NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

OPENING OF THE RUTHERFORD LABORATORY

AND

INAUGURATION OF THE
7 GEV PROTON SYNCHROTRON
NIMROD

Friday, 24th April, 1964

Speeches by

The Rt. Hon. The Lord Bridges, G.C.B., G.C.V.O., M.C., F.R.S.

Dr. T.G. Pickavance

Sir John Cockcroft, O.M., K.C.B., C.B.E., F.R.S.

The Rt. Hon. Quintin Hogg, Q.C., M.P.,
Lord President of the Council and
Secretary of State for Education and Science.

OPENING OF THE RUTHERFORD LABORATORY

AND

INAUGURATION OF NIMROD

24th April, 1964

Speech by Lord Bridges

Lord President, Ladies and Gentlemen,

I rise to welcome you all here to-day. I am very glad that so many members of the Governing Body have been able to come. We also welcome many persons of great distinction in nuclear physics, not only from this country, but also from C.E.R.N. in Geneva and from ten Laboratories in five other countries.

We are all delighted, Lord President, that you are able to be here today. It is very good of a busy Minister like yourself - responsible for Universities, other forms of Education and Science - to find the time to perform this ceremony. But we are particularly glad to see you for personal reasons: because of the keen interest which you have always shown in our affairs, and the support and encouragement we have always had from you.

Many of you may have wondered why the Governing Body of such an important scientific institute as this should have a layman as its Chairman. I am not sure that I know the reason myself. And I am sure I owe a good deal to the members of the Governing Body for their tolerance of a Chairman who is so little learned in their affairs.

As an unscientific Chairman there is one side of the job which has appealed to me very strongly from the outset. That is co-operation with the Universities and I am delighted to welcome here to-day representatives of no fewer than 13 Universities.

The Laboratory was of course set up to provide facilities for research by members of the staff of the Universities (and of other bodies) in a field where

the cost of modern apparatus is so great that facilities can only be provided on a national basis. Perhaps the most important feature of this organisation is that the nuclear physicists of the Universities come here to carry out their experiments, in which they look for help and support from the staff of the Laboratory. This sort of arrangement depends of course for its success on close partnership between the different teams at work. But it calls for more than this.

We want University staffs coming to the Laboratory to feel that they are coming to a place which is in some sense theirs, which is an extension of their own and other Universities. And we want them to know how much we welcome their visits here and how determined we are that everything possible should be done for them. We want them to feel that to do this is not merely our duty, but something which we enjoy doing. Indeed, so far as possible, within the limits of an establishment run under Government rules, we do our best to cosset them and make them feel happy.

I am sure that this spirit will always continue. And that in this way the Laboratory will be doing something very important. It will not only contribute to the growth of knowledge in nuclear physics, but it will also help in keeping alive the essential links between advanced teaching in the Universities and fundamental research.

On this Opening Day one looks back over the $6\frac{1}{2}$ years since this project was started. It has been a difficult job, calling for very high skills indeed, and of course we have had our share of the snags and delays inevitable in so big an undertaking. But all these difficulties and troubles have been met by the staff of the Laboratory with courage and skill and the utmost devotion - met and overcome.

It is only right that on this Opening Day I should say, on behalf of the Governing Body, how grateful we are to all the staff of the Laboratory who worked so well under the leadership and example of Dr. Pickavance, whom I now call on to speak.

OPENING OF THE RUTHERFORD LABORATORY

AND

INAUGURATION OF NIMROD

24th April, 1964

Speech by Dr. T. G. Pickavance

Lord President, Lord Bridges, Ladies and Gentlemen:

It has been a great privilege for me and for my colleagues to be entrusted with responsibility for the work of the National Institute here in this Laboratory, and I thank you, Lord Bridges, for your kind remarks about our efforts to carry this responsibility. I thank the Governing Board for their kindness in inviting many of the Laboratory staff, and their wives, to be official guests at this ceremony.

Accelerators are usually inaugurated very shortly after their first operation. Here there has been an interval of 8 months which can be blamed on me. We chose this date a year ago, and I took an unjustifiably gloomy view of the NIMROD programme at that time. I cannot remember now what were the particular difficulties which bothered me then. But today's proceedings have gained something from this delay, because we can tell you that we have developed NIMROD sufficiently to schedule it reliably for high energy physics, with enough intensity and enough ancillary equipment for serious experiments. We operate regularly at 3 or 4 times 10^{11} protons per pulse, which is 30 or 40 times the intensity achieved during the first operation. We hope to reach 10^{12} protons per pulse by the end of this year, and will then see whether we can go any higher. We are very pleased with NIMROD; in spite of its complication it is reasonably docile.

The universities, together with the A.E.R.E. groups and our own staff, have made a good start on their research programmes. There is no shortage of important research problems for NIMROD, and there is no shortage of imaginative physicists anxious to mount experiments with which to attack the problems. We shall be able to make good use of every hour of operating time we can squeeze out of the machine, and every improvement we can make in its performance and its equipment.

NIMROD takes most of our attention, because it takes most of our money and effort, but we should not forget the proton linear accelerator. This 50 MeV machine operated 4 years before NIMROD and is used by 50 physicists of seven university departments, the A.E.R.E., and the Laboratory. It is a very potent research instrument, and has shown us how to make the idea of the Institute work in practice. It has also constantly reminded us, during the tedious second half of the NIMROD construction programme, that we are a research laboratory and not just an organisation for building big machines.

High energy physics is a truly international field, and it is a great pleasure for me to acknowledge here the close collaboration we have enjoyed, and the generous help we have received, from high energy laboratories in other countries. I also use this occasion to acknowledge publicly the invaluable help we in the Rutherford Laboratory have had, and continue to have, from the U.K.A.E.A., and the efforts of our many contractors who have erected our buildings and built our equipment to our exacting and, I am sure, often exasperating specifications.

Finally, I express my gratitude to my own colleagues for their hard work, often in difficult circumstances, and their loyal support.

I now invite Sir John Cockcroft, Master of Churchill College and a founder member of the Governing Board of the Institute, to speak.

OPENING OF THE RUTHERFORD LABORATORY

AND

INAUGURATION OF NIMROD

24th April, 1964

Speech by Sir John Cockcroft

Lord President, Lord Bridges, Ladies and Gentlemen:

On 13th and 14th May, 1955, we held a small Conference at Harwell to discuss with University research workers in nuclear physics the need to build in this country a high energy nuclear accelerator to supplement the accelerator being built with our participation at C.E.R.N. We had an extremely lively discussion and especially about the relative desirability of building a machine for 12 GeV of modest intensity or a machine of lower energy but to produce 100 times the number of protons than were then available from the Berkeley bevatron. I remember Oliphant saying that Nobel Prizes were won by work with the highest available energy but, in spite of his strong advocacy, in the end we decided to go for NIMROD and we seem likely to achieve the target of intensity then envisaged. So we are now well equipped both with the accelerator and the complicated and expensive tools for experiments. Whilst NIMROD was being constructed, we benefited by operating the P.L.A. to establish the tradition and method of University operation of central machines.

Since 1956 high energy nuclear physics has proved to be a rich field for new discoveries of great importance. By 1959 those of us interested in the subject could carry in our heads or in our little black books a list of about 17 so called "elementary particles" each with their anti-particles, thus extending the pre-war list of protons, neutrons, electrons, neutrinos, photons by the Mesons and the LAMBDA, SIGMA and ZETA Baryons. Since 1959 the field has opened again in a spectacular way and we have added to our lists over 80 additional sub-atomic objects and realise that the concept of "elementary particles" is dead. We can now arrange our sub-atomic objects in new patterns

enabling us to predict missing particles and even their masses. Although we are finding these pattern symmetries we are rather far away from a basic understanding of these patterns and are perhaps in a similar situation to that of the spectroscopists before Niels Bohr's quantum theory of atomic structure provided a unifying theory. The long term objective of high energy nuclear physics is to understand the relation of the four basic forces of the Universe - gravity, the classical electromagnetic interactions which are the basis of chemistry, solid state physics and biology: the strong nuclear forces which hold nuclei together and the rather mysterious weak nuclear interactions which govern the behaviour of neutrinos, muons and radioactive decay. But before we reach this distant goal, it is very likely that many others, now unpredictable discoveries, will be made with our powerful new instrument.

So we would maintain that our central position in science, making possible as we do an understanding of the development of the Universe, the evolution of the elements, the behaviour of atomic nuclei, the application of fission and fusion, justifies continued support by our Government, expensive though it is, and we are most grateful for this.

Our major immediate task is to obtain the maximum possible number of experimental hours from NIMROD during the coming fruitful years. We will look forward as Rutherford would have done, to the results.

I will now ask Professor Weisskopf to speak on behalf of our distinguished overseas visitors.

OPENING OF THE RUTHERFORD LABORATORY

AND

INAUGURATION OF NIMROD

24th April, 1964

Speech by Mr. Quintin Hogg

Having seen the guest list I have no doubt that the whole of this very distinguished company, and not only the staff, know quite exactly what we are about and do not require a Minister to tell them.

To them no doubt it is, if unaccustomed in practice, at least commonplace as an idea that we should be inaugurating a machine costing eleven million pounds of the taxpayer's money, which has taken seven years to develop from the moment when, on my advice, the decision was taken, the only purpose of which is to accelerate approximately to the speed of light a stream of almost inconceivably small particles with the object of creating other particles even smaller whose length of life after they have been created can only be measured in much less than micro seconds.

It is, however, as well to remind ourselves that in any generation before the present we should have been considered mad to do this and that even at the present time the great majority of those who have actually paid for this machine have not the remotest conception what it is about, and if they had might be quite likely to ask what good they might expect to get out of it.

Since under the constitution I am the person responsible for answering these questions, I think you have done right to ask me to open it and, having done so, I hope you will bear with me if I attempt to justify our proceeding less to yourselves (who understand all about it) than to the man in the street who quite certainly does not and if he did might quite easily be likely to demand an explanation.

The acquisition of knowledge for its own sake is essential to the well being of a civilised country. Moreover, such knowledge being obtained is apt to have more revolutionary consequences than even the discoverers can measure at the time, and far more so than other more immediately useful types of information with more obvious parsnips in the buttering process.

I am told that I am no longer to be allowed to believe the story of Rutherford (after whom this laboratory is named) which I have long treasured to the effect that he said, when he discovered the structure of the atom, "that here thank heaven was a subject of study which could have no conceivable practical application". However, se non e vero e ben trovato. I shall continue to accept it into my canonical stock of philosophical and historical commonplaces. A university is a place where original minds must be allowed to climb the Everests of the scientific and scholarly Universe simply because, like the mountain, they are there. N.I.R.N.S., though in effect a consortium of university institutions, still belongs to the intellectual Alpine Club of university life.

However, this in itself presents a difficulty. Eleven million pounds is more than you have to spend on a professor of philosophy or history - and, of course, the cost of these modern machines is by no means limited to the one off. All form a pattern of interconnected facilities. We have the 30 GeV machine at CERN so expensive that it took twelve nations to build it. Now we have NIMROD here, and not fifteen miles from here Professor Wilkinson's tiny little accelerator in the Keble triangle which will cost about a million. N.I.R.N.S. - the true parents and only begetters of NIMROD have already cajoled the Treasury into providing a baby sister - an electron accelerator called NINA appropriately enough since we live in a wonderland near the birthplace of Lewis Carroll. Round the corner will be demands for machines of 300 GeV and even 1000 GeV (which, at least in my opinion) will only be sensible to build on a world scale. Not even the combined nations of a continent can afford nuclear science on that scale. And of course to the cost of the accelerators must be added the cost of the giant computers like ATLAS and other accessories which are necessary to their proper working.

This, of course, is the explanation of N.I.R.N.S. itself. If no one nation can be self-supporting, no one university can justify facilities on this scale. They must be provided for a consortium of university scientists. The experiments on this machine already absorb the energy of nine university groups, two A.E.A. groups, and the Rutherford group representing in all about 100 physicists and forming eight teams each proposing one or two experiments depending on the electronic techniques of particle detection. Seven other university groups and the Rutherford group are participating in bubble chamber experiments.

This is in addition to a two shift 24 hours a day programme operated on what is paradoxically known as the low energy accelerator because it delivers particles of only fifty million volts of energy. For the paradox is that the nearer you get to the absolute minimum in size the nearer you get to the absolute maximum in engineering. To reduce it to a formula 10^{-14}cm. = £11 x 10^{6} or, better, cm.DC^{-n} = £(x + 1) x 10^{n-8}.

All this means that we are engaged today on what is essentially an act of faith - one of the greatest a human society has made - faith that is in the value to a nation of knowledge acquired for its own sake, of brains engaged in, free speculation about the ultimate nature of the Universe, and the structure of matter. It is as much an act of faith as Ely Cathedral, and in the end faith of this kind is the sort that moves mountains.

I have long had this faith myself. I accept - of course - that when experimental science becomes a significant part of our total economy as nuclear science is - we must, by one means or another, hammer out priorities and set some limit on the ambitions of scientists. Yet, in an age when the human intellect is engaging on these speculations, I have it deeply in my heart that if this country can no longer emulate the power of Imperial Rome, as we have done until recently, we can at least aspire to the intellectual eminence of an Athens in the modern world. And if experience be any guide, such a position may well carry with it too a political and economic prestige which will justify even from the material point of view the efforts we have made in the purely speculative field.

It is with these thoughts in my mind that I have much pleasure in declaring THE RUTHERFORD LABORATORY OPEN, and will now inaugurate NIMROD. May he prove a mighty hunter of particles, strange and less strange, K mesons, anti nucleons, and hyperons, and all the rest, and let him be a magnet to attract to this country brains and talent and imagination and shed lustre both on those who use his facilities and those who had the imagination to design him, and those who had the courage to order him, and not least on the poor British taxpayer who has to pay for him.

W. T. Walsh

INAUGURATION OF NIMROD

The procedure whereby the Secretary of State will inaugurate NIMROD is as follows :-

At the end of his speech he should formally declare the Rutherford High Energy Laboratory open and, using the same microphone as for his speech, Inaugurate NIMROD by calling the Nimrod Main Control Room and requesting message 4. The form of words might be :-

> "..... I formally declare the Rutherford High Energy Laboratory open and will now Inaugurate NIMROD". (Pause) then "This is the Secretary of State for Education and Science (or Lord President) calling the Nimrod Main Control Room, may I have message 4, please."

When this message is received a warbling note will be broadcast, followed by "Message 4". The last phrase of "Message 4" is

> "THE ESCAPE HATCHES ARE OPPOSITE OCTANTS 3 AND 7 AND STRAIGHT 2 AND ARE PAINTED GREEN AND LABELLED 'EMERGENCY EXIT'".

On completion of "Message 4" the Secretary of State will press a button whereupon red lights will appear on the indicators in the restaurant showing that the beam is on, and the T.V. monitors will relay a signal from the induction electrodes showing the circulating charge.