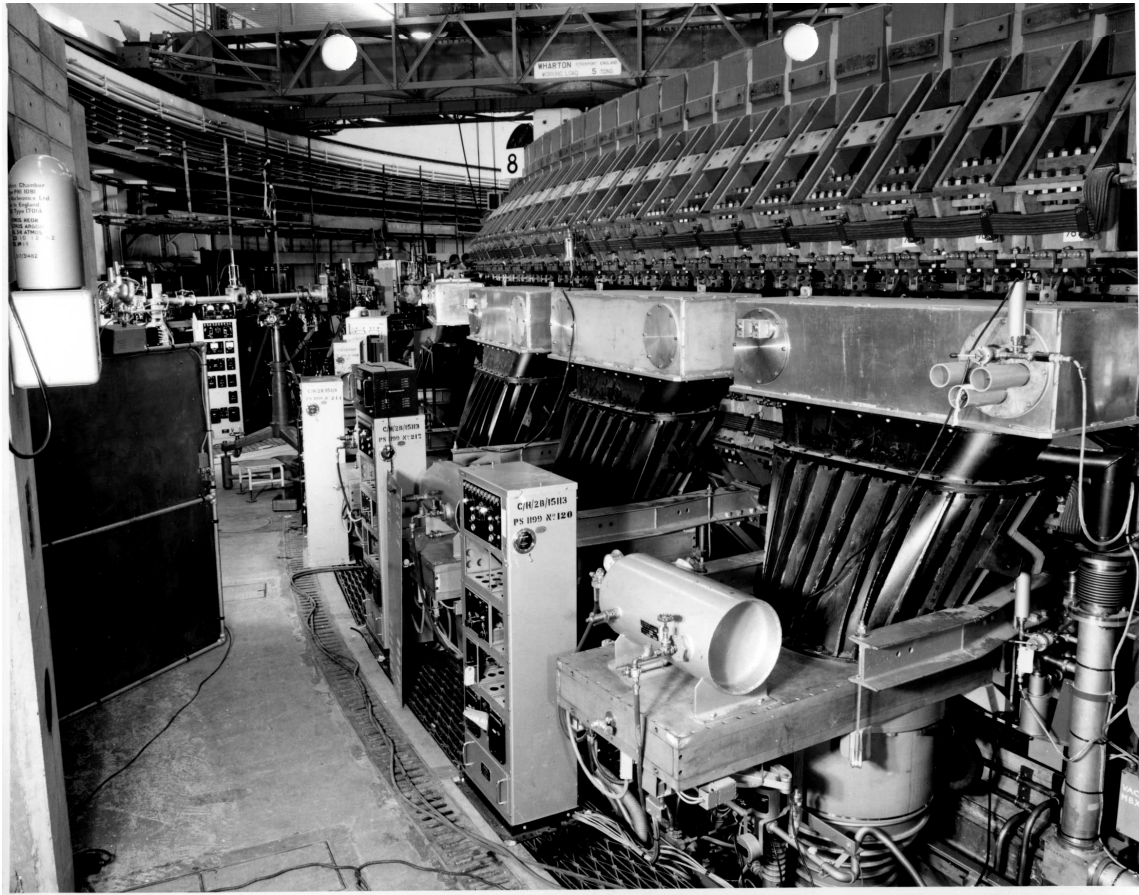


Rutherford High Energy Laboratory

The NIMROD years 1960 -1970



Nimrod as I remember it, never easy to see it all!

The April 1959 edition of Nuclear Engineering gives a good summary of the Nimrod project to date.

Nimrod was essentially the next generation of accelerator after the PLA, and instead of being linear, it was a large circular machine in which the beam would be accelerated many times around before leaving the ring at a tangent, in other words, a synchrotron. Compared to the PLA this was a much higher energy machine and a larger engineering project, as the machine itself would consist of a huge magnet ring about 50 yards across and the injector was almost as big as, and indeed was part of, the PLA. There was a huge experimental hall built on the end of the beam, where experiments could be carried out on the beam which exited the ring tangentially at this point. This magnet weighed over 7000 tons and was a huge engineering project requiring real engineers, certainly much bigger and heavier old style engineering than the more recent collider which looks like a toy gun in comparison. It's a typical example of how modern technology often produces

more for less, as it were. The weight of the machine was such that preliminary cores had to be taken of the ground. It was then determined that it would probably float around on the ground as it was really not very hard, but in the machine circle accuracy of fractions of an inch had to be maintained. A specially built power house would be required to give the pulses of electrical energy required from the grid.



Site clearance, 1959



The start of the hole

This was a 7GeV machine, as compared to the 600 MeV PLA, and the whole machine was to be buried under a large mound of earth to provide radiation screening. The direction of the output beam was chosen to go into the side of the neighbouring hill, for safety. The larger office blocks like R2 were also built around this time to house the staff and laboratories. R2 was to be the location of Bernard's office for many years, and one of my first memories of visiting his office on a Saturday morning during the 1960s! I always remember the bakelite electric clock, the glass case of TRE memorabilia and the telephone with the Recall press button!

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Bernard also produced a paper entitled "Philosophy on controls" produced November 1960 which detailed the wishes of the physicists regarding the design and facilities of the Nimrod control room. There would be mimic diagrams and remote controls for almost everything. Thought had to go into safety and the need for flexibility and to consider the experimental areas as part of a physics lab with room for temporary experimentation etc. The number of people involved would be high at the start, but during routine operation there may be only one or two people operating the machine.

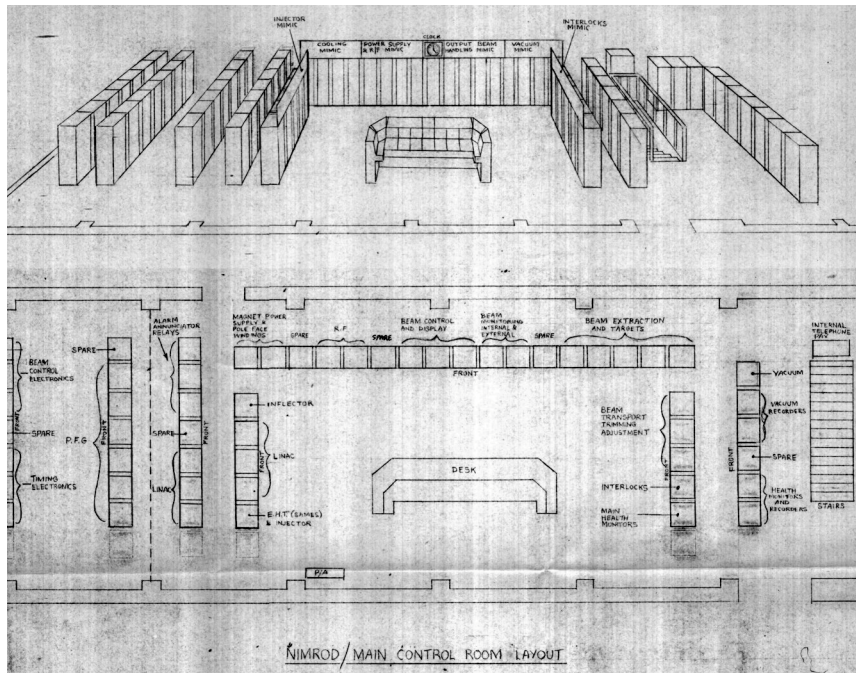
In September Bernard made a visit to CERN at Geneva to see what they were doing, and he came back with a binder of copious notes many relating to their control room. This was one of his first trips abroad away from us, and he came back with presents for the family. For me there was the Caravelle model aircraft with battery powered flashing lights and internal giro. Looking back this was quite a good quality model and had it survived it would probably have been valuable. But at 5 years of age I don't think I appreciated it that much. Then there was the cuckoo clock, I think this might have been nominally for my brother but it was firmly nailed to the wall for the best part of 40 years until it wore out.

Plan of the Nimrod area

It is interesting at this point to repeat the fact that much of the control equipment for Nimrod still used thermionic principles throughout (valves), there were only a few semiconductors being used. Therefore the racks were large heavy items full of 19 inch

chassis shelves with traditional valves and transformers etc with lots of heat and high voltages.

Also at this time he produced a paper showing the control room layout proposals. It seems that the space allocated very early on was not really big enough to meet the proposed needs. The drawing is rather like that of a typical power station control room situated in a computer room, with a central clock, although it appears that the actual design later implemented differed somewhat.

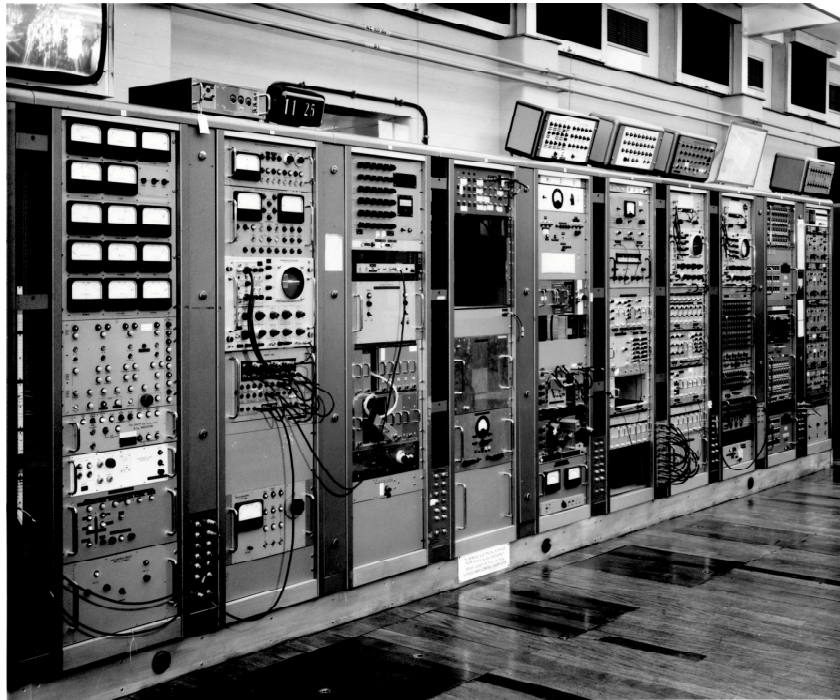


Control Room layout as designed early on by Bernard

There is a reprint of an article by The Royal Institute of Chartered Surveyors, dated April 1961, detailing the precise surveying in the construction of Nimrod, such was the unique scale of accuracy required. The machine is built on a concrete monolith or raft, 160 feet in diameter and 15 feet thick. The paper reports that the whole monolith has sunk into the chalk by 1/3 inch over two years.

In 1962 only 10% of Bernard's time was spent on Nimrod matters, probably still focusing on the PLA handbooks as described in the previous chapter. But the ACR expands the detail to explain that requirements were being drawn up for a coaxial cable monitoring system for the whole machine and a review of how the control facilities planned to meet the needs to vary the characteristics of the output beam.

The first issue of "Orbit" published in July 1962 contains a report by Assistant Director Mr Mullet giving a progress report on Nimrod. Commissioning was planned to be complete by August 1963. They are continuing to mound the whole thing over, in the hope that there will be no more shifts in the magnet foundations!!



A view of racks in Main control room

In 1963 an Orion computer is due to be installed in R1. This would be the first one at Rutherford, since up to this time they had relied on access to the AERE computer system. This availability could not be relied upon to continue without problems.

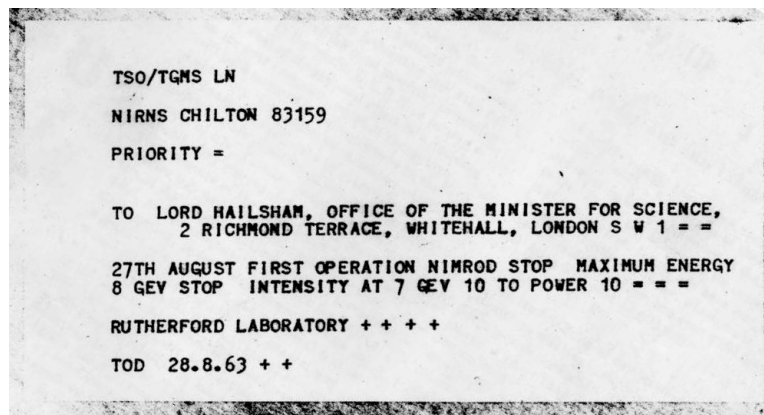
An interest continued in coordinating the control requirements of Nimrod. Some trouble had been experienced with getting the injector to work and cleaning had the opposite effect to that desired. Dirtying certain components with a candle proved to be the answer!! (Lampblack)

Transistors are reported to be used for the first time, in parts of the RF system.

In March 1963 Bernard sends out a memo asking for contributions to an annual progress report.

About this time Bernard's salary was considered to be able to stretch to his first motor car, a new Ford Popular in blue.

The August issue of Orbit was hailing new computer news, but a stop press is attached to the front, being a copy of a telex sent to the Minister for Science, Lord Hailsham, reading as follows:



TSO/TGMS LN
NIRNS CHILTON 83159
PRIORITY =

TO LORD HAILSHAM, OFFICE OF THE MINISTER FOR SCIENCE,
2 RICHMOND TERRACE, WHITEHALL, LONDON S W 1 = =

27TH AUGUST FIRST OPERATION NIMROD STOP MAXIMUM ENERGY
8 GEV STOP INTENSITY AT 7 GEV 10 TO POWER 10 = = =

RUTHERFORD LABORATORY + + + +

TOD 28.8.63 + +

Telex announcing first operation of Nimrod

Details followed in the September edition. “Nimrod reached design energy for first time”. “The next stage into the new year is to develop a *reliable* instrument”

Harwell Bulletin reports that Nimrod operated for the first time at 5.20 pm on Tuesday 27th August.

The Rutherford Laboratory is officially opened and Nimrod inaugurated in a special ceremony on Friday 24th April 1964. This was possibly the time at which the “High Energy” was dropped from the name. In the same issue is an article about the new Pendon museum, not so famous then, of which Bernard eventually became a life member.

The first actual research using Nimrod is reported in the August 1964 edition of Orbit, this is the conclusion of phase 1 experiments. A celebration party was held on 30th July to record the first year of operation and much beer was consumed. In between this and the news from CERN, some details are given about the role of those strange devices, the “Bubble chambers”, used in this type of research. Basically they enabled the tracks of particles to be traced. The job of studying the photos of these tracks was given to young women scientists, one of whom was a friend of the family until her death in the 90’s, Sylvia (Effie) Preston.



Another view of the Main control room

During 1964 the new ICT (previously Ferranti), Atlas computer was coming online. This had 2 card readers for input capable of 600 cards per minute! Also 2 paper tape readers. For output a 1000 line per minute printer was offered, along with a card punch and a Teletype tape punch at 100 characters per second.. It has a 48 K core store and a magnetic drum capable of twice that capacity!

The only other records relating to the year 1964 for Bernard relating to Nimrod, are the notes for his ACR:

Work for the editing of the maintenance handbooks for Nimrod.. So far 200 documents are planned with nearly 70 authors. He also negotiated the contracts for the actual printing and production of the handbooks. Also work on editing a full technical report on Nimrod of over 200 pages, with drawings etc.

A document published with a 1965 date called "Nimrod Commissioning leading to the first 7 GeV Operation", by Mullett et al, is interesting reading. Broadly, the ring was closed 3 weeks before the first full operation was attained, ie the end of July. Before this date the injector had seen 15 days running and adjustment. The whole machine attained full vacuum on 6th August and from then on the machine was run until midnight each running day and during that time all personnel had to be evacuated from the ring. There is a day by day account of the adjustments being made until full output was attained on 27th.August.



The separate control room for the RF supply looks even worse!

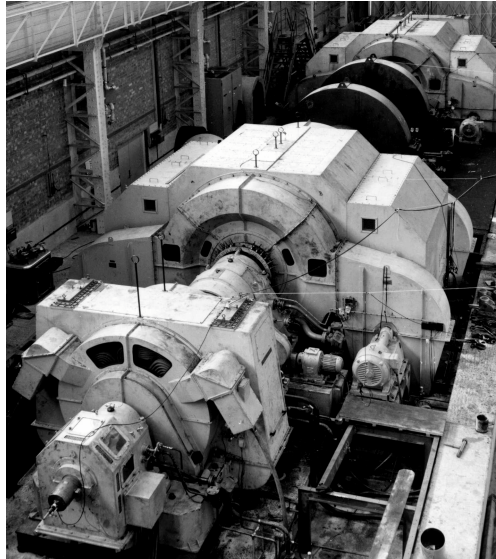
He also contributed an article to Orbit, December 1964 . This was about the family visit to the “At Home” project at Oxford Engineering Department, where the new Van Der Graff machine was on display. Much ado about sparks and hair raising, but the memorable bit is that about my mother, who is reported to have said the Professor of Nuclear Physics at the University “didn’t look like such an exalted person”. The comment about having to do some quick shopping and return in time for Dr Who was very tongue in cheek, I don’t recall ever making it back in time to see the start of Dr Who, let alone any of it, after an Oxford trip! I do recall the visit, vaguely. For some reason the publishers seem to have chosen to make the article by an anonymous visitor.

However, in February 1965 there was a catastrophic failure of the Nimrod power supply, whereby both alternators were removed from service. By the end of the year one alternator was back in service, but as the December Orbit reports, there were more failures. The plunging mechanism shaft broke, and then there was a large vacuum leak in the RF section, causing more damage.

A piece of the alternator rotor broke and a similar problem was found with alternator 2 on inspection, causing the shutdown of both. Orbit, March 65 reports that a part of one alternator fractured, leading to contact between rotor and stator. Four persons are named as entering the power house to deal with the situation, “This must have taken great courage as the damaged machinery was making terrifying noises and the building was

filled with black acrid smoke”. I guess that, nowadays it would have been left to explode and burn itself out? Some press reports were rather over generous in imagination, reporting experimental areas strewn with debris. These locations were actually a long way apart.

Nimrod was run at 2GeV for the rest of the year during the power failure period by direct use of the mains grid. Lack of the flywheel prevented use of higher power.



The infamous alternators in the power house

There is a letter dated April 1st 1965 welcoming Bernard to being a member of staff of the new Science Research Council. The yearly ACR announces completion of the work outlined on the Nimrod report, and the on going work as editor of the Nimrod maintenance handbooks.

There is a copy of the Nimrod Report Part 1, NIRL/R/44 , nearly 2 inches thick, which became available at the end of May 1965. For 50 years I have been hoarding a dummy copy of this book to use for scrap paper.

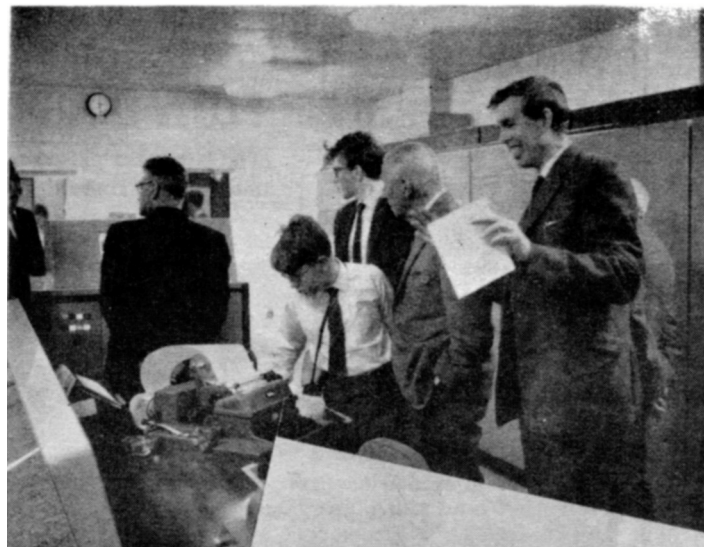
Things worth noting on reading include

1. Everything was done in ‘thous’ of an inch, feet and inches, looks very quaint nowadays.
2. Accuracy of alignment was affected by the bending and sinking of the monolithic concrete base, especially after mounding the earth over the top. 100 tons of earth was found to make a measurable shift.
3. The transistor was being used for the first time, although sparsely. But the drawing symbol being used was one I have never seen and must have been devised before the current world standard everyone recognises today.

There is a memo that Part 2 will be delayed until July. Did it ever appear? I do not have a copy or any evidence of it in the archives.

In May 1965 the BBC showed a programme called “The Proton Synchrotron” on BBC2. This included features of Nimrod and the PLA. (audio recording in archive)

In June an Open day was held. In Orbit June 1965 there is an article with photos, one showing Bernard explaining the Atlas computer facility while I am observing with great interest the Friden Flexowriter . Maybe this is one reason my interests have also diversified into telegraphy and teleprinters!

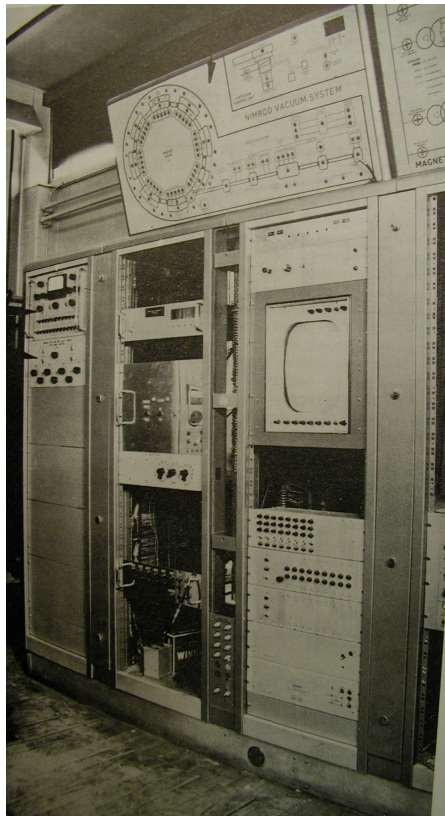


Myself, brother David and grandfather listen to my father explaining the Atlas Computer

This year also saw a memorable family 2 week holiday in Wales, which included a week in Wyddgrug, a remote cottage in Lleyn where a family friend still lived. This is where we learnt to play Monopoly with a central Bank and how to go to bed by candle light, as they had no electricity. There were gas lamps downstairs of which I can still recall the characteristic aroma of burning Calor gas. This place may be one of the venues which seeded my passion for quiet rural places (and gas lamps).

In 1966 the ACR notes indicate that he continues to lead a section devoted to the preparation of the Nimrod handbooks. To complete the work the section was extended to 4 staff and two contract technicians and two further technical authors were requested. The work included the assessment of the handbooks required and the order of priority, and the supervision of the writing and preparation of diagrams and illustrations by technical authors. Also of course the editing of the documents, and liaison with outside firms assisting with draughting, typing and printing and collating of the completed handbooks.

He also attended a PERA symposium on Effective Technical Publications, and writing and speaking effectively, ..



This view of the control room shows one of the mimic panels

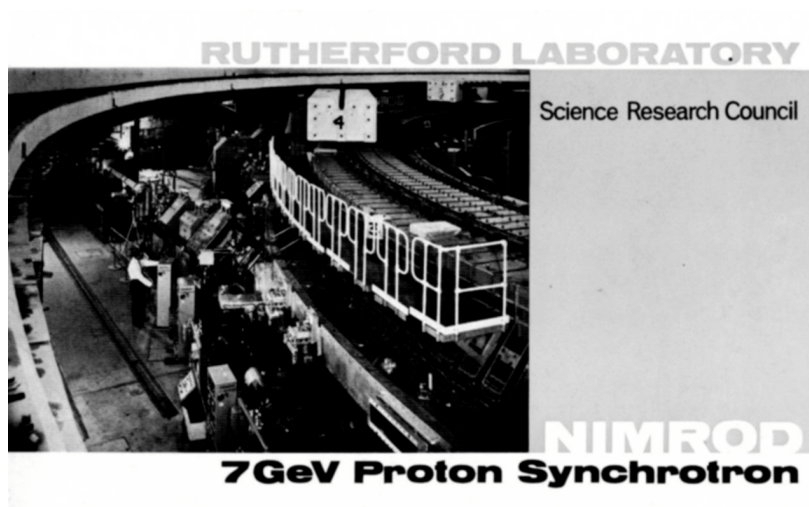
The February 1966 copy of Orbit tells us that CERN have just experienced a similar accident in their power supply to that experienced at Nimrod.

Also reported is the first idea of a Nimrod Booster, basically an improved injector.

In 1966 Les Mullett was seconded to the Ministry of Technology. His career starting at TRE and The Lees, is documented in Orbit March 66.

In September 66 it was decided that it was necessary to offer a barrel of beer if anyone could get Nimrod to provide a good beam for 24 hours continuously. Apparently this was effective, as the party was held as promised in October. Food was an extra 4/- a head. If more than 288 pints should be consumed then the users pay the excess!

In 1967 a booklet was published outlining a number of sites in various countries for the building of “The CERN 300 GeV Synchrotron”. The UK site was to be near Cambridge. I do recall some family unrest at the time as there was a suggestion that we might have to move to East Anglia! However, where would one build the CERN machine other than in CERN. Government cuts saw to it that it wasn’t built here and it was indeed ultimately built at CERN.



One of the popular leaflets advertising the facility

In August 1967 he was in correspondence with the accommodation department regarding a request for another move, this time from R20. He had been offered an unsatisfactory office, probably too small and/or shared with someone else. He is requesting additional storage for all his stuff (without which there would have been no biography!). He was moving office quite frequently and didn't like sharing, understandable after years of having one's own space. I recall visiting him in R12, R2, R20 and various other single story additions somewhat like temporary offices. In the archives is an envelope which is a kit of parts for working out how to arrange his furniture in a new office, probably used many times. Little pieces of paper to represent furniture and graph paper.

The work on the handbooks continues into 1967 through to 1970 as the main activity. But in addition some colour display diagrams were produced showing the internal structure of Nimrod. Apparently Bernard initiated the design of special stencils for use with the Nimrod drawings. There are a number of samples of UNO stencils embossed RHEL, in the artefacts.

Around 1969 the ITV ran a short series on the construction and use of Nimrod (audio recording in archive)

Also Bernard was the joint editor of the Nimrod Beam Line Equipment Data Handbook., a major loose leaf reference document.

In 1970 plans were made to complete the handbook project. One might judge the size of this project which went on for so many years, from the numbering system. There are only a couple of dozen examples in the archives, probably ones Bernard was particularly involved with. The numbering suggests at least 6 different main sections and possibly upto 60 different titles in each one. There is a section numbered 30 but not sure there were that many. If there were 6 sections and say 50 titles in each, that is 300 titles.



Friden Flexowriter

In early 1970 Bernard transfers to the “Nimrod Accelerator and Beams Theory Group”. For this, 25% of time is spent learning the Fortran programming language, including writing simple programs and running them on the IBM 360 computer. He attended a Fortran Course at AERE training centre.

This year saw the start of family visits to the Dorset retreat, an old 1950s caravan which Bernard spent many hours restoring over the previous winter. This had gas lights but he added 12 volt lighting. In those days there were no mains hook-ups at sites, even though this was a semi-permanent site. The fridge ran on gas and the lights from the car battery, and no television (until I provided various means to do this, but that is another story). The return to gas, following my encounter at Wyddgrug in 1965, probably became too much at this stage and possibly accounts for my later interest in preservation of gas lights. The use of the site, but not with the same ‘van’, was to continue into the ‘90s.



Bernard enjoying a stay at the ‘new’ caravan
near Wareham, Dorset

The year was rounded off by a 2 week holiday in Scotland, which became the subject of an 8mm film with added sound which Bernard and I worked on during the following winter.

Although Bernard has little further direct involvement with Nimrod, this is not the end of the Nimrod chapter, but further information regarding Nimrod after this date is scanty.

Much time was then spent with development of computer programs assisting in the solution of problems related to the SCS machine (later to be the SNS) beam transport systems.

He published SCS/Machine/29 “Betamin: a short program to survey doublet lattice parameters.

Bernard’s immediate work on Nimrod was done but service went on into the 70s. In 1972 there was to be a winter shutdown for modifications and maintenance. This included new flywheels in the power house and computer control upgrades, including graphics provision.

Although no longer of Bernard’s concern, in 1974 part of the old Linac from the PLA was moved into the Injector hall of Nimrod to become tank 2 of the new upgraded Linac for Nimrod. This part of the work going into 1975 was to provide Nimrod with a 70 MeV injector, thus increasing the proton beam intensity to about 10^{13} protons per pulse. Another PLA tank will also be added shortly.

In the Bulletin for February 1978 the 21st birthday issue reported significant dates, eg, NIRNS was formed to incorporate RHEL in 1957, and in April 1965 the SRC was set up. The PLA ran from 1960 to 1969. Nimrod had parameters with all the sevens. In 1957 it was approved, a 7 GeV synchrotron, for 7 million pounds, using a 7000 ton ring magnet, with a 0.7 sec current rise time.



Coffee breaks were important brainstorming events!

However, the Bulletin for May 1978 reported events to mark the closure of Nimrod. It was to be switched off by the Director at 1700 hours on Tuesday 6th June. There will be a party with free beer and the usual caveat, when it runs out normal sales will resume!

On Friday 9th June there was a special Nimrod commemoration ball. Saturday 10th of June would be families day for everyone to look around the Lab. On Tuesday 27th June a special Nimrod commemoration would be held, by invitation only. However, Bernard was invited and we know there were lectures followed by an evening buffet. The dinner included sherry. The June Bulletin reports on the closure day and shows a picture of the SNS, which appears to be in the same mounded location as Nimrod. Bulletin No 11 shows the actual closedown ceremony.

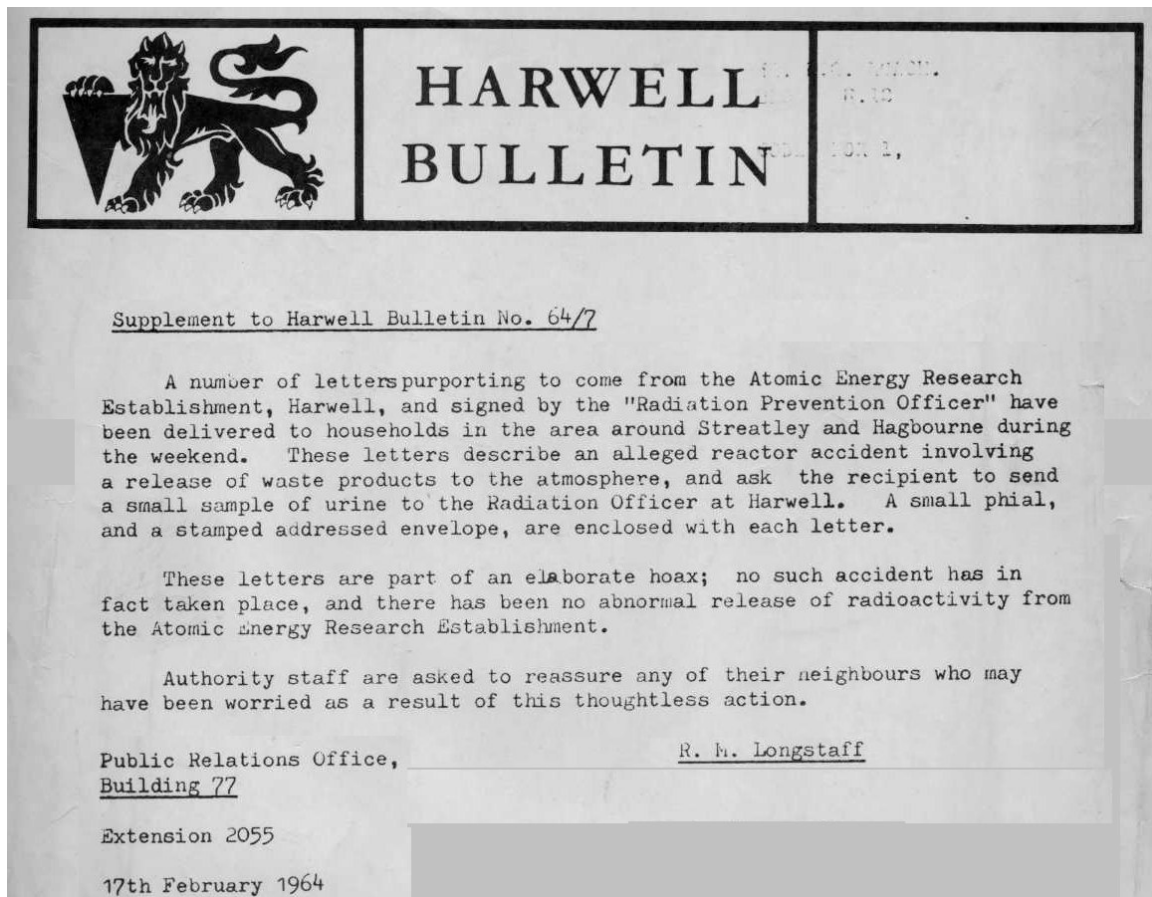
The event is reported in the July Bulletin. Dr Pickavance was presented with the Nimrod master key in a jar and told to keep it until required for the SNS.

A 1979 Bulletin tells us that the Science museum wanted to preserve part of Nimrod, but chickened out at the sheer size of what was involved. They settled for preserving the model from the hallway.

In January 1979 the NIMDIS team completed stripping out the first octant of Nimrod. Disposal of the scrap had been hindered by the transport strike and the weather.

There is a substantial booklet which was produced to commemorate the closure which describes a full story of Nimrod- "Nimrod, The 7GeV proton synchrotron, proceedings of a Nimrod commemorative evening held at Rutherford Laboratory on 27th June 1978", John Litt, 1979.

The Bulletin for February 1980 records the removal of the last magnet sector. Some recycling did occur, some magnet sectors were used as shielding for the SNS, the new machine everyone is looking forward to. It was reported that the last section to be removed could be the one that was on the trailer that broke down in Cornmarket Street during delivery!



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