building up the Divisions concerned with nuclear physics, reactor physics, chemistry, chemical engineering, metallurgy and materials. Health Physics was also obviously important.

There was one feature of Britain' s general atomic energy policy which had a decisive influence on Harwell and in which Harwell, in turn, then had a decisive influence on the further development of this policy: it was the choice of nuclear reactors. The imperative in 1945 was to develop a British nuclear deterrent and to do it quickly. This meant that it had to be based on plutonium; hence the requirement for nuclear reactors. Again, for quickness, these reactors had to be fuelled by natural uranium. Enrichment would have to wait until later. The two candidate moderators for natural uranium were graphite and heavy water. Whereas Britain had easy access to sources of graphite, there was little heavy water available. Finally, there was the problem of cooling. Light water cooling of a graphite reactor was seen to be hazardous (as was tragically demonstrated, many years later, at Chernobyl) and so the choice was gas cooling. Hence the UK embarked on the system of natural uranium, graphite moderated, gas-cooled, reactors, starting with the first Harwell ones, GLEEP and BEPO; a system which was to dominate British atomic energy for many years. Initially, the gas cooling was chosen to be of the simplest kind, merely unpressurised air along cooling channels through the graphite and out into a chimney stack.

GLEEP and BEPO were constructed as experimental reactors, still known as 'Piles' in those days, mainly to provide nuclear data and prototypes for the Windscale reactors and to test graphite and uranium for impurities. But they also had other uses. A heat exchanger was fixed to the air exit of BEPO, to provide the Harwell site with hot water, surely the first peaceful use of atomic energy. BEPO, particularly, was also used for research into radiation damage. Importantly, both reactors were used from the earliest days to produce radioisotopes for medical applications. The small radium business of Thorium Limited at Amersham was taken over, in mid-1946, to become the Radiochemical Centre, later Amersham International, the commercial outlet for Harwell's isotope production. This was the first example of what was later to become a familiar feature of Harwell's evolution: the launching of separate activities, outside the Harwell 'fence', initially as external subsidiaries but later to become independent, self-standing, activities and businesses.

The Golden Age

There was one feature of the earliest days of the British atomic energy programme, including Harwell, that many people thought unsatisfactory. It was under the control of the Ministry of Supply. The general impression was that the Civil Service was not the right organisation for running such a new, adventurous, enterprise; and a general campaign was mounted, led by Lord Cherwell, to create a separate and more independent organisation for atomic energy. On 4 June, 1954, the Atomic Energy Bill became law. It introduced the Atomic Energy Authority as a semi-autonomous body with three main groups, Research, Industrial and Weapons, led respectively by Cockcroft, Hinton and Penney, together with a London headquarters, under the Chairmanship of Sir Edwin (later Lord) Plowden. With this new-found freedom, British atomic energy — and with it, Harwell — rapidly expanded into its golden age. It brought Harwell's manpower up to a peak of about 6000 by 1962.

There was a second reason for this golden expansion and one which brought about the first great change within Harwell itself, beginning in about 1950. Ever since the earliest days people had dreamt of a civil application of nuclear energy, that of producing electricity. In Britain these thoughts were sharpened by the bitter winter of 1946-47, when the great fuel and power crisis led to an almost total shutdown of all national activity, other than shivering, for several weeks.

Honour

It was decided to build upon existing British experience, and a design study was completed at Harwell in 1952 for a gas-cooled, graphite-moderated, natural uranium reactor which would have the dual purpose of producing both plutonium and electrical power. Known initially as PIPPA — ie. pressurised pile producing power and plutonium — it later became known as a MAGNOX reactor, in honour of a notable Harwell contribution. Up until then uranium fuel rods had been encased in aluminium cans. But aluminium reacts disastrously with uranium at temperatures above 250 degrees Centigrade; and the power reactors have to operate at much higher temperatures than this. A research programme at Harwell developed an alternative canning alloy based on magnesium and named as magnox. It has proved very successful for the British natural uranium power reactors.

Starting from BEPO and Windscale experience it was hoped that the development of the PIPPA/MAGNOX reactors would be a relatively simple matter. This might seem to be true since the first of these, the Calder Hall reactors, were built in only three years, to be formally opened by HM The Queen at a famous ceremony in October 1956, when the first nuclear electricity entered the national grid. But the development turned out to be very far from simple and the effort on it produced great changes at Harwell, as well as in the Industrial Group at Risley, Springfields and Windscale. Although BEPO and the Windscale reactors had involved sophisticated nuclear physics in their design and advanced chemistry and chemical engineering to produce their input materials and deal with their irradiated fuel, in all other respects they were extremely simple, undemanding, constructions. It was an entirely different matter, however, for power reactors.

Operation at higher temperatures introduces difficult corrosion problems. Operating the coolant gas — now carbon dioxide — at high pressures brings in the need for pressure vessels, either steel or prestressed concrete, with all their immensely complicated technology and new safety problems. Operating the fuel to higher burn-ups means controlling the ghastly effects of radiation damage which occur in heavily irradiated material. An immense range of new scientific and technological problems thus challenged Harwell and these were problems mainly outside the then traditional areas of Harwell expertise, nuclear physics and chemistry. And so large R & D Divisions had to be developed in these new areas, particularly to do with materials science and metallurgy, with an importation of a second wave of scientific and engineering staffs, more experienced in the newly required disciplines. All this was further enhanced by a correspondingly large research and development effort, on the Fast Reactor and also the Advanced Gas Cooled Reactor (AGR), which again involved new sciences and technologies, such as ceramic fuels, different fuel can materials and liquid metal coolants.

Launched

Harwell at that time was also in a fever of excitement over the invention of new power reactor systems. The Magnox reactors were obviously only a first step in the nuclear power programme. And, while the fast reactor was seen as the ultimate step for fission power, it was clearly realised that much better thermal reactors than Magnox could, and would, be developed. There were many candidates and each had its champions, around which small pioneering design teams formed in an almost ad hoc manner. Harwell's task here, in the reactor field, was to make first studies of possible reactor types and evaluate them. It was also realised that the Harwell site could not accommodate all these embryonic new reactor types, especially as it was already adding to its existing facilities two major materials testing reactors, DIDO and PLUTO. As a result, Harwell launched a second research establishment, at Winfrith on Thomas Hardy's Egdon Heath in Dorset, where the experimental High Temperature Reactor (DRAGON) and Steam Generating Heavy Water Reactor (SGHWR) were built and operated.

Another strongly growing activity at Harwell was thermonuclear research, with the long-term goal of producing a commercial fusion power reactor. Despite the setback of the premature Zeta project this activity flourished so much that it also was eventually hived off to another site, at Culham, a few miles from Harwell, which later became the home of the international JET project.

Through all this flurry of activity on new reactor projects, Cockcroft' s other ambitions for Harwell — that it should also be an academic centre and engage in such pure science as springs from its primary roles — were also satisfied. Two major teaching ventures, the Isotope School and the Reactor School, were set up and, over the years, trained large numbers of students in these new sciences. As regards pure science itself the contributions were many. To mention just a few, the forces between nucleons were determined and the shell model of nuclear states developed, the chemistry of the actinides was worked out, the problems of plasma stability studied, solid and liquid structures were analysed using neutron diffraction and scattering, the basic processes of radiation damage were unravelled, especially by high-resolution electron microscopy, fluorine chemistry was developed, the Mossbauer effect was applied to the theory of general relativity, radioisotopes were used to elucidate the mechanisms of atomic movements in solid-state diffusion; and fundamental work on electronic interactions in solids, which defined the transition between metals and non-metals, threw new light on the basic processes of magnetism. Harwell's large experimental facilities, its reactors and accelerators, were opened up to university groups for their fundamental researches and this led in 1957 to the setting up of the National Institute for Research in Nuclear Science (later to become the Rutherford High Energy Laboratory) alongside Harwell.

This period, from about 1950 to 1965, was truly a golden age. I was fortunate enough to have been there during part of this time (1955-58). An enlightening description of the establishment at that time was given by a visiting American scientist, A. Langsdorf (Atom, July 1961): "Harwell itself is steadily becoming more attractive to the eye, thus better matching the pleasant countryside around it as the original airfield and early temporary buildings are obscured by landscaping and replaced by new construction. Most of the buildings lie in a mile-long crescent which follows the old airstrip. They are tightly grouped and it is usually a surprise to learn that they house about 6000 people. Four large hangars... are conspicuous... they were the first buildings converted to research purposes. The most recent construction has burst from the confines of the crescent on to the open airfield, giving a clear impression of booming research. Beyond this is a group of buildings dominated by two steel shells, each housing one of the twin heavy-water reactors, DIDO and PLUTO. They are at the edge of the level field close to the open rolling downs which ring the area."

New Roles

After about 1965 Harwell faced a new problem. It seemed that its initial work, which was to provide the scientific basis for Britain's atomic energy and nuclear power programmes, was approaching completion. Actually, this was not true, as I shall argue later. But in 1965 the later problems of nuclear power were barely visible and the substantial and successful solution of most of the initial ones meant that Harwell had to seek new roles. The Moses, then to lead Harwell towards a new land, was Walter Marshall who became Director in 1966. What enabled him to do this was the Science and Technology act of 1965 which required the UKAEA to undertake certain non-nuclear scientific research. Marshall reckoned that the demand on Harwell for research in support of the nuclear power programme would drop to about one-third of that at the peak. He also clearly saw that to reduce the Laboratory by this amount would effectively destroy it; and so he decided to offset the nuclear research run-down by a major new initiative, ie. non-nuclear research based on Harwell's existing expertise and directed towards helping British industry increase its technological and economic performance. Harwell thus set out to become a contract research organisation, selling high technology as a spin-off from its work for nuclear power. Marshall also recognised that if a technological innovation was to survive its vulnerable infancy and grow into a commercially successful venture it had, usually, to be attached to a single industrial company so that this had a commercial incentive to develop the innovation exclusively for its own benefit. This was the frankly realistic basis of what became known, inappropriately in my view, as Marshall's 'policy of maximum unfairness.' Underlying this was an even more basic policy, which defined the aim of Harwell at that time in Marshall's own words as "to use our scientific knowledge, people and resources, to the maximum national advantage."

Target

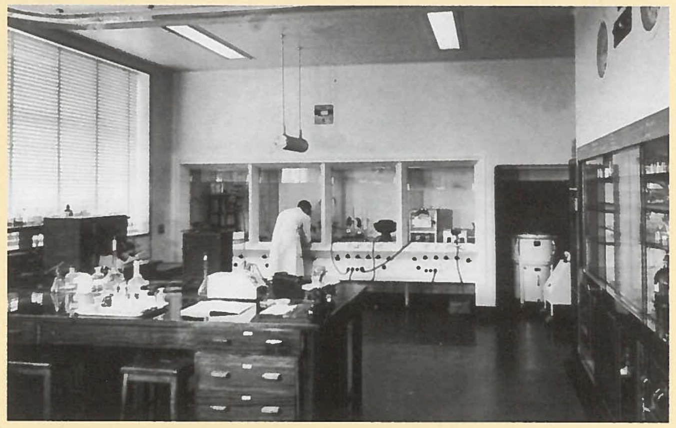
Although new research contracts began to be won by this means at an impressive rate, it was nevertheless inevitable that some reduction in staff numbers at the Laboratory should occur; and in fact by 1973 the total employed at Harwell had dropped to about 4500. This difficult run-down had to be combined with the equally difficult conversion from a traditional, government-funded, laboratory to one that would live partly or wholly on contract research. Marshall's target, here, was for Harwell to give about half of its total effort to nuclear power, one-quarter to contract work for government departments and one-quarter to British industry. It is a tribute to the late Lord Marshall's leadership and to the resourcefulness and adaptability of the Harwell staff that this difficult transition was achieved so well and smoothly.

Pressure

Looking at the published figures for the change in professional manpower and financing of Harwell, over the period up to about 1974, I find one surprising feature. Despite the statement that the conversion was necessitated by the near-fulfilment of Harwell's initial role — that of providing the scientific basis for Britain's

Harwell airfield under construction, 1937, with Hangar 7, top left. (HP 84899)

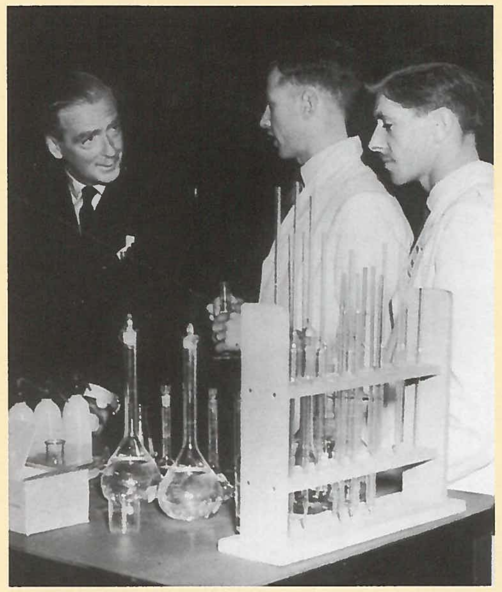
Cockcroft, third from right, and early Harwell heroes, 1946. (HP 84898)



The Hot Lab, building 220, 1949. (HP 84855)

Bulganin and Kruschchev visiting Harwell in 1956. (HR 102818)

Cockcroft and Henry Seligman opening the Isotope School, 1951. (HP 84842)



Anthony Eden, left, visiting Harwell in 1957. (HP 84985)

Harold Macmillan, right, visiting Harwell in 1957. (HP 84811)

Winston Churchill, seated centre, visiting Harwell in 1954. (HP 84983) nuclear power programme — in fact over this decade there was remarkably little run-down in the annual resources given to this nuclear role.

It declined by only about 20 percent. The big cut back was in the underlying programme of fundamental research into all aspects of atomic energy. This was reduced by nearly two-thirds, which suggests to me that the real external pressure put upon Harwell at the time was not due to a drop in the needs of the nuclear power programme but came from a campaign simply to cut government expenditure on research. All subsequent government actions abundantly confirm this impression.

Under the new policy, Harwell's all-round expertise in all sciences related to atomic energy, together with the resourcefulness and imagination of its staff in identifying new applications, led to a remarkable set of commercial initiatives. I will mention merely a few. The need to run nuclear reactors with complete reliability for many years had led to the development of excellent non-destructive testing (NDT) techniques. Many new commercial programmes grew out of these, such as the radiography of engines, while in rotation, for Rolls-Royce. In other areas the desalination of water, liquid chromatography and the production technology of carbon fibres were also major ventures for Harwell. Yet another was the Ceramics Centre, based on Harwell's work on oxide and carbide fuels for the nuclear power programme, which anticipated the modern trend towards the increasing use of ceramics in engineering. Chemical analytical techniques, instrumentation and control systems in medicine and industry, computer programming and chemical engineering have generated further applications. And of course, radioisotope tracer techniques have been applied very widely, not least in the monitoring and protection of the environment and the assessment of natural resources. Another venture, set up in 1974, was the Energy Technology Support Unit, to serve the (then) department of Energy in the assessment of national energy supplies and technology.

Excellence

All this represented the new face of Harwell. In admiring all of this, done under the new directive, we should not overlook Harwell's continuing excellence in its more traditional fields. The effort it could put into these, although severely reduced in quantity, remained of highest quality. As just one example of this, there was the brilliant work done to understand and control the formation of voids by point defects and inert gas atoms, in fast reactor materials.

Continuing Research Needs of the Nuclear Programme

I mentioned that the expected run-down in the need for research on nuclear power may have been over-estimated in 1965. The Fast Reactor programme of course generated a large programme of research for many years after this. But in addition there were two other developments, perhaps overlooked in 1965. The first was the need to assure everyone, particularly the general public, that nuclear power was safe and environmentally acceptable. The second was to increase the economic gain from nuclear power by first developing longer-lived fuel elements and then extending the working lives of the Magnox power stations. All this led to a second wave of researches for the nuclear power programme.

National Opinion

The question of safety has of course grown into a major public issue over the past twenty years. It has not been a matter of real risks, in Britain at least, for these have been extremely well controlled in the wake of the Windscale accident in 1957. It has been one of imagined risks, imagined by a general public sensitised by highly vocal national opinion formers. There has of course long been an intrinsic public fear of radioactivity, which was seen to be a new form of medical hazard, silent, invisible, insidious. Furthermore, its awful effects had already been demonstrated at Hiroshima and Nagasaki. But in the early years of the nuclear power programme the public were generally willing to accept assurances from both within the nuclear industry and external experts that it was all safely under control.

Then the anti-nuclear lobby got to work. I do not believe that safety against radioactivity was their driving motive — which was probably partly nuclear disarmament and partly a general opposition to industrial society — but they recognised, in the easily aroused public fear of radioactivity, an irresistible opportunity to raise anti-nuclear opposition to fever pitch.

They were skillful propagandists, entrancing large sections of the media who found in their dire pronouncements an easy source of sensational headlines. The result has been an intense concentration in recent years on safety issues, waste disposal and decommissioning, culminating in the massive public inquiry into the proposal to build a pressurised water reactor (PWR) at Sizewell. It has also raised expenditure on safety in the nuclear industry to £20m per life saved, more than 25 times that in other areas such as safety against road accidents.

Trend

One consequence has of course been a large recent growth in safety-related research, in which Harwell has participated fully in many ways. Interestingly, it has become closely linked with the other modern trend that I mentioned, the drive to extract more electricity from fuel elements and power stations by extending their working lives. As regards fuel, the research work has achieved remarkable successes. For example, the life of magnox fuel elements has been stretched from 0.4% burn-up, initially, to 0.9 percent now, which gives great economic benefit.

The working lives of the Calder Hall, Chapel Cross, and Magnox stations have also been extended. Of the various re-searches that made this possible, perhaps the most prominent have been directed at ensuring the safety of the steel pressure vessels against brittle fracture. This has proved to be a fascinating problem which combines the fundamentals of material behaviour with mechanical engineering in the most complex and intricate ways. Much brand-new basic science has been generated as a necessary spin-off from this applied programme with a directly economic motivation. Such research is in the classical tradition of Harwell which has of course played a key role in it, shared with other strong contributions from Risley, the Central Electricity Generating Board, Nuclear Electric, industry and the academic world.

This last point illustrates another feature of the history of Harwell. In the beginning Harwell was THE research centre for the nuclear power programme. Everything started there. Then the Northern Group of the AEA had need to do research and development, mainly in the field of mechanical engineering, so that scientific facilities grew at Risley, Springfields, Windscale and Culcheth. Next, as the civil nuclear programme got under way the (then) CEGB saw the need to have its own laboratories and a scientific force to deal with the on-going problems of operating nuclear power stations. Harwell has thus increasingly come to share its research role with other establishments.

The Present and Future

A big further trend began in 1989 when AEA Technology was created, converting part of the AEA into a commercial organisation to market itself as a science and engineering business. The other part of the AEA was to become a Government Division, dealing mainly with the decommissioning of nuclear plant and the disposal of nuclear wastes. In a sense, the creation of AEA Technology was Marshall's Harwell doctrine writ large, now applied across all of the AEA in the form of nine AEA-wide businesses. A key feature was that these businesses were not individually confined to single AEA establishments but spread as networks across all of them, claiming staffs and facilities from each as appropriate. This of course has had an effect on Harwell; its site and facilities have to some extent become a condominium in which parts of these networks have lodgement.

Applied

The present work of Harwell, on behalf of AEA Technology and the UKAEA (Government Division), extends over an impressively wide range of activities, including the decommissioning of nuclear reactors, research into the disposal of nuclear waste including fundamental groundwater studies, non-destructive testing methods particularly of steel pressure vessels, radiochemistry, electrochemistry, environmental technology, remote handling, advanced materials development and engineering software. One cannot but admire the resilience, resourcefulness and fortitude of the AEA staffs as they have adjusted to these profound changes in their organisations, and worked hard and skillfully to make them a success. All these qualities will surely be exercised to the utmost as privatisation takes effect, now that AEA Technology plc has been established as a publically-owned company. I find it particularly encouraging that the originality and grasp of fundamentals, so characteristic of Harwell's scientific work, is now being applied to the science of the management of commercial innovation. A good account of this has been given recently by Professor Stoneham in his recent Royal Society Zeneca Lecture, to be published in Interdisciplinary Science Reviews.

Assumptions

The drive behind these changes stems from two strategic assumptions, in my view both dubious. The first is that Government should divest itself, as far as possible, from funding applied science and technological development. The second is that nuclear power is now fully developed, at least as far as thermal fission is concerned. For example, Government annual funding for nuclear technological development has declined from some £200m in 1988 to below £30m today.

The national mission to develop nuclear power-generating systems has thus been almost totally abandoned, leaving only the UKAEA (Government Division) fusion projects at Culham as remaining examples of the exciting, far-sighted, reactor research and development philosophy which once motivated Harwell. This withdrawal from reactor development cannot be right, if only because there is no nuclear power system yet available at a capital cost low enough to attract unsubsidised private investment. The Sizewell PWR is a magnificent piece of engineering but also costly and complex. Unfortunately a 'mind-set' seems to have developed, to the effect that it is finality in thermal reactor development. It is not; only another stepping stone, the Magnox of the 1990s.

Achievement

In the great programme for civil nuclear power, what has been so far accomplished is the controlled release of nuclear energy and its conversion to useful electricity on a large scale in a fully safe manner. This has been a fine achievement but the last part of the task, which is to provide all these features in a system of low capital cost, still remains to be done. This part of the remit, set all those years ago, has yet to be fulfilled.

Challenge

The scientific and technological challenge is to retain today's standards of safety and efficient energy conversion in a system far simpler than anything available today. The need for simplicity, which must surely lend to lower capital costs, has I think been greatly under-emphasised. To give it prominence and priority means freeing ourselves from existing concepts of reactor systems and looking at the problem completely afresh, this time with simplicity as its starting point. For example, it is likely to lead to systems based on natural safety features involving gravity and convection, instead of engineered ones. Needless to say, there is already forward thinking of this kind, not surprisingly in the USA where new generations of simplified advanced light water reactors are being designed and developed. The Westinghouse version, for example, uses 60 percent fewer valves, 75 percent less pipework, 80 percent less control cable, 35 percent fewer pumps and 50 percent less building volume, than the corresponding nuclear core of a conventional PWR. I believe that even the AEA was interested in a corresponding project, the Safe Integral Reactor (SIR), a few years ago.

Getting back into advanced reactor design, almost certainly in an international collaboration, would be a magnificent challenge for Harwell, one in accord with its great traditions of scientific and technological originality, one aimed at completing the great programme of nuclear power development implicit in its remit of 50 years ago; a task to take Harwell forward for the national good.

Acknowledgement

I am grateful to Dr. Brian Eyre and Dr. Richard Judge for substantial help during the preparation of this lecture.

Congratulations to Harwell
from its tenants and neighbours

AEA Technology plc

Since its formation in 1954, the United Kingdom Atomic Energy Authority has had a base at Harwell. From the work here at Harwell, and at other sites, sprang the skills, knowledge and technologies which have led to the creation of the science and engineering services business, AEA Technology plc.

Harwell remains one of AEA Technology's principal sites. At Harwell, for example, AEA Technology has developed innovative lithium battery technology and advanced software for modelling fluid dynamics.

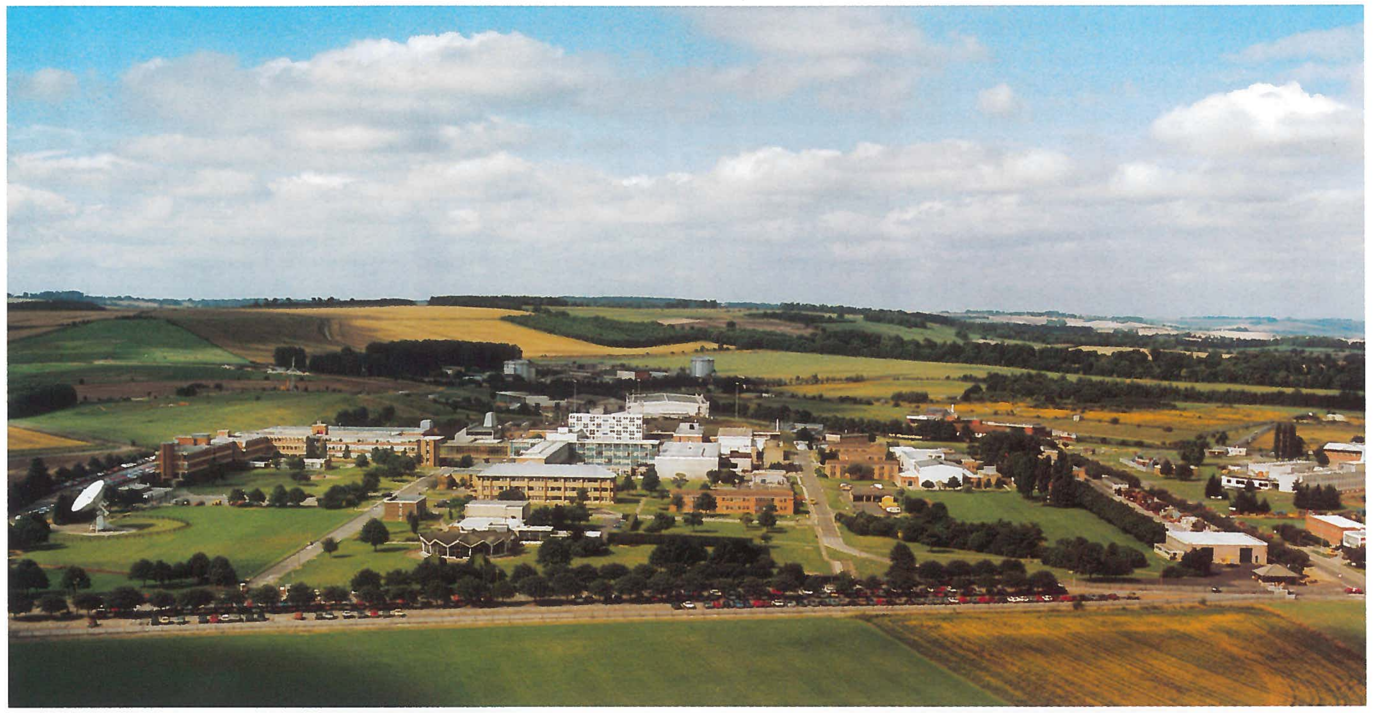
AEA Technology has now been successfully floated on the Stock Exchange. This is the first step in the process of creating from the work of the UKAEA a competitive private sector business capable of providing technical, safety and environmental solutions to industries and governments in the UK and overseas.

The privatisation process saw the formal separation of AEA Technology from the UKAEA on 31 March 1996. But AEA Technology has drawn from UKAEA a rich heritage of independence, integrity and innovation. These, combined with a commitment to the highest standards of science and engineering, are the foundations of our competitive strength.

AEA Technology is active at all six UKAEA sites, as well as having a number of overseas offices. At Harwell, as at all its other locations, AEA Technology is committed to being a good employer, neighbour, supplier, tenant and purchaser.

We value our relationship with UKAEA highly. Harwell has been a centre of excellence for 50 years; as a major presence on site we will be playing our full part to help ensure it remains a centre of excellence in the future.

AEA Technology plc's HQ at Harwell



The Rutherford Appleton Laboratory

Rutherford Appleton Lab

"It gives me very great pleasure on behalf of the Council for the Central Laboratory of the Research Councils to congratulate Harwell on achieving its Jubilee.

The history of our largest laboratory, The Rutherford Appleton Laboratory (RAL), is, of course, intimately linked with the history of Harwell. The Rutherford High Energy Laboratory was established as an independent organisation in 1957 so next year we will be celebrating 40 years of independent existence on the campus. RAL's programmes are now very diverse encompassing space astronomy and remote sensing, microstructures, large scale computing, particle physics, lasers, super conductivity, electronic and mechanical engineering and materials science. It is interesting, following Harwell's leadership in nuclear reactors, that RAL is now the leading international player in pulsed neutron scattering though our world-leading ISIS facility.

Some of our core technological capabilities can be traced back to our early years in the fifties, when Harwell's influence was very strong, but, like all children, we have grown up and developed our own skills and reputation which I believe complement areas of Harwell's expertise.

CCLRC congratulates Harwell on its fine record and for being the catalyst that initiated the development of Science and Technology based industries in South Oxfordshire. The Harwell/Chilton campus is still a key player and I am proud that RAL has played its part in this story."

Paul Williams, Chairman and Chief Executive, CCLRC.

UK Nirex, a tenant company at Harwell.

Nirex

The Nuclear Industry Radioactive Waste Executive was formed in 1982 and incorporated as a limited company — United Kingdom Nirex Limited (Nirex) — in 1985, to provide radioactive waste disposal services. The Company is pursuing the development, design and construction of an underground repository for disposal of intermediate-level, and certain low-level, radioactive wastes.

The Company's principal activities at present are site investigation and the provision of advice concerning waste packaging and transport. All Nirex's research, development and design work is directed to providing and managing a deep facility for the safe disposal of radioactive waste. UKAEA will be a major customer.

Currently, Nirex is awaiting the outcome of a local public inquiry into its application to develop a Rock Characterisation Facility (RCF) at Longlands Farm near Sellafield, which is a potential site for the repository. The RCF is planned to be sunk to a depth of 735m below the ground surface and is essential so that Nirex can obtain a firmer assessment of the potential of the site's suitability for radioactive waste disposal.

Nirex would like to take this opportunity to congratulate Harwell on its 50th anniversary, and looks forward to our continuing association and co-operation.

The Medical Research Council

"The Medical Research Council have had a presence on the Harwell site since 1947 and we are very pleased to be able to congratulate Harwell on their Jubilee Year, coming as it does just one year before our own! In those early days the Unit was at the forefront of helping to establish the effects of radiation on man and the importance of genetics for human disease and carried out pioneering work which led to some modern life-saving medical procedures, such as bone marrow transplants for leukaemia patients.

In October 1995 the Radiobiology Unit was replaced by two new related and complementary Units, the Mammalian Genetics Unit headed by Bruce Cattanach and the Radiation and Genome Stability Unit headed by Dudley Goodhead. In January 1996 the new UK Mouse Genome Centre also became operational headed by Steve Brown, creating an expanding and integrated campus with the MGU for molecular genetics, genomics, mutagenesis, transgenesis and informatics. There is particular emphasis on genomic imprinting, induction and use of chromosomal deletions, mutagenesis, the characterisation of deafness genes, developing complementary programmes in neurogenetics and on strengthening existing scientific links with human genetics programmes at Oxford. The Radiation and Genome Stability Unit studies the mechanisms of genetic and medical effects of radiation exploiting the evolving knowledge on induction of genomic instability (research pioneered at the Unit) and cell signalling processes.

We look forward to continuing to work with our colleagues at the other establishments on site to take Harwell into the next 50 years!"

Bruce Cattanach, Dudley Goodhead and Steve Brown, Directors, MRC Harwell Unit.

The Medical Research Council, Harwell

Procord

Procord is delighted to offer its congratulations to Harwell on reaching its 50th Anniversary.

Procord's association with Harwell began in 1995 with the acquisition of the Facilities Services Division (FSD) of the UKAEA when nearly 1000 staff joined us across all six locations.

Since then our relationship with both the UKAEA and indeed AEA Technology has developed, particularly here at Harwell.

Procord's commitment to the Harwell site is demonstrated by its decision to base the UK Headquarters of its entire Government & Technology Business Unit at building 344. Several members of the senior team are based at Harwell including Procord main board director, Stewart Wood.

Commenting on the relationship with the Harwell site, Stewart said, "Harwell is an exciting and changing facility enjoying significant development. Within this framework I am delighted that we have built, in partnership with our customers at Harwell, a relationship based on mutual trust and support to deliver key services to a world class facility."

Procord itself is enjoying an anniversary. It is five years since the Business was created as part of a Management Buy Out from IBM. Now a wholly owned subsidiary of US based Johnson Controls, Procord is a significant player providing quality facility management solutions as part of a truly global business.

Procord's relationship with Harwell provides a "best in class" case study now used world-wide.

Our association with everyone at Harwell is one which everyone at Procord is justifiably proud of.

Happy anniversary Harwell.

Stewart Wood, Director

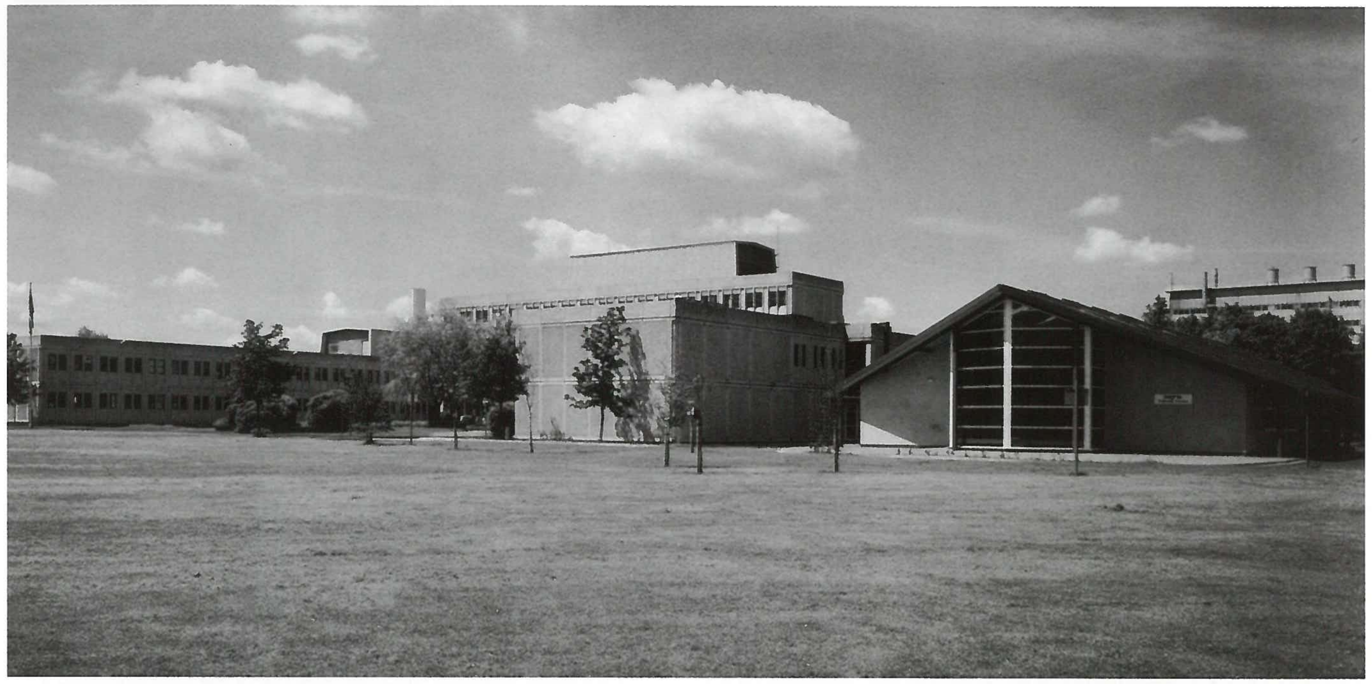
National Radiological Protection Board

"NRPB was set up in 1970, to give advice, conduct research, and provide services and training in radiation protection. It has been on the 'site' since then and over the years it has become well known nationally and internationally. It acts as a focal point for organisations with responsibilities in radiation protection, especially government departments, local authorities, general industry, the European Commission, and various professional groups. Its work includes non-ionising radiation (eg. UV, lasers, mobile 'phones, power lines) as well as ionising radiation.

Some 275 people work at its headquarters and southern centre at Chilton, about 25 at its northern centre, Leeds, and 15 at its Scottish centre in Glasgow. The Department of Health provided about 45% of its £14.5 million revenue in the last financial year, the remainder being earned through the supply of technical services and research under contract to a variety of organisations.

NRPB congratulates Harwell on reaching its Jubilee Year and hopes that it will continue for many more, maintaining the very high standards of science and technology for which it is famous."

Mike O'Riordan, Board Secretary



The NRPB building.

Amersham International

"Amersham International's association with the Harwell site has been long and close. The Radiochemical Centre — later to become Amersham International — was part of UKAEA until 1982 when it became one of the first government privatisations.

The Harwell reactors were the main source of radioisotopes for Amersham until their closure in 1990. The Amersham Isotope Production Unit (IPU) formed in 1959 and based in building 10.23 provided an essential link between the Harwell reactors and the chemists at Amersham Laboratories. The relationship forged by IPU and reactor staff was a model for co-operation and effectiveness. The success that Amersham currently enjoys has to a large extent been built upon the foundation of the service provided by the reactors and the UKAEA staff.

The closure of the reactors has forced a change of emphasis in the way that Amersham operates at Harwell. Currently on the Harwell site, Amersham operates two major businesses. The first, *Sentinel*, is at the forefront of the non-destructive testing market. The business supplies iridium-192, ytterbium-69 and cobalt-60 sources, together with sophisticated equipment to radiographically examine mechanical parts for defects. Typical applications would be in the examination of oil pipeline and aircraft engines. The second business, *Puridec Technologies*, supplies large cobalt-60 sources for use in industrial gamma sterilisation plants. The plants are used primarily to sterilise medical devices.

Amersham would like to congratulate Harwell on its 50 years of invaluable contribution to the nuclear field and to thank everyone in the organisation, both past and present, for the excellent relationship that exists between our organisations."

Gary Beynon, Site Manager, Harwell
Amersham International