

THE ORIGINS OF NIMROD

by John Hendry

NOTE

I had originally intended to write this up as a self-contained story, but on reading through my notes it did not seem worth doing so. To create a complete story would require a lot of additional research in government departments, which is unlikely to be necessary within the confined^s of E & E. I have therefore written the story on the basis of AEA material, as a barely connected narrative^{and} with no attempt at structuring, which would in fact be rather difficult.

This account should be supplemented by that given by Wilkinson in the Nimrod commemorative booklet.

THE ORIGINS OF NIRNS.

In the immediate post-war period, the organisation and funding of nuclear physics in Britain became closely tied up with those of the atomic energy programme. It was generally believed that a large and well-provided effort on fundamental nuclear physics would be essential as a foundation for further atomic energy developments. The research itself was expected to lead to important innovations, and the particle accelerators on which it would be conducted were also thought to be essential for a preliminary training of a new generation of atomic energy physicists. On the other hand, since the first priority was for accelerators for use in the atomic energy programme itself the accelerator expertise was most naturally concentrated within this programme, first at ^{the Telecommunications Research Establishment,} (TRE) Malvern, then at ^{the Atomic Energy Research Establishment (AERE),} Harwell.

The consequence of this situation was that all those universities that wanted accelerators were automatically given the necessary finance, through the ^{Department of Scientific and Industrial Research} (DSIR); but that the accelerators themselves were for the most part designed by the Malvern-Harwell group. For Harwell itself a substantial programme of accelerator design and construction was authorised, including the construction of a 110" cyclotron, the uses of which were not expected to be directly applicable to atomic energy needs. Harwell staff also played a dominant role in the technical planning of the CERN laboratory at Geneva, even before Britain was officially a participant in this organisation. And in 1953 the Atomic Energy ^{Board} ~~Authority~~ (AEA) approved in principle the design and construction at Harwell of a 250m long proton linear accelerator. This was to be designed in collaboration with University and Imperial Colleges, London, neither of which had accelerator facilities of their own, and it was to be sited outside the fence at Harwell, primarily for University use. In proposing the machine, John Cockcroft, the director of Harwell had made much of its possible use for the production of fissile

and other special materials, and the proposal appears to have been approved largely on this score. But the Harwell¹ experts had already come to the conclusion that the accelerator would be inefficient in this respect, and the justification seems to have been an artificial one. In line with the philosophy he had pursued consistently since the war, Cockcroft wanted the ~~a~~ proton linear accelerator both for freely chosen and not necessarily applicable research by his own physicists, and because he believed that since the universities could not cope with the provision of such equipment Harwell, who had both the expertise and the resources, should provide it for their use. Even allowing for the possibilities being created by the construction ~~of machines of~~ of an accelerator of much higher energy at CERN, the proton linear accelerator, which was designed to produce a 600 MeV beam at much higher intensity than those planned elsewhere, appeared to be an essential facility if Britain was to remain at the forefront of international nuclear physics research. But its cost, which had reached over £3½m by the end of 1954, was well beyond the means either of the universities or of their financing bodies.¹

The proton linear accelerator, and the plans for its use by the London colleges, constituted a practical response to the problem of the funding of nuclear physics in Britain.² But by the middle of 1954 it was clear that more formal arrangements would have to be made. The view that Britain should not spend too much money on nuclear physics, which had earlier been predominant and which had contributed towards her dragging her feet on CERN, had more or less died out for the time being. The atomic energy programme was in the process of being removed from the Ministry of Supply and placed under the new Atomic Energy Authority (AEA). And the DSIR and the University Grants Committee (UGC), who at that time shared responsibility for the funding of nuclear physics in the universities, were beginning to look towards the end of the present quinquennium in 1957, and the arrangements that would then be appropriate.

As things stood, the UGC was responsible for the routine costs of nuclear physics in the universities, such as salaries and general departmental overheads, while the DSIR was responsible for the capital and major operating costs of the accelerators, which were located at Oxford, Cambridge, Birmingham, Liverpool and Glasgow. Harwell placed small research contracts and ran its own, completely independent, programme.³ So far, this system had worked satisfactorily, but it had obvious weaknesses and in Summer of 1954 several new suggestions were made as to how it might be improved. Don Fry, head of the General Physics Division at Harwell and in overall charge of their accelerators, suggested that the joint university committee he had proposed to coordinate the use of the proton linear accelerator might form the basis of a more general nation-wide nuclear physics coordinating committee.⁴ Following the discussions of the proton linear accelerator the Treasury expressed their concern at the possible duplication of fundamental research between the AEA and the DSIR,⁵ and asked for an explicit and agreed division of responsibility. And the DSIR expressed a wish to be relieved of their responsibility in the matter when the existing agreement came to an end in 1957, a course that would be consistent with their normal policy of providing capital grants only.⁶

In the light of these moves, the immediate problem seemed to be to decide what to do about the DSIR's desire to give up their role in the funding process. One obvious solution was to transfer responsibility entirely to the UGC. But given the size of expenditure involved this would have involved the UGC in earmarking grants for the accelerators, and this was something to which both they and the ^{un}vice-chancellors objected strongly in principle.⁷ The second obvious solution, in the light of the existing situation, was that the AEA should take over the role of the DSIR. This was what Cockcroft wanted, and what he thought the university heads of department wanted; and as chairman of the DSIR Nuclear Physics Committee he was in a strong position both to determine these physicists' needs and to press his own opinions.⁸ In the course of subsequent correspondence it became apparent that some heads of

department, such as Dee from Glasgow and Moon from Birmingham, preferred to stick to the DSIR if at all possible.⁹ Dee in particular had very limited connections with Harwell (he had not been much involved in the war-time effort), and was very mistrustful of their motives. On the other^e hand Skinner of Liverpool, Mott of Cambridge and Blackett of Manchester, all of whom knew Cockcroft well, positively preferred the AEA, whom they expected to be less rigid and more sympathetic to new developments.¹⁰

On balance, AEA financing seemed to be a possibility well worth pursuing, and it tied in well with Cockcroft's concept of Harwell's role in British physics. Indeed it seems to have been largely on Cockcroft's advice that the DSIR had come to their decision to drop out.¹¹ Since Harwell already dominated the field, and would do so even more when the proton ~~line~~^{linear accelerator} was completed, ~~it was~~ and since the AEA themselves could be answerable to no-one in the civil academic field, AEA financing was ^{also} the obvious way of coordinating the nuclear physics effort. But Keith Murray, chairman of the UGC, was concerned that the university vice-chancellors might not be so keen on the idea. He therefore circularised those whose universities had DSIR funded accelerators asking for their views on possible alternative funding schemes, through university funds, earmarked UGC grants, or some other (unnamed) government source.¹² At the same time, to establish the feasibility or otherwise of UGC funding, ~~he asked~~ of the major operating costs (the idea being that the AEA or DSIR would provide capital grants only), he also asked for a report on their recurrent expenditure. The results showed that the recurrent expenditure fluctuated wildly, making it difficult to fund from the UGC, and that the vice-chancellors were divided between earmarking UGC funds and an alternative government source.

Murray's enquiry left open the funding of new accelerators, which was considered to pose less of a problem than that of operating the ~~existing~~ ones. This problem had been considered, however, by Cockcroft, who thought that the AEA should be responsible for this too, and who also thought that there was a need

for several large new accelerators, of which the proton linear accelerator was only one.¹³ Recent and largely unrelated discussions had led to the suggestion that Cambridge University should be given a small research reactor enabling reactor technology to be included in the courses offered by the chemical engineering department.¹⁴ And in October 1954 Cockcroft proposed to Mott that such a reactor should be combined with a new accelerator in a Harwell outstation at Cambridge.¹⁵ His suggestion was that a case should be made out and put to the DSIR Nuclear Physics Committee for the provision of a new electron accelerator in the 2-5GeV energy range. The committee should be asked to recommend its construction by the AEA, and the AEA to recommend its construction as part of an outstation of Harwell near Cambridge, on land leased from the University.⁵ AEA concern that Harwell was getting too big, and the argument that the new facilities should be close to a university department, would be sufficient to secure the desired result.¹⁶

may have

How much this proposal owed to Cockcroft's own desire to retire to Cambridge or to other ^{more} specific motives is obscure, but it was a neat concoction. Cockcroft could never get permission for another big accelerator for Harwell unless it were specifically requested by the universities for their own use, and the DSIR would never request ^{it} unless it were attached to a university and well removed from Harwell itself. The London office of the AEA were pressing Harwell to stop expanding and start unloading some of their research to other sites, and there was a strong contingent at Harwell who would have liked to work in a more academic environment, while still remaining in the AEA. Viewed objectively, Cockcroft's plan made little sense; but it stood a good chance of pleasing everyone.¹⁷

As it happened, however, the last two months of 1954 proved particularly ^{yl} eventful, and although negotiations of the Cambridge project continued into the Spring of 1955 the whole ~~questions~~

question of what machines to build and where became the subject of much wider discussions. No sooner had the final go-ahead for the Harwell proton linear accelerator been given in October,¹⁸ than Le Couteur's work on magnetic beam extraction from the Liverpool proton synchrotron promised to make the Harwell machine redundant. The justification for the proton linear accelerator had always been ~~the~~ ^{the} high intensity of its proton beam, originally over 1,000 times that of the synchrotron. But the gap had been narrowing all the time, and the latest developments brought the factor ^{down} to about 10.¹⁹ Both Skinner and Mott urged that the linear accelerator be continued, and it did still have a slight edge in intensity and the advantage of a variable energy of operation. It was also capable of extension, in principle to higher energies, and was a more interesting project technically than a circular machine.²⁰ But it was also many times more expensive, and the estimates from Metropolitan-Vickers were rising rapidly. It would be many years before it was completed, and it looked like being more a technological curiosity than a useful experimental tool. By January it had been abandoned, only the 50 MeV first stage, to which the AEA were already committed with Metropolitan-Vickers, being continued with the intention of ~~it~~ using it as an injector for a large circular machine.²¹ At about the same time the discovery of new "strange" particles in America prompted the demand for a British accelerator in the 5 - 6 GeV range (GeV = BeV). In America the Atomic Energy Commission proposed to fund a 5 GeV synchrotron at Boston for the use of MIT and Harvard, and Denys Wilkinson wrote to Mott from Brookhaven that England too should have such a machine, preferably a 6 GeV electron synchrotron.²² At Harwell the accelerator experts Walkinshaw, Pickavance and Mullett also argued for such an accelerator, to be sited outside the fence at Harwell and to be followed ^(not preceded) by either the proton linear accelerator or a high energy proton synchrotron.²³

The two issues of what to build and where and of how to fund it all, were brought together in the discussions at two

meetings in London in December 1954. On December the 7th, Massey held a meeting at University College to which were invited Schonland, Fry and Pickavance from Harwell, Mott and Taylor from Cambridge, Blackett from Manchester and Devons from Imperial College.²⁴ At this meeting it was agreed that, while an electron synchrotron at Cambridge was highly desirable, and while this might well have to be set in a Harwell ~~outstation~~, the University would ~~ensure~~ need safeguards to assure their free access to the machine. The same would be true of the university users of the proton linear accelerator at Harwell. It ~~would~~^{was} therefore suggested that an advisory panel of university nuclear physicists should be appointed by Harwell to control the access to and use of their machines. A week later Devons presided over another meeting at the Royal Society, with Massey, Cockcroft, Pickavance and Fry.²⁵ He expressed his growing doubts as to whether ~~the~~^{more than one of the} large new accelerators proposed could actually be justified, given the limited resources available for science as a whole, and suggested that the electron synchrotron should be given priority over a proton machine. This should be sited at Harwell ~~rather than at~~^{in preference to} Cambridge, but should ideally be placed in a new laboratory. The idea of a single national centre for high energy accelerator work, based on the concept of the American Brookhaven National Laboratory, had already been discussed earlier in the ~~year~~ at the DSIR Nuclear Physics Committee,^{25a} and it ~~was~~^{had been} Cockcroft's intention that the proton linear accelerator outside the fence at Harwell should form the basis of such a centre.^{25b} Devons had apparently been sympathetic to Cockcroft's aims, but while he assumed that a new centre would have to be administered by the AEA, he was not altogether convinced ^{that} it should be at Harwell. On the 15th of December he wrote to Cockcroft ~~he wrote to Cockcroft~~ that he was "firmly of the opinion that there should be a single national centre for multi-BeV work, which would now concentrate on the building of one large machine."²⁶ Ideally this centre should be equidistant from Oxford, Harwell, London and Cambridge.

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The question of safeguards for university users was especially important in the context of the Cambridge proposal, and the Financial Board of the University had serious doubts about the control of the site.²⁷ Despite this, however, and despite the move of opinion towards a single national centre for large accelerators,⁵ negotiations between Harwell and Cambridge continued. In January the proposal was put to the General Board of the University that ^{they should build} a 3 or 7 GeV electron synchrotron,²⁸ the choice depending on whether or not Harwell went ahead with a 7 GeV proton synchrotron now being considered as a possible replacement for the proton linear accelerator.²⁹ When the University put the ball back into the AEA's court,^t however, further doubts began to creep in. From Harwell both Flowers and Lawson argued in the strongest terms that if an electron synchrotron were to be built it would have to go up to at least 5 GeV, regardless of what else was proposed.³⁰ And when the matter was put to the AEA by Cockcroft, who naturally attributed the initiative in the project entirely to Mott, the University of Cambridge and the DSIR, Plowden decided that the whole question of the funding of nuclear physics would have to be sorted out completely before any new accelerators could be considered.³¹ At the same meeting of the AEA, Cherwell put forward again the idea of a new national establishment, or "English Brookhaven" ~~and~~ ^{but} made it clear that he was very unhappy with the AEA having anything to do with it.³²

Meanwhile, discussions on the sensitive issue of funding were continuing at the UGC, with a meeting of vice-chancellors planned for early March. Skinner was pressing hard for the new capital expenditure at least to be born by the AEA, while Cherwell was pressing equally hard for the AEA to be left out of things altogether, and for the entire funding to be handled by the UGC.³³ Cockcroft diplomatically told Plowden that ~~he had~~ ^{he had} no desire for the AEA to be included more than was absolutely necessary, and that if they were to take a part it was

up to the other interested parties to approach them.³⁴ In view of Cherwell's views, however, he suggested that a quiet meeting with Murray before he consulted the vice-chancellors might not be amiss. At this meeting Murray, who in public was dutifully sitting on the fence awaiting the vice-chancellors views, let it be known that he personally wanted the AEA to take over both the ~~operating~~^{capital} funding of new accelerators and the major operating costs of existing machines, leaving the UGC with a slightly increased contribution, but one that was regular and predictable.³⁵ When the vice-chancellors met on the 7th of March they agreed, subject to assurances about safeguards, to Murray's suggestion that the non-UGC component of nuclear physics funding should be handled by the AEA.³⁶ And two months later Murray wrote to the Treasury offering specific proposals based on this division of responsibility.³⁷ AEA financing, combined with some sort of assurances for university users, was presented as the "only option", and it was proposed that all nuclear physics ~~be~~ grants be handled by a joint UGC-AEA committee. Cherwell still disagreed strongly, but he was now isolated in his views, at least among those who knew what was going on.

With the UGC submission to the Treasury the discussions entered a new phase. The treasury called a high level meeting of AEA, UGC, DSIR, Treasury and Atomic Energy Office representatives to discuss the Murray's proposals, and this meeting took place at the end of June. Murray and Millaby^a represented the UGC, Cockcroft and Perrott the AEA, How the AEO, Blount the DSIR, and Playfair, Clerke, Serpell and Vetch the Treasury.³⁸ At the very beginning of the meeting Cockcroft suggested that any new accelerators should be sited at a new ⁿational, Brookhaven-like laboratory, with free access for university users, and from that moment the ^e concept of a national centre played a central part in the discussions. The problems of ^funding, organisation and location were ^hus brought together, and separated from the technical

problem of precisely what new accelerators were needed.

Although the idea of a national centre was generally accepted at the Treasury meeting, there was still uncertainty as to where it should be and how it should be organised. Perrott suggested that from the AEA point of view it should be separate from Harwell but close to one of the universities. The Treasury representatives and How preferred a ~~site~~^{site} mutually convenient to the interested universities; and Murray, who reported general university acceptance of the idea of a national laboratory, agreed that a ~~site~~^{site} close to a university would lead to problems arising from the differential in pay ~~scales~~^{scales} between the universities and the AEA. It was decided that a working party, with representatives from the AEA, UGC and DSIR, ^{should be set up} to consider the details both of the ^{of university} funding and of the location of a national establishment. Detailed proposals should then be submitted to the Treasury and thence to ministers.

When this development was discussed^s at the AEA, Cherwell continued to express his strong opposition. It was in his view "dangerous and undesirable ~~for~~ the Authority to take over any responsibility for nuclear research at the universities."³⁹ Although it was difficult to resist a suggestion that now had the backing of the UGC, the DSIR and the Treasury, other members too had doubts.⁴⁰ Either responsibility for funding the work at universities would be in the hands of the proposed UGC-AEA committee, in which case the AEA would act merely as a rubber stamp. Or it would actually be in the hands of the AEA, which would be both difficult and potentially embarrassing. Cockcroft had therefore to report to Murray that, contrary to his expectation, the AEA could not take on the responsibility for the funding of operating costs of the university accelerators.⁴¹ It was generally accepted, however, that the AEA could take on the responsibility for a central national laboratory, and following ^u further correspondence with the Treasury a new committee was set up to consider the ~~possibilities~~.

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possibilities.⁴² As a starting point a centre with two large machines was proposed, and Fry provided an estimate of £7m - £10m, spread over as many years, for the capital cost entailed. The possibility of equipping the centre with a neutron beam reactor was also to be considered.⁴³ In respect of the organisation and constitution of the new establishment, the general idea was that there should be a managing board dominated by university representatives, with the AEA responsible for administration, finance and the secondment of senior operational staff.⁴⁴

At a meeting ~~of the~~ at the Treasury on October the 4th, general agreement ~~was~~ ^{the} to the above characteristics of ~~the~~ ^{the} new centre was reached.⁴⁵ At the end of October the Treasury decided to submit a paper to ministers seeking approval of the scheme in principle.^{45a} But, largely because of an uncertainty as to how many Harwell staff could be off-loaded to the proposed second site for the Research Group of the ~~AEA~~ AEA, the question of siting was left open.⁴⁶ The Treasury submission to ministers was delayed as a result of internal discussions, but at the end of November it was circulated for comment. The plan was for a national centre with two accelerators and the prospect of a research reactor, to be run by the AEA. Responsibility for financing the operation of existing university accelerators was to remain with the DSIR for the time ~~being~~ being.⁴⁷ There was then a further delay as the universities requested an assurance that no secret work would be conducted by the ~~AEA~~ ^{AEA} at the centre, ~~but Cockcroft gave this assurance~~ and that AEA time on the accelerators would be limited. ~~But~~ ^{But} Cockcroft gave the required assurance and in February 1956 the proposals were finally submitted to ministers.⁴⁸ By the middle of the month the Treasury ministers had approved the project in principle, and within another two weeks the Lord President had also agreed, though only at this stage to a detailed examination of the possibilities.⁴⁹ As Cockcroft wrote to Murray in March, the way was now clear for discussion!⁵⁰

While the formalities had been proceeding, official recognition of the concept of a national centre in the Summer of 1955 had led to extensive discussion behind the scenes as to what new accelerators were needed, what should be the scope of the centre, and where it should be located. In order to provide a basis for discussion of accelerator types, Cockcroft had convened a large meeting at Harwell in May 1955, at which almost all the prominent nuclear physicists in the country, including some 28 from ~~the universities~~ ^{outside the AEA,} were present.⁵⁷ Opinion was divided between a high intensity 2 - 3 GeV proton synchrotron (proposed by Massey ~~and~~ Peierls, Skinner and Cassels, and by Mandl from America) and a 12 GeV alternating gradient proton synchrotron (proposed by Cockcroft, Blackett and Oliphant). ~~Some~~ ^{Some} thought that both accelerators were essential, and Wilkinson insisted that to put Britain right back at the ~~front of the~~ frontiers of research a high intensity 6 GeV machine would be needed. Cockcroft, in the chair, concluded that the majority of opinion favoured his own choice; but the opposition to this was in fact very strong. With CERN and ~~Brookhaven~~ Brookhaven planning 25 GeV machines, 12 GeV, which represented a high energy option, did not seem to be particularly pioneering, and there was a widespread feeling that the option of a high intensity machine, albeit it at a much lower energy, would be much more productive. At any rate, the division of opinion was such that it was thought worthwhile to put out a circular requesting written views. The response to this circular showed a general recognition that the 12 GeV machine would be technically much easier, and would be the only ~~choice~~ ^{choice} possible if it were thought essential to have a machine operating within a short period. But the balance of preference was for a high intensity accelerator, and by the end of July Cockcroft could write of general agreement that this should be the goal.⁵² There was still a problem in that 3 GeV, at which energy an intensity ^{1,000} ~~1000~~ times that of the Berkeley 6 GeV proton synchrotron (the Bevatron) was thought to be practicable, was thought by some to be too low ^{an energy} to produce a worthwhile k⁻ meson flux. Dee, Wilkinson and others pressed ^{an attempt at} for higher energies but ~~with~~

with the same intensity, although they knew that this would in practice be difficult and risky.⁵³ Mandl was able to report from Chicago, however, that Anderson was working on a 6 GeV machine with 50 times the intensity of the Bevatron. And after visiting America to see things for himself Cockcroft came to the conclusion in November 1955 that 7 GeV should be a minimum energy target, but that it might still be possible to improve the Bevatron intensity by a factor of 100.⁵⁴ A further large meeting of nuclear physicists at Harwell in early December endorsed this approach.⁵⁵

By the end of 1955, then, it was agreed that the first priority for the new national centre should be a 6 - 7 GeV spiral ridge proton synchrotron, with a target of 100 times the intensity of the Bevatron. But what of the organisation and location of the centre? During the discussions at the Treasury it had been agreed that this should not be at Harwell. But in the Autumn of 1955 Brian Flowers, then head of ^{the} Theoretical Physics Division at Harwell, launched a campaign in favour of its not only being at Harwell, but being the ~~AERE~~ AERE itself.⁵⁶ Flowers was strongly in favour of a national laboratory of nuclear science, incorporating not only particle accelerators but also nuclear reactors. He also thought that if it were not to be sterile this laboratory would have to be in close communication with either a strong university department or a scientific research establishment. Outlining the requirements of an ideal national laboratory, he came to the conclusion that "the strange thing is that this dream-world closely resembles Harwell, with its security fence largely demolished and without some of its most technological groups." Moreover, looking at it from the Harwell ^{we} point of view, he saw that the AERE, which was steadily losing its role in the reactor research programme, was in danger of being left without any clear raison d'être. In the eyes of the rest of the world it was already Britain's national nuclear research laboratory and it seemed both natural and desirable that it should evolve in this direction. Security posed one problem, but with a second site for the AEA Research Group under consideration it seemed plausible that all the classified work might some day be moved to that site. The universities,

would need adequate control over the activities of the new laboratory, but then Flowers proposed that it should be removed from the AEA as soon as the reorganisation was complete.

In December, Egon Bretscher, head of ^{the} Nuclear Physics Division, circulated another memorandum in broad agreement with Flowers's proposals, but suggesting that the new laboratory should cover all research, ~~and that~~, for whatever reasons, could not be done ⁿ at the universities. ⁵⁷ At this point Basil Schonland, deputy director of AERE, complained that Flowers and Bretscher wanted it both ~~ways~~ ways, with AEA money and resources, but without any of the obligations of atomic energy project work. ⁵⁸ But Cockcroft defended their views, and expressed himself explicitly, and unambiguously, in general agreement with them. ⁵⁹ Further memoranda, containing detailed suggestions as to terms of employment at and the organisation of the national laboratory, followed in January. ⁶⁰

The Flowers plan and its variations caused quite a stir, but at the official level it does not appear to have been taken seriously. ⁶¹ At the end of March 1956, the AEA, ^U ^G ^C, and DSIR met again and agreed on a proposal for a governing board made up of representatives of the universities (7), UGC (2) DSIR (2) and AEA (3), with an independent chairman, all to be appointed by the Lord President with the agreement of the Chancellor of the Exchequer. Based on this meeting, Cockcroft and Murray drew up a new set of ^{specific} ~~proposed~~ proposals, and on the 25th of May they were put by Murray to the vice-chancellors. ⁶² The reaction was generally ~~of~~ favourable, with the small proviso that some wanted the Royal Society to be represented on the governing board. The Royal Society expressed their own wish to be so represented, and the ammendment was therefore accepted, a single Royal Society representative bringing the board up to 15 members plus the chairman. ⁶³ Meanwhile, at Harwell, plans for the proposed proton synchrotron were completed. ⁶⁴ ~~The~~ ^{The} idea of two sites, one in the North, was proposed (by Skinner) and rejected. ⁶⁵ And

suggestions as to who should be chairman of the governing board were thrown back and forth. Cockcroft suggested Mott or Massey, but Murray wanted someone more "independent" such as Adrian or Chadwick. Skinner suggested that if it were not to be a physicist it should be Zuckermann or Ashby, but that Lockspeiser should be "added to the black list". Mott rejected Skinner's suggestions and proposed Peierls. Skinner ~~was~~ rejected Murray's suggestions and proposed Murray himself. And so it went on.⁶⁶

Another subject for discussion was of course the site of the new centre. By November 1955, Cockcroft had decided it should be outside the fence at Harwell, and at the meeting of university physicists at Harwell on the 2nd of December he had, or claimed to have, gained their approval to this.⁶⁷ In outlining the proposed centre to the TSC in ~~July~~^{January} 1956 he had put forward the ~~arguments~~ arguments in favour of Harwell. The site was geologically suitable for the support of the large accelerators, and was served by well developed facilities and administrative and technical support services. Its location relative to the universities was reasonably central, and in the Harwell cyclotron and the first stage of the proton linear accelerator there was a ready existing basis for the centre. Many of the staff would, in the early stages, have to come from Harwell anyway, and the effect on the AERE if the centre were placed elsewhere could be devastating.⁶⁸ Perrott had pointed out at this point that if Cockcroft really wanted the centre at Harwell then the less he said about it the ~~better~~ better.⁶⁹ But in June Cockcroft put forward an internal AEA paper recommending specifically that a site at Harwell should be chosen for the centre, and quickly.⁷⁰ And in his first draft of a new UGC-AEA submission to ministers, written in July 1956, he again recommended a Harwell site.⁷¹

Although some of the nuclear physicists at Harwell had reservations about having the new national centre on their doorstep, fearing that it would attract away all the best men and all the freely chosen research from the AERE; and although there were reservations too about whether the local facilities could support an additional establishment, the AEA approved Cockcroft's wish to have the centre outside the fence at Harwell.⁷² From the point of view of the universities there was no obvious alternative, and this aspect of Cockcroft's draft submission therefore went ahead ^{unchallenged.} ~~for the time being.~~ But the draft did run into other problems with the universities. In principle, everything had already been agreed. The submission was intended to provide detailed proposals for final ministerial approval.⁷³ But in fact the universities were still unhappy, especially in the light of the choice of site for the centre, that the AEA might monopolise the centre's facilities, or use them for classified work. Cockcroft had given an assurance on this earlier in the year,⁷⁴ but ~~that~~ they had had no official undertaking from the AEA and the draft included no explicit guarantee that secret work would not be carried out. Murray felt that if such a guarantee were not forthcoming he would have to go back to the vice-chancellors for their agreement before the draft could be submitted.⁷⁵ When the matter was put to the AEA in August, ^{Plowden supported} Cherwell ^{insisted} ~~insisted~~ that they must reserve the right to use the centre's facilities for classified work, at short notice, and without having to seek the permission ^{of} ~~of~~ the governing board.⁷⁶ Murray therefore went back to the vice-chancellors, who agreed on a compromise proposal that secret work should be carried out only with the permission of the board of ^ggovernors, the Lord President and the Chancellor of the Exchequer. This was still too restrictive for the AEA and the scheme therefore had to ~~be~~ be submitted to ministers with ~~the~~ this particular point left open.⁷⁷

With this qualification, the proposals were finally submitted to ministers in November 1956. After considerable

discussion, the centre had been designated the National Institute for Research in Nuclear Science, or NIRNS for short.⁷⁸ The membership of the governing board was to be as agreed earlier. The operating and administrative staff were to be employed by the AEA. Research staff were to be seconded from the AEA and universities. The first machine was to be a 6.5 GeV proton synchrotron, and for reasons of time and money it was to be sited in a new establishment at Harwell.⁷⁹ By the end of the year ministerial approval had been obtained to the setting up of a governing board,⁸⁰ and a further compromise on secret work^r had been agreed between the AEA and the university vice-chancellors.^{80a} Secret work could be conducted by the AEA with the permission of the Lord President and the Chancellor of the Exchequer, who were to be advised by the governing board. On St. Valentine's day, February the 14th 1957, the foundation of NIRNS was finally announced in the House of Commons. The chairman of the governing board was to be Lord Bridges.^{80b} By mid-March it had been officially decided that the first machine would be in a new laboratory outside the fence at Harwell, though without any future^r commitment to that site being implied, and this was announced officially on March the 19th.⁸¹ By the end of May, the ~~construction~~ construction of the new proton synchrotron (now rated at 7 GeV) had also been approved.⁸²

Considering the organisational problems entailed, the new national laboratory had been approved and set up with remarkable alacrity. But although interested parties had been consulted throughout Cockcroft and Murray had proceeded largely independent of any formal advice. And as the cogs of officialdom turned during 1956 there was a growing feeling of unease, especially among university nuclear physicists, who felt that their views had not been properly taken into account.

The problem of the relationship between the AERE and the universities had been considered by Flowers, both in his original proposal for turning the AERE itself into the new centre, and in some later ~~circulated~~ notes.⁸³ In Flowers's original conception ^{the centre} would eventually be removed from AEA control, and would act very much as a high technology scientific university, awarding research degrees, running courses and so on.⁵ As the details of Cockcroft's proposals emerged, however, Flowers expressed his concern that a separate establishment outside the fence at Harwell would be in the position of competing both with the AERE and with the universities and was bound to cause a lot of friction on all sides. In June 1956 Maurice Pryce, then at Bristol, expressed his support for the national laboratory ^{as} then envisaged, and in addition for its being able to grant research degrees and act as an autonomous institution. But he also noted that it was bound to constitute a threat to the universities, and that this should be recognised and faced before it led to serious trouble.⁸⁴ In confirmation of this note Skinner replied to Pryce's memorandum by arguing against the proposed autonomy of the centre and in favour of its being treated rather as an adjunct to the university departments.⁸⁵

The first indication of strong university doubts did not come, however, until November, when a memorandum was circulated by Devons, who had moved up from Imperial College to take over the Langworthy chair at Manchester from Blackett.⁸⁶ Over a year earlier Devons had already written to Cockcroft arguing against too much being made of the new centre.⁸⁷ He had also replied to the Flowers memorandum by ~~replying~~ ^{writing} that while some university work might have to be conducted in a new centre this was a development to be regretted and minimised.⁸⁸ It appears as if, having just moved to Manchester, Devons regretted his earlier support of a centre based on the proton linear accelerator at Harwell, convenient for the University of London.⁸⁹ Whatever the reason, he had by the end of 1956 become fiercely anti-AEA.⁹⁰ Instead of the arrangement already agreed for NIRNS, which he saw as

being far too dominated by the AEA, he proposed in his memorandum a national commission for the funding and coordination of the whole of British nuclear physics, whether in the universities, at CERN, at the AERE, or at the new centre. As a first step towards getting something done about this, he tried to bring up the matter at the Nuclear Physics Committee of the DSIR, but having been discouraged in this course he instead called a meeting of eminent university nuclear physicists at Manchester on December 11th. Blackett did not go, and Cockcroft was not invited,⁹¹ but Pickavance from Harwell was invited as an afterthought.⁹²

At this meeting, some reservations to ~~the~~^{the} existing official proposals found general agreement. There was, for instance, a call for a reduction in the discrepancy between AEA and university salaries, and for some sort of overall coordinating body for nuclear physics. But Devons's idea of an overall controlling body, did not find favour, and the conclusions of the meeting posed no threat ~~for~~^{to} the existing plans.

Other views on the detailed organisation of NIRNS were also expressed at about this time, most notably in a joint memorandum by Flowers and Wilkinson, completed in mid-February 1957. But since Wilkinson was appointed to the NIRNS board this memorandum was never circulated.⁹⁴ And as NIRNS came into existence there appears to have been no-one desperately unhappy with it apart from Skinner, who was deeply aggrieved at being passed over for the governing board.⁹⁵

Since there had at no time been any public discussion of the proposals, debate reopened up again in the Spring, when these were finally published. But although a Nature editorial cast doubts upon the wisdom of the new centre the response of its readers, even of Devons, was almost unanimous support.⁹⁶ When the

governing board began to meet there turned out to be deep differences of opinion on such matters as the choice of machines (in particular, ^{on} whether ^{or not} to accept Harwell's offer of the cyclotron and first stage proton linear accelerator) and of director (the natural choice, Pickavance, was tainted with AEA associations, but was eventually appointed).⁹⁷ But that is another story.

References

1. For references to introductory paragraphs see my notes on Accelerators and atomic energy.
2. Fry, memo, 9.7.54, AERE 11/NI/1 pt 1.
3. AEX (54) 137
4. Reference 2.
5. Perrott / Cockcroft, 25.6.54, AERE 11/NI/1 pt 1.
6. Ibid. & Cockcroft / Perrott, 28.6.54, ibid., AEX (54) 137.
7. Ibid. (all references)
8. Cockcroft / Perrott 28.6.54, ibid.
9. Skinner / Cockcroft 2.7.54, ibid.
10. ^{Ibid.} Skinner / Mountford 2.7.54, ibid. See also Skinner / Cockcroft 10.10.55, AERE 11/NI/1 pt 1.
11. AEX (54) 137; Cockcroft / Perrott 28.6.54, AERE 11/NI/1 pt 1.
12. Murray / Cockcroft, 1.10.54, ibid.
13. Mott / Wilkinson 1.10.54, ibid.
14. AEX (54) 136
15. Mott / Wilkinson, 1.10.54, AERE 11/NI/1 pt 1
16. Ibid.
17. See also my piece on the Role of Harwell.
18. See my notes on Accelerators and atomic energy.

19. ibid.
20. ibid., and Mott / Blackett, 9.12.54, AERE
11/1/1/23(3)
21. Reprises in my piece on Accelerators and atomic energy.
22. Wilkinson / Mott, 21.10.54, AERE
11/1/1/23(3).
23. Walkinshaw, Pichavane and Mallett, "Accelerator Programme", ibid., and AERE P 34 pt 2.
24. Meeting at UCL, 7.12.54, AERE 11/1/1/23(3)
and P. 34 pt 2.
25. Meeting at R.S., 14.12.54, ibid. (both volumes).
- 25^a. D. Wilkinson, "Events surrounding the construction of Nimrod" (hereafter Nimrod), in Nimrod: The 7 GeV proton synchrotron (SRC, 1979), 7-20: 8.
26. Devons / Cockcroft 15.12.54, AERE 11/1/1/23(3)
and P. 34 pt 2.
27. Mott / Schonland, 9.12.54, AERE 11/1/1/23(3).
28. Mott / Schonland, 12.1.55, ibid.
29. AEA(55)10.
30. Lawson / Mott 2.2.55, AERE 11/1/1/23(3).
Plowden / Cockcroft, Feb 55, ibid.
31. Plowden / Mott, 18.2.55, ibid.
32. AEA(55)12; AEA, 10.2.55.
33. Skinner / Cockcroft, 9.2.55, 21.2.55; Cockcroft / Skinner, 15.2.55, 25.2.55, AERE 11/VI/1/pt 1.
34. Cockcroft / Plowden, 11.2.55, ibid.

35. Corkcroft, note of discussion with Murray and Plowden, 1.3.55, ibid.
36. Corkcroft, note of discussion with Murray, 24.3.55, ibid.
37. Hale/Clerke 18.5.55, ibid.
38. Meeting of Treasury, 30.6.55, ibid.
39. AEA, 30.6.55
40. AEA (55)98; AEA 28.7.55. See also Perrott/Corkcroft, 4.7.55, AERE 11/VI/1 pt 1.
41. Corkcroft/Murray, 24.8.55, ibid.
42. Playfair/Perrott, 1.9.55, Plowden/Playfair, 27.8.55, ibid.
43. Fry/Schwarland, 8.9.55, Perrott/Playfair, 13.9.55, Meeting at the Treasury 4.10.55, ibid; AEA (55)98; AEA 6.10.55.
44. Corkcroft/Fry, 5.10.55, ibid.
45. Meeting at the Treasury, 4.10.55, ibid.
- 45^a. Playfair/Perrott, 31.10.55, ibid; TSC(56)3; TSC, 2.1.56.
46. Willm, memo, October 55, ibid.
47. Playfair/Perrott 29.11.55, Playfair/How, 30.12.55, Corkcroft/Playfair, 3.1.56, ibid.
48. Playfair/Corkcroft, 24.1.56, Corkcroft/Playfair 26.1.56, Murray/Playfair, 28.1.56, Playfair/How, 10.2.56, ibid.
49. Playfair/How, 15.2.56, How/Playfair, 23.2.56, ibid.

50. Corkcroft / Murray, 12.3.56, Murray / Corkcroft
14.3.56, ibid.
51. Meeting at Harwell, 13.5.55, AERE 11(1)/23(3);
Mott / Corkcroft 30.4.55, Mott / Corkcroft 17.5.55,
ibid.
52. Blackett / Schriber 12.7.55 et seq., especially
Corkcroft, circular letter, 25.7.55, ibid.
53. ibid, passim.
54. ibid, passim, especially Corkcroft / Dee, 1.11.55
et seq.
55. Meeting at Harwell, 2.12.55, ibid.
56. Flowers, "National Laboratory of nuclear science",
AERE 7A (Nurs) 1, and see Nunrod, 9-10.
57. Bretcher, "The UK Laboratory for nuclear science",
AERE 7A (Nurs) 1, ~~and see also~~
58. Schriber, memo, 2.1.56, ibid.
59. Corkcroft, memo and marginalia on Bretcher's paper,
4.1.56, ibid.
60. Willison, "Some notes on the national high-energy
centre", 9.1.56, ibid and Nunrod, 11
Mott, "Note on the organisation of the proposed
national centre for research in high energy nuclear
physics", 24.1.56, ibid and Nunrod, 11.
61. Skinner / Corkcroft 26.3.56, Corkcroft / Skinner,
29.3.56, AERE 11/N1/1 pt 1.
62. Corkcroft / Plowden, 28.3.56, Murray / Corkcroft,
3.5.56, 14.5.56, 8.6.56, Corkcroft / Murray
11.5.56, ibid.
63. Murray / Corkcroft 8.6.56 et seq., to Martin /
Corkcroft 19.7.56, ibid.

- 64. Pichavame, memos 5.6.56, 18.9.56, AERE
"1/1/23(3); HC(56)83.
- 65. Corkcroft / Fry, 12.7.56, AERE "1/NI/1pt1.
- 66. Ibid. ^{specials} passim, 24.7.56 - 30.7.56.
- 67. ~~Also~~ Reference 55.
- 68. TSC(56)3
- 69. Willson / Corkcroft, February 56, AERE "1/NI/1pt1.
- 70. Corkcroft "location of a unit for the institute for
nuclear science", 11.6.56, ibid;
HC(56)83; AEA(56)76; AEA 26.7.56.
- 71. Corkcroft, draft paper for AEA, July 56, AERE
7A/Wins 11. See also HC(56)139.
- 72. Schonland / Corkcroft, 30.7.56, AERE
"1/NI/1pt1; Biecher / Schonland 23.7.56 et
seq, AERE 7A/Wins 11; AEA(56)76
and attached brief by Jules.
- 73. AEA(56)73; AEA 12.7.56.
- 74. Reference 48
- 75. Murray / Corkcroft 27.7.56, AERE "1/NI/1pt1.
- 76. Schonland, notes on discussion at AEA, 27.8.56,
Ibid; ~~AEA 23.8.56~~, Corkcroft / Murray
30.8.56, ibid; AEA, 23.8.56; HC(56)139.
- ~~76~~
- 77. Murray / Corkcroft 20.9.56, Schonland / Corkcroft,
28.9.56, ibid; AEA 20.9.56, 18.10.56.
- 78. Penott / Schonland 2.10.56; Schonland / Corkcroft
30.7.56, Penott / Playfair 13.9.55, ibid
- 79. Nimrod, 14-15.

80. Corkcroft / Skinner 21.12.56, AERE "NI" 1 pt 1.
How / Frazer, 19.12.56, AERE "NI" 1 pt 2.
- 80^a Murray / Corkcroft, 19.12.56, AERE "NI" 1 pt 2.
- 80^b Salisbury / Bridges 4.1.57, Bridges / Salisbury
7.1.57, et seq, Ibid.
- 81 H.C. 13.3.57; ~~Atkinson~~,
82. AEA (57) 52; AEA 30.5.57.
83. Reference 56 and Flowers, "Harwell and the
universities", 14.3.56, AERE 7A/Nims/1.
84. Nimrod, 12.
85. Skinner / Pyrie 11.7.56, AERE 7A/Nims/1
86. ~~Skinner / Pyrie~~ Devons, memo³.11.56,
AERE "NI" 1 pt 1; and Nimrod, 12-13.
87. Devons / Corkcroft 8.9.55, AERE 7A/Nims/1.
88. Nimrod, 10-11
89. Ibid.
90. Reference 86
91. Ibid, and Skinner / Corkcroft 28.11.56,
AERE "NI" 1 pt 1; Devons, memo, 12.12.56, AERE
"NI" 1 pt 2.
92. Devons / Corkcroft 29.11.56, AERE "NI" 1 pt 1
93. Flowers and Wilkinson, memo, 13.2.57,
AERE "NI" 1 pt 2.
94. Flowers / Corkcroft 20.2.57.
95. Nimrod, 18.

96 7A | N ins | | passiv, and ke also Ninnd, 20

97 7A | N ins | | passiv.