Meters, etc. (Enquiry dated 26th October, 1960).

P.L.A.

× The programme scheduled for the P.L.A. during the current week is as follows:-

<u>Date</u>	<u>Team</u>	<u>Experiment</u>
6th, 7th November	U.C.L./N.I.R.N.S. - (Dr. Thresher)	Measurement of p.p. Spin Correlation coefficients.
8th-10th November	Clarendon Laboratory (Dr. Clegg)	Measurement of capture gamma-rays.
11th-13th November	N.I.R.N.S. - (Dr. Batty)	Neutron time-of-flight.

Internal Events

Friday, 11th November, 11 a.m., P.L.A. Conference Room, Building R.12.	P.L.A. Group Lecture	Mr. K. Batchelor	"Coaxial Line Theory" (3rd Lecture)
Monday, 14th November, 11 a.m., Conference Room, Building R.1.	Theor. Group Colloquium	Prof. J. Hamilton (University College, London).	"Anti-protons"

Foreign News

- (a) The Nobel Physics prize for this year has been awarded to Professor D. A. Glaser of the University of California, for his invention of the bubble chamber.
- (b) It is reported that Dr. V. F. Weisskopf has been appointed to succeed the late Professor C. J. Bakker as Director-General of C.E.R.N. Dr. Weisskopf, who is President of the American Physical Society and Professor of Physics at the Massachusetts Institute of Technology, will hold the post for three years. An official announcement is expected later this month.

G. L. COOPER

4th November, 1960

MSG.