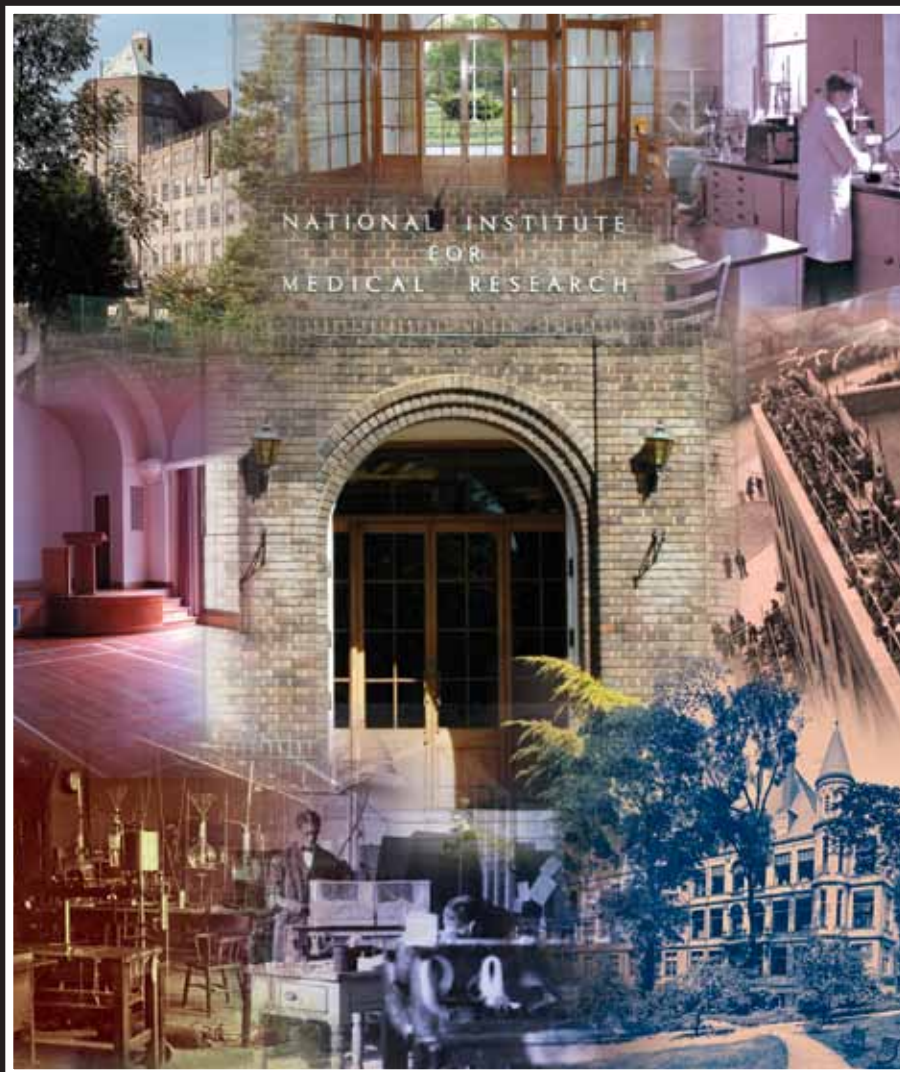


MRC National Institute for Medical Research



A Century of Science for Health

MRC

National Institute
for Medical Research



Dedication to Robert Moore

Robert Moore was librarian at NIMR 1972-1999, and Deputy librarian for 10 years before that. He put hours of work into the NIMR archives and preserving the historical record of NIMR. He was devoted to and expert on the history and achievements of NIMR and passed on some of that knowledge and devotion to myself. Without his previous influence this book project would not have come into being.

Frank Norman

www.historyofnimr.org.uk

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Preface

The motivation for publishing this book about the story of the National Institute for Medical Research derives from the desire to mark its 100th anniversary in 2014 combined with the knowledge that the Institute will cease to exist as an independent entity during 2015.

Initial discussions, in mid-2012, led to an outline structure that included: an account of the way the Institute was organised and interacted with its funder, the Medical Research Council, and a description of the scientific accomplishments from its staff as well as telling stories of the people who contributed to these discoveries. Crucially, the book was conceived as far more than just a list of the names of people who worked at NIMR. Given the time available, a formal 'History' seemed out of the question though the resources gathered in the course of this project might prove a valuable starting point for such a scholarly endeavour.

We envisaged that the book would include a series of chapters for the different Directors followed by a number of thematic sections on different scientific topics. The Directors' chapters would follow the political developments and changes marking the Institute's history and the scientific chapters would chart the achievements of the people who worked in Hampstead and in Mill Hill. Both sections would also include material describing the human side of life at the Institute and illustrating social changes during the past 100 years. For the most part the final manuscript follows this plan.

The approach is necessarily selective – it was not possible to include all research topics or accounts of all the fascinating scientists and their stories.

A vital early step was the recruitment of Julie Clayton, a science writer, editor and journalist who had previously worked for Nature and the BBC and who has many freelance writing credentials. She has played a key role in preparing this book, taking on the writing of the Director's chapters and some of the science chapters as well as editing those Science chapters that were drafted by past and present members of the Institute's staff. She carried out more than 40 interviews and spent weeks sifting through Institute archives and reports seeking out telling details to enrich the narrative, and choosing photographs from our extensive photographic archive. Though many people have contributed to the book, she is the principal author.

We thank Jim Smith for his support during this project. We are also extremely grateful to those who have provided written accounts of NIMR's scientific history; to those who have agreed to be interviewed or have otherwise contributed information and photographs and to Joe Brock for designing and setting the manuscript. We apologise to those whose contributions have not been included on grounds of insufficient space or through inadvertent oversight.

What has emerged is an NIMR-centric account of the Institute's history. We have had no access to MRC Head Office files and for practical reasons have interviewed mainly those who are close to the Institute. Nevertheless we hope that this account is entertaining, informative and that it will perhaps bring back a few fond memories of life in a leading scientific institution during the past century.

Frank Norman

Jonathan Stoye



NIMR in winter

Part 1

Moulding of the Institute: The Influence of each Director



NIMR Hampstead

Henry Hallett Dale 1914-1942

Henry Hallett Dale was one of the first team leaders hired by the MRC for the new Institute in 1914 and became the first overall Director of the National Institute for Medical Research in 1928. Coping with war would be a challenge that was to mark both the beginning and end of Dale's employment with the MRC, while the intervening period saw the emergence of a world class researcher and administrator.

Dale was the youngest of four scientists appointed to lead research at the new MRC Central Research Institute in 1914. His previous post was that of Director of the Wellcome Physiological Research Laboratories, where he had begun research into the pharmacological effects of acetylcholine on the nervous system. According to his colleague Wilhelm Feldberg, Dale hesitated over accepting the new Institute appointment until he knew that the role of MRC Secretary would be taken by fellow physiologist Walter Morley Fletcher. Dale became head of the Department of Biochemistry and Pharmacology, and recruited two colleagues from the Wellcome Laboratories to join him, George Barger and Arthur Ewins.



Former Mount Vernon Hospital, Hampstead 1922 (front)



Mount Vernon Hospital ward

The MRC had purchased an old TB hospital and its three acres of grounds for £35,000. This was at Mount Vernon, on the top of Holly Hill in Hampstead, London, and they planned to convert it into the new Central Research Institute. Dale and Barger worked with the architect “by sketch plans and by chalk outlines drawn on the floor” in planning the conversion. For inspiration they toured Germany visiting the labs of distinguished scientists, but had to curtail the trip when they were informed that war was imminent. They packed and departed by train via Brussels and Antwerp then by boat to Harwich, “crowded with English girls being sent home from Belgian convent schools” and arrived home only days before war was declared on 4 August.¹

Also part of the new Institute were the Department of

Applied Physiology, led by Leonard Hill, the Statistical Department, led by John Brownlee, and the Department of Bacteriology – led by Almroth Wright.

War is declared: 1914-1918

Just as the new Institute staff were due to begin their work, war was declared on Germany and the whole project of adapting Mount Vernon Hospital was postponed. The premises were loaned to the War Office then to the Canadian Army Medical Service and on to the Air Ministry and in 1917 became the Central Hospital for Flying Officers under the control of the Royal Air Force. Dale and his team spent the duration of World War One in temporary accommodation at the Lister Institute of Preventive Medicine in Chelsea.

The MRC researchers diverted their research focus to wartime priorities, which was especially urgent given that “so large a part of the whole population is exposed to the special risks arising from war, whether during active service abroad or in the performance of other work at home.”² The MRC saw in war “special opportunities” for studies that would lead to “a more rapid progress of medical knowledge in a few months than had been seen in as many previous years”. This was expected to have lasting impact in peace time.



Henry Hallett Dale at the Lister Institute, 1915
photograph by Sir Charles Lovatt Evans.
(Wellcome Library, London)

Dale and his colleagues investigated the phenomenon of traumatic shock which was commonly seen among battle casualties. They concluded that it resulted from “a toxæmia due to products of massively injured tissues and affecting the circulation” with a histamine-like action. The best treatment, they found, was transfusion with a newly developed blood fluid.³ They also did safety tests on drugs produced by British and French manufacturers to replace German pharmaceuticals, including Salvarsan for the treatment of syphilis. Ewins’ appointment with the MRC was brief: in 1918 he left for a position as Director of the company May & Baker. Dale recruited two new assistants, Miss Florence Durham, who had abandoned her experiments in genetics made impossible by war conditions, and Mademoiselle Juliette Marchal, a refugee from Belgium. Both stayed beyond the move to Hampstead. Also camping out at the Lister Institute was Leonard Hill and his Applied Physiology team including Benjamin Moore, who spent the war years investigating chronic poisoning of factory workers producing high-explosive munitions containing trinitro-toluene, TNT.

Wright spent much of the war in army hospitals in Boulogne, together with chief assistant Captain Stewart Ranken Douglas, producing typhoid and other vaccines

Henry Hallett Dale FRS (1875-1968)



(Wellcome Library, London)

Henry Dale was the first Director of NIMR, and a distinguished scientist known for his research on the chemical transmission of nerve impulses. He applied the same qualities to research as to administration: “clarity of mind, breadth of vision, balanced judgement, unremitting care, and shrewd practicality.”²¹ He provided support, encouragement and friendship to colleagues, and was regarded with enormous affection.

After retirement from NIMR, Dale remained active on many committees. He became a member of the MRC Council, and was chairman of the Scientific Advisory Committee to the War Cabinet (1942 to 1947), and chair of the post-war Committee on Medical and Biological Application of Nuclear Physics (1945-9). As President of the Royal Society he spoke publicly on issues including the scientific establishment’s “new responsibility for the future of mankind.”²² He espoused the cause of women in science: in March 1945 two women, Kathleen Lonsdale and Marjory Stephenson, were elected as Fellows of the Royal Society. In his Presidential Address that year Dale recognised “the growth in extent and distinction of women’s contribution to the advancement of science by research.”

For the Wellcome Trust, Dale continued as a trustee until his 85th birthday in 1960, overseeing grant awards for research, and then only cut back a little, remaining as a scientific advisor until one week before he died at the age of age 93. In token of his memory the Wellcome Trust endowed a research professorship in his honour and a floating research vessel for use in Africa, The Lady Dale.

1875	Born in Islington, London on 9 June
1898	First-class honours degree in natural sciences, Trinity College, Cambridge
1900	Begins clinical training, St Bartholomews Hospital, London
1903	Qualifies in medicine; visits Paul Ehrlich laboratory in Frankfurt, Germany
1904	Pharmacologist, Wellcome Physiological Research Laboratories
1914	Fellow of the Royal Society
1914	Head of Biochemistry and Pharmacology, MRC Central Research Institute
1928	Appointed Director-in-Chief of NIMR
1931	Founder member of the British Pharmacological Society
1932	Knighted
1936	Nobel Prize for Physiology or Medicine, with Otto Loewi
1937	Copley Medal of the Royal Society
1938	Appointed chair of the Wellcome Trust
1940	Elected President of the Royal Society
1942	Retires from NIMR
1948	Knight Grand Cross Order of the British Empire
1944	Order of Merit
1968	Died 23 July

for the British and Allied Armies and developing new types of dressings and skin-grafting methods for war wounds. Clifford Dobell, also in Wright's department, investigated amoebic dysentery in troops in the Mediterranean. In collaboration with Dale he developed an effective treatment, emetine-bismuth iodide.

Brownlee undertook statistical work in a rented house at 34 Guilford Street in London (close to Great Ormond Street Hospital). In particular, he provided reports on the epidemiology and treatment of 'phthisis' or pulmonary TB in Great Britain and Northern Ireland, based on mortality returns of the Registrars-General.

In addition to the four London departments of the new Institute, a fifth department briefly existed, Clinical Research and Experimental Medicine. The MRC was concerned about the dearth of medically trained 'younger men' who could do research in experimental medicine in a hospital setting. It had originally considered siting the Institute next to a hospital with dedicated beds for patients involved as research volunteers, but it was not feasible or affordable at the time. The fifth department was an alternative arrangement, led by clinical professor Thomas Lewis whose main base was at University College Hospital Medical School (UCH) but who ran a study of 'soldiers' heart' (chest pains, palpitations, and giddiness) at Mount Vernon Hospital while it served as a military hospital. He determined which patients were in need of long-term care and which could be retained in service. Towards the end of the war the cardiac speciality unit relocated to Colchester and Lewis returned to UCH, funded by MRC but not as part of the Central Research Institute.

Dale was by this time also making a reputation for himself as an able and likeable administrator who could tackle wider issues than those affecting his own immediate research interests. According to medical historian Tilli Tansey, in 1916 and again in 1917 when Fletcher was seriously ill, Dale spent several mornings a week assisting with MRC administration and served on various advisory boards and committees. The MRC Annual Report for 1918-1919 gave full credit:

Altogether, Dr Dale and his colleagues have borne a heavy burden of responsibility, and have met unflinching a constant drain upon their activities, which were deeply pledged in other important directions... he and his colleagues have rendered conspicuous service to the medical profession, to the public and to the manufacturers.

Peace time: The move to Mount Vernon, Hampstead

When hostilities ceased in 1918 the researchers returned to their peacetime agendas. The RAF evacuated Mount Vernon Hospital in June 1919, and HM Office of Works began converting what were once hospital wards into laboratories, with all the necessary benches, shelving and equipment required. Looking back in 1963, Dale wrote:

The kinds of special research equipment then available seem, in retrospect, to have been astonishingly few and simple, in comparison with the ever more complex and costly requirements of today. We started with an adequate supply of ordinary microscopes, , desiccators and simple centrifuges, a spectroscope, a couple of kymographs, and such like... In general, however, our methods and apparatus were simple, and we still depended largely on improvisation.⁴

Mount Vernon Hospital became ready in April 1920 and in the same year the Medical Research Committee was renamed the Medical Research Council, to reflect its independent status and avoid becoming “merely the ‘back-room boys’ of the new Ministry of Health.”⁶ The first arrivals were Brownlee’s Statistical Department and the Publications Department, run by Edgar Schuster who was also a part-time mechanic. The Departments of Biochemistry and Pharmacology, Applied Physiology, Applied Optics (established in 1919), and Bacteriology, Protistology and Experimental Pathology all followed. In total, there were 12 full-time scientific staff, 10 attached workers, plus laboratory assistants and administrative staff.

In the hospital grounds, Mount Vernon House, the former manor house then nurses’ home was refurbished for Dale and his wife Ellen, and three children. “It became a charming place with its few pieces of English furniture of the late eighteenth and early nineteenth century, so becoming to the finely proportioned old rooms, some of their original simple mantelpieces over the open fireplaces still preserved.”¹ The MRC Annual Report for 1920-21 records for the first time the new name, the National Institute for Medical Research, NIMR.

Wright decided to stay at St. Mary’s, which was to the MRC’s relief, according to Landsborough Thomson. He was “a large bear-like man, a dominating personality and aggressive in disputation” whom they had found difficult.⁷ In his place, the Council appointed Douglas as Director of the Department of Bacteriology, Protistology and Experimental Pathology. Rather than appoint an overall Director, Council dealt directly with each departmental head until 1923 when it became clear that the burgeoning administration required an intermediary – cue Dale’s new appointment as chair of a committee of departmental directors.



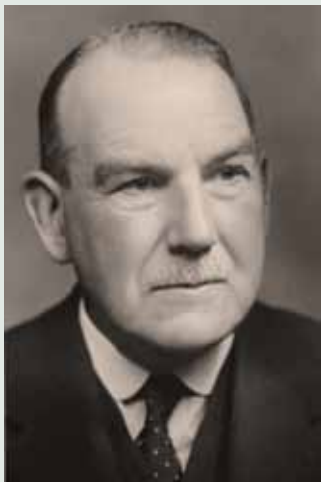
Hampstead 1948 (back)

“It was a pleasant warm red brick edifice with the Victorian embellishments of towers and turrets and sited in its own spacious, shrubby grounds.”⁵



Mount Vernon House, 1948

Captain Stewart Ranken Douglas (1871-1936)



Stewart Ranken Douglas was born in Caterham in March 1871 and studied medicine before joining the Indian Medical Service, becoming a surgeon lieutenant in 1898, then captain. While in India he unfortunately contracted amoebic dysentery, fell ill and was discharged from service in 1901. He later embarked upon treatment with emetine bismuth-iodide, monitored by Clifford Dobell. Although cured of infection, he continued to suffer ill-effects. He joined St. Mary's Hospital as a bacteriologist, and in 1914 was appointed by the MRC as chief assistant to Sir Almroth Wright. He became Director of the Department of Bacteriology and Experimental Pathology at NIMR, performing studies on vaccinia and canine distemper. More interested in cooperation and the interchange of ideas than in individual endeavour, Douglas had "a real genius for encouragement and for quietly lubricating the machinery of co-operation," according to his obituary by Dale. He was Deputy Director of the Institute from 1928 until his death on 26 January 1936.

According to Tansey, Dale deftly combined his administrative responsibilities with research. A visiting worker in 1927, Dickinson Richards noted:

Dale was primarily an experimenter and continued this through almost all his active years... the laboratory door would fling open, and Sir Henry (Dr Dale as he was then) would come charging in, often in morning coat and striped trousers, grab a lab coat off the hook, and be with us in seconds. What is more, he would stay until the experiment was finished, whether at tea time, dinner time, or later.⁸

Dale was also expanding his own Department rapidly, with the recruitment of biochemist Harold Dudley and organic chemist Harold King. Attached workers included Otto and Mrs Rosenheim. The Institute's maintenance staff reconfigured the chemical laboratory which "greatly increased the facilities for chemical manipulations."⁹ Dale continued his fascination with the idea of chemical transmission in the nervous system – challenging the previous dogma that nerve transmission was electrical in nature. Dale's pharmacology lab, known as "F4", attracted pharmacologists from around the world, including Joshua Harold Burn, John 'Jack' Gaddum, Frank Campbell (Hank) MacIntosh, and William Drummond Macdonald (Bill) Paton. Dale's group had an extraordinary legacy, laying the foundations for pharmacology and neuroscience research at NIMR – the subjects of separate chapters in this book.

Spillover to Mill Hill: the Field Laboratories

It was soon clear that as the research expanded more extensive facilities would be needed for animal husbandry and food production. Luckily, with a post-war rise in the number of people paying health insurance premiums, the government had more income to spend on research. In 1919, the MRC was able to set aside £7000 for a new site. In 1922, the Council purchased the 39 acres of the mostly derelict Rhodes Farm at Mill

Hill, 6 miles from Hampstead – apparently first spotted by Lady Dale. The first buildings were little more than wooden huts, for the breeding and care of dogs and other large and small creatures under the supervision of veterinarian G.W. Dunkin. The new site became known interchangeably as the Field Laboratories or the Farm Laboratories. In 1934, Council purchased an additional eight acres as an option for future expansion, and granted it on a 50-year lease to the Imperial Cancer Research Fund.



Dog compound, Mill Hill Farm and Laboratories, 1924

Among the first to capitalise on the Mill Hill site were Joseph Edwin Barnard and his team in the Department of Applied Optics, including John Smiles, William Elford and W.A. Wood. In 1925 they moved their overgrowing range of optical devices into a specially built laboratory, funded through a bequest from the late Miss O.H. Stubber. Bad weather and a coal dispute delayed the move – and their research – but once installed at Mill Hill the team wasted no time in applying optical methods to the study of viruses. They worked first with W.E. Gye, a member of Douglas's team, on a cancer-causing virus in chickens, then with Patrick Laidlaw on canine distemper and influenza.

Institute staff made use of the Mill Hill site in other ways too, including the occasional cricket match in the adjacent Grosvenor Sports Ground – in which Dale also took part.



The Ronan Building

A proper home for animals: the Ronan Building

In 1927, with a bequest from Lord Justice Ronan, the MRC agreeded to the construction of the Ronan Building, designed by local architect Maxwell Ayrton, to connect via a series of bridges to all floors of Mount Vernon Hospital. It was to house small animals and monkeys and was ready in 1928. According to the MRC Annual Report for 1928-1929, its colour and texture was “in harmonious relation to a neighbourhood rich in old houses of beauty and interest.” But not everyone liked it – the Prime Minister Ramsay MacDonald, a local resident, – called it an “atrocitcy”, according to Landsborough Thomson.

Construction of the Ronan Building required the removal of several “unsightly” wooden huts built originally for military use 10 years earlier. Its cost was less than the increasing value of the land upon which the Institute and Farm Laboratories stood. Douglas James Short became the Chief Animal Technician for the Institute – and passed many a tale on to his children.

The Monkey ‘Tail’, Hampstead, NW3, circa 1936

My father, Douglas James Short was an experienced senior technician under Sir Henry Dale, the director. One morning my father and a crew were transferring about a dozen rhesus monkeys from one large outside caged area to another when a door was inadvertently left open and quick as a flash they were gone, down the stairs, into the grounds and away. They scampered across the well-kept gardens, through the tennis courts and over the wall.

Dad just stared for a minute and then said, “We must get them all back – now.” He assembled a team and started down Froggnal, the road next to the Institute. Some were captured quite easily once they realised they didn’t know where they were, others came for food. The team gathered them up, and were looking around when they saw an elderly couple staring up at the tall flagpole on Ramsay MacDonald’s front lawn at Froggnal Lodge. There at the top were two monkeys chattering away. Not wishing to disturb the former Prime Minister someone produced some fruit to coax the animals down, but to no avail, so Dad ran back to the Institute and retrieved a 12 bore shotgun.

Without hesitating he shot the monkeys off the flagpole and was stuffing the carcasses into a sack when Ramsay MacDonald himself appeared at his front door. “I say, you there, what on earth do you think you’re doing?” he shouted. Dad ignored him and they all ran away up Froggnal and back to the Institute. The next morning there was hell to pay. Sir Henry Dale had recently been awarded the Nobel Prize for

Medicine and was in no mood to jeopardise it. The Rt Hon. Ramsay MacDonald spent about an hour railing at Sir Henry for everything from inadequate animal husbandry to careless firearms use, to unresponsive staff.

Then Sir Henry called Dad in and both he and MacDonald dressed him down royally for being the senior person in charge and allowing it to happen. Finally MacDonald departed, still annoyed but now less irate. As the door closed, Sir Henry said 'That will be all, Short!'

Dad turned to leave and Sir Henry, with no change of expression said, "Well done Short! Well done!"¹⁰

As animals were moved out of the main NIMR building, new space became available for researchers. Offices were also made vacant following the death of John Brownlee in 1927, and the subsequent merger of the Department of Statistics with the MRC Statistical Research Unit at the London School of Hygiene and Tropical Medicine. Barnard then moved his Department of Applied Optics back to Hampstead from the Farm Laboratories at Mill Hill. The Council expected the Institute's buildings now "to provide the main requirements" for research "for a long period of years," but within two years, a new range of one-storey brick buildings were built in the grounds for general storage, carpentry, the quarantine of newly purchased animals, and a garage for Institute vehicles.



NIMR library, Hampstead, 1948

Recognition at last: Dale becomes Director-in-Chief

Dale's role in presiding over the new developments and expansions was officially recognised in 1928 when the MRC formally appointed him as Director-in-Chief. Captain Douglas, was appointed as Deputy Director.

One of Dale's first moves was to recruit Alan Parkes to lead a new field of research at the Institute – sex hormones. He played a game of 'academic poker' with Parkes' former employers University College, in creating an employment package that would entice Parkes to move. Parkes arrived in 1932 and found the Institute atmosphere – and his interactions with Dale – pleasantly informal. Dale would often pop by in the evening from his house next door, if he saw a light on in the laboratory. Parkes recalled:

I well remember one evening around ten o'clock discussing with him the antics of a ferret which I had in the laboratory. These, therefore, were happy and productive years for me – Dale, having brought me to the Institute, was more likely to regard me favourably than if he had inherited me from someone else, and

*these years may have been less happy for other staff members. I would not know.*¹¹

Unfussy administrator

Dale preferred to keep administration to a bare minimum and allow staff to be free to follow their own ideas. His relationship with other staff was “cordial and friendly in an Olympian kind of way,” according to Parkes. If he wanted to see anyone, Dale would stroll along to their laboratory, and if the person was not around

*Dale took the view that he might have gone to a meeting, or to a library or he might have gone sick; he might even be taking a day off. So what, his job was to do research not punch a clock.*¹¹

James Lovelock, who arrived at the Institute in 1941, described Dale as “a Churchillian character, bluff and direct.” He challenged Lovelock over his status as a conscientious objector to the war. Under Dale, the Institute was “a wonderfully democratic place, in the Greek sense... If you were a member of the scientific staff... there was a great deal of freedom to do whatever seemed right scientifically.” However, technical and office staff “were there to do what they were told.”⁵

Between 1930 and 1936, in a bid to integrate the different departments of the Institute, Dale broke down the original large divisions into smaller laboratory groupings, then reorganised these into two main departments, purely for administrative purposes. Dale directed the Department of Physiology, Pharmacology and Biochemistry, with a sub-department of Endocrinology led by Parkes, while Douglas, by then Deputy Director of the Institute, was head of Experimental Pathology and Bacteriology, with sub-departments of Protistology (led by Dobell) and Microscopy and Physical Methods (formerly Applied Optics). Douglas became a close colleague of Dale. Sadly, he died in January 1936, only a few months away from retirement. Sir Patrick Laidlaw took his place as Deputy Director from 1936 to 1940, followed by Ashley Miles.

Patrick Playfair Laidlaw FRS (1881-1940)



Patrick Laidlaw was born in Glasgow. He was educated at the Leys School in Cambridge and made a strong impression on one part-time biology tutor, Henry Dale. Laidlaw studied medicine before joining Dale's team in 1909 at the Wellcome Physiological Research Laboratories at Herne Hill, London. After a lectureship in pathology at Guy's Hospital, Laidlaw joined NIMR in 1922, to work with Captain Douglas. In 1936, upon the death of Douglas, Laidlaw took over as head of his Department – renamed Experimental Pathology – and became Deputy Director of the Institute. His outstanding research included biochemistry as well as the development of a vaccine against canine distemper and discovery of the influenza virus. He was knighted in 1935, and left to become Rede Lecturer in Cambridge in 1938. He died on 19 March 1940. He was remembered as a shy, modest and helpful person, with a “wonderful appreciation of detail” and an “untiring patience and thoroughness.”²³

To support Leonard Hill's Department of Applied Physiology, Dale commissioned a wind tunnel to be built at the Institute for performing tests on volunteers by subjecting them to different degrees of air movement and hence cooling. Although these were fruitful studies, Dale found it difficult to attract sufficiently high-calibre researchers to take over the department when Hill retired in 1929. Martin Flack had died, and of the remaining team, Benjamin Moore had moved to a university position, while Robert Bourdillon switched to other interests, and so the Department folded.



Henty Dale and senior NIMR staff

Military precision: conditions of work

As for staff working conditions, Dale complied with MRC rules, telling staff:

The hours of laboratory work are officially from 10am to 5.30pm and 1pm on Saturday. Laboratory attendants will come in at 9am to prepare for the day's work, and they must sign the attendance book before 9.05 each morning at the attendants' entrance in the basement by the disinfecting room; they must not use the front entrance.

Dinner for attendants will be served in two divisions, viz., 12.30 and 1.15 and officers are requested to allow attendants to go at their arranged hours whenever possible.¹²

A prominent feature of Institute life was the separation of staff at meal times, dictated by the small size of rooms dedicated to dining. This meant an "officers' mess" for high-grade research staff, who preferred to sign chits for money owed rather than to use 'dirty money' according to biochemist Tommy Work. He recalled, "It was rather a stiff place. It was not very chummy... the older people in general sat separately and there wasn't

all that much communication between [them] and the young people initially.”¹³ Scientific staff wore white coats while laboratory assistants (technicians) wore brown lab coats. They and the administrative staff each had their own dining rooms – an arrangement that lasted until the move to Mill Hill in 1949.

Setting new standards: better science, safer medicine

Since his days at the Wellcome Physiological Research Laboratories, Dale had been interested in the definition of standards for hormones, anti-toxins and other complex biological substances. There was the problem that these could be ineffective if given to patients in low doses, and potentially dangerous in extremely high doses, and yet biological preparations – often extracts from animal tissues – varied considerably in concentration. To address the issue further, with MRC approval Dale set up the Department of Biological Standards at NIMR. His influence extended internationally through involvement with the Health Committee of the League of Nations in Geneva [see chapter 14.]

Germany's loss: Dale's gain

With Hitler's rise to power in the 1930s, Jewish academics left or were expelled from research institutions in Germany. Dale generously assisted several German and Austrian scientists in seeking new careers. He provided a home and laboratory space for Wilhelm Feldberg, an introduction to the Academics Assistance Programme and a personal grant by the Rockefeller Foundation. In 1936, Dale won the Nobel Prize in Physiology or Medicine together with Otto Loewi for their work on neurotransmission. Eschewing any fuss on the day of the announcement, Dale apparently instructed his secretary “to tell telephone callers that he was working in his laboratory and could not be disturbed,” according to Parkes.¹¹ In 1938, when Germany invaded Austria, Dale helped Loewi to reach London, then Belgium and New York. It was also in 1938 that Dale finally ceased running his own research programme.

Chemotherapy drives the need for a new building at Mill Hill

By the mid 1930s, the Hampstead facilities were getting rather crowded, particularly with the expanding work on biological standards. The problem would only worsen with a planned expansion of chemotherapy research. This was going to be critical because, until now, Britain had relied almost entirely on the supply of antibacterial drugs produced by the German pharmaceutical industry. The political instability in Germany and threat of war meant that cuts to drug supplies were a distinct possibility. As chairman of the MRC Chemotherapy Committee, Dale was aware of the scale of research needed – both within the Institute and other British laboratories. Further extensions and outbuildings on Mount Vernon were out of the question given the limited area and sloping grounds. Instead, a brand-new purpose built Institute was required. The MRC settled on a plan to commission a new Institute on the extensive grounds of the Farm Laboratories at Mill Hill. This would solve both the space problem and eliminate the hassle of staff having to trek back and forth between the different facilities. According to Parkes it was Dale who brought in local architect Maxwell Ayrton once again, and the MRC set aside £70,000 for the design and construction of the new Institute, which began in 1937. Because Lady Dale had originally suggested the Mill Hill site for the Farm Laboratories, the new building became known as Dale's Folly. Dale consulted heads of laboratories to determine their

requirements for space and layout. Parkes remembers:

With everyone wanting different accommodation and equipment, the unfortunate Director had a grim time trying to arrive at some kind of standardisation and the staff meetings called to try to iron things out became quite exciting. One particularly interesting contrast in requirements was that for some reason physiologists are wedded to large open-plan labs, with a lot of industrious fellows working away in different parts of it and Dale felt that this could properly be the standard arrangement for the whole Institute. He even referred disparagingly to ‘people skulking in private laboratories’. Happily, with his characteristic liberality of mind, Dale ultimately agreed that there was a case for smaller units and I was allowed to have my way.¹¹

Coping with wartime (again): 1939-1945

The shell of the new Mill Hill building was completed in 1939. Dale was due to retire in 1940 at the age of sixty five. He had hoped to see the Institute move to its new home but with the advent of the war, the move was postponed and Edward Mellanby, Secretary of the MRC, asked Dale to stay on, to “oversee what was foreseen to be a difficult time.”⁸ Dale would have to guide the Institute through a difficult transition period in which many staff would either be called-up for military service or given new research priorities. Rather than evacuate the Institute, staff made preparations to protect their building against bombing raids. Thus there was no let up in Dale’s administrative responsibilities. On top of this, he became President of the Royal Society (1940-1945).

As early as 1938, staff anticipated the action they would take in the event of war. On 29 Sept 1938, Laidlaw issued a memorandum to staff regarding infectious material and infectious animals. If war was declared, all highly infectious material such as viruses and cultures were to be stored immediately in a basement cold room. All animals with any highly infectious disease should be destroyed and the carcasses burnt to avoid accidental exposure to the community. Accordingly, in 1939, two chimpanzees in the animal house and a troop of macaque monkeys kept in the top of the main building were euthanised.



Institute staff build the sandbag wall in 1939

During the Munich Crisis in September 1938, staff created their own protection by building a sandbag wall at Mount Vernon, 14 feet high and 73 feet long, 5 feet wide at its base, which stretched along the front of the building past the Director’s office and round the corner. Parkes recalled:

It was a warm day and several of the toilers on the wall had dispensed with their shirts. This display of torsos gave a new and interesting angle on the staff – one secretary coming to admire our handiwork was

heard to whisper to another 'Dr ---- strips well, doesn't he!'¹¹

Unfortunately, however, the heavy snow of December 1938 caused the wall to collapse, causing much hilarity according to the local Daily Worker newspaper. In the following spring chemist Kenneth Callow rounded up a team of volunteers to rebuild the wall and reinforce it with corrugated iron and timber. Meanwhile, workers at the Mill Hill Farm Laboratories (about 30 in total) dug a trench for air raid protection. This was V-shaped, six foot deep, with bays that were 18 feet wide, and equipped with hurricane lamps, food and water, cookers, blankets, portable wireless set and amusements. A roof of corrugated iron would protect against rain and shrapnel.

The Institute air raid shelter

In compliance with a government ruling to British employers, the Institute also created an air raid protection shelter. Dale sacrificed his spacious ground floor room and moved upstairs to share Dobell's third floor office. The office of the Institute typists, the adjoining ladies' cloakroom and the publications office belonging to Dr Schuster, were also commandeered. The rooms already had very solid ceilings and floors, with a volume of air that was estimated to be sufficient for around 10 hours. The shelter had to cater for up to 140 staff, assistants and households of those living on the premises. Subsequent work was done to reinforce ceilings, cross windows with cellulose tape for protection against splintering, and to create air locks around doors that opened onto the corridor. The rooms were equipped with all manner of supplies such as bedding, blankets, torches, water bottles, oxygen cylinders and fans.

Staff were allocated special roles: Callow became the Institute's Air Raid Precautions Officer in charge of various operations such as organising a rota for nightly fire-watching duty and first aid. The Fire Squad – trained by the London Fire Brigade - included Drs Elford, Parkes, Rimington, Emmens, MacIntosh, Crisp, Parker, and Tommy Work, who later recalled: "Fire was regarded as a much greater danger than anything else because Hampstead was sufficiently far away from the centre of London that there were few [large] bombs but there were plenty of light fire bombs around."¹³ Fortunately the Institute never received a direct hit, but the volunteers helped to put out fires in nearby buildings. First aiders included Drs Brown, Van den Ende, Edward, Pulvertaft, Andrewes, Lush, Higginson and Ward.

Parkes recorded Dale's increasing restlessness over the disruptions to the Institute's work:

Finally, hearing that Callow (as ARP Officer) had spent the afternoon fixing the caretaker's blackout, he called the staff together and said that the object of all these arrangements was that scientific work could continue at the Institute, and, please would we get on with it. Dale, of course, was noted for his skill as Chairman, and someone next to me whispered 'Ask him whether, if there's a panic, he'll take the chair at it.' With some reluctance, I ignored this happy suggestion.

However, war time was also an opportunity for Dale and other staff to get better acquainted. "Even Sir Henry Dale, an awesome figure to his staff, became approachable when he met his colleagues in the air-raid shelter", Callow noted.¹⁴

Similarly, parasitologist Frank Hawking recorded an episode involving Dale in his diary in January 1941:

Last night, I slept at the Institute. As we (Dale, Hudson & Elford) were playing bridge, at about 11.15, the night watchman burst into the room saying he had fallen down the steps & broken his shoulder. We all gathered round him & among so much eminence, it was difficult to handle him properly. He made such a fuss, & writhed about so much, that it soon became obvious that most of his symptoms were hysteric. I had just got this settled when Elford cried that Hudson had fainted outside the door. I was rather hesitant about a man like him, but I grabbed his head firmly & pushed it down between his knees in the conventional way. And he soon recovered. Then I took the night watchman over to the New End Hospital & after confirming that nothing was broken I took him to his house nearby.¹⁵

Opportunity and inconvenience



Frank Hawking had joined NIMR in 1940 and became a member of the MRC War Wounds Committee. He explored the use of topical sulphonamides to determine the best means of preventing gas gangrene. He wrote detailed diaries and letters to his family. One Saturday in September 1940 he described frequent air raid warnings and bomb attacks:

Nothing much has fallen in my time here in Hampstead although in the previous week a bomb fell one night near Golders Green Garden Suburb. This afternoon, about 5pm, a big attack developed on the dock area below Tower Bridge. We could see the explosions of bomb-salvos from the Institute... The attacks seem increasing in intensity. At first all work in the Institute stopped every time an alarm sounded but now people are carrying on & refusing to let their work be interrupted. At night, most people including myself go to bed as usual & take their chance. But some people spend their nights in Air Raid Shelters & become very nervy in consequence.

On one occasion, the Institute water supply failed and Hawking took a pail of rainwater from the garden to the laboratory. Hawking recorded, however, that Dale, adhering to guidelines, “came round to say that everyone must be sent home as soon as possible till Monday, & although we were most diplomatic in procrastinating over our departure, we got only dirty looks for our doggedness to continue work!”¹⁵

Dilemmas of war duty

Many Institute researchers were eager to support the war effort, but their contracts prevented them. MRC scientists were not allowed to volunteer for the Armed Services if this meant that their scientific skills would be “frittered away.” What they should do for the war effort was a question that even MRC Head Office could not answer initially. In 1939 the Council told all staff to carry on as normal until there was “the demand for investigations into special problems which may arise.”³

Illustrating the kind of work for which staff could volunteer, Dale wrote to Landsborough Thomson at Head Office on 18 May 1939 to say that virologist Christopher Andrewes was on call for the Emergency Bacteriological Service in the event of the outbreak of war, which would mean him being sent to take charge of a laboratory elsewhere. Dale was clear, however, about when he felt staff were suitably occupied. On 1 October 1941, he informed the Central Medical War Personnel Committee that George Lindor Brown and Marinus Van den Ende, although medical practitioners, could not be spared for service with the Forces owing to their research on war-related problems.

Not all staff accepted his ruling, however. Callow, who had helped the Air Hygiene team in the testing of disinfectants, was adamant about joining the Royal Air Force. Dale admitted to Mellanby that, “the psychological situation” was beyond his control when Callow asked to be released from his contract. Dale came to the conclusion, “if I could not keep Callow happy, I could not keep him useful.”¹⁶ Callow left to become a Pilot Officer on Probation from 29 November 1940. According to biochemist Albert Neuberger, “Sir Henry Dale, on being told of Callow’s decision, said that he was ‘a bloody fool’, but softened this comment with a friendly smile.”¹⁴



Mount Vernon Hospital, rear view

Science versus the military: Clifford Emmens

Clifford Emmens in Parkes’s department was also anxious to sign up for military service, but his contract forbade it because he was classified as a chemist, a reserve occupation. Emmens became subject to a tussle between the Ministry of Home Security who wanted him to do statistical work with Solly Zuckerman in Oxford, and Edward Mellanby who preferred to keep him for physiology research at NIMR. In a series of exchanges with Edward Mellanby, between 1941 and 1942, Dale – who was aware of Emmens’ eagerness to join the war effort – eventually convinced Mellanby that work with Zuckerman would be more useful. Emmens

joined Zuckerman and studied the impact of bombing on morale. He showed that the idea of starting a bombing campaign over south Germany was unlikely to reduce morale.¹⁷

Dale was so impressed by Emmens' work that he asked the next Director, Charles Harington to give Emmens a permanent position at the Institute. Emmens returned in 1946 to resume work with Parkes, but soon became impatient to move on, and took up an offer of a professorship at the University of Sydney, in 1947.

Threats to the armed forces

The MRC supported research on specific threats faced by armed services and established committees together with the army, navy and air force. Mellanby chaired the Royal Navy Personnel Research Committee and recruited George Lindor Brown as secretary. Brown organized a group to do underwater physiology research together with J.B.S. Haldane's Admiralty Experimental Diving Unit, on problems such as oxygen poisoning and 'shallow water blackout'. Other colleagues included in the work were Hank MacIntosh, Bill Paton, and H.B. Barlow. Brown procured a pressure chamber from the Lister Institute and installed it in a hut in the garden of the Institute, together with a new compressor, where the team often performed the experiments on themselves. On one occasion things went a bit too far. "During an experiment on the narcotic effect of breathing carbon dioxide mixtures in an experimental booth, Paton lost consciousness, and was rescued by a passing cleaner who had the presence of mind to break the glass."¹⁸

They found that an accumulation of carbon dioxide in the 'dead space' of breathing apparatus was responsible for the blackouts and produced a new set of recommendations regarding the design of diving equipment to enable divers to operate for longer underwater. They also developed a new safer procedure for navy personnel escaping from a flooded submarine, with a device that increased carbon dioxide uptake by sea water to reduce the risk of toxicity.

For the army, Robert Bourdillon researched the efficiency of flame throwing devices, and possible means of protection against flames, which he performed with "courageous experiments involving substantial personal risk."³

Mysterious case of the German pilot

Some slightly bizarre requests came the way of the Institute during the Second World War, including a top secret project to examine the mysterious packets of pills and vials stashed in the pockets of a German pilot ('Captain Horn') whose plane had crashed in Scotland. Without knowing the true identity of the pilot, Dale, chemist James Walker and bacteriologist Bruce White undertook the work on 17 May 1941. They found that the medicines included 'normal' remedies and items for personal hygiene such as mouthwash, aspirin, barbiturates and opiate painkillers, and homeopathic remedies. Dale dismissed the whole episode as having been inconsequential and a waste of valuable research time. He repacked the articles and returned them to

Mellanby. The official MRC report, thought to have been written by Dale, noted:

It seems clear from the remarkable collection of drugs that Captain H. was intent on protecting himself against all assaults of the devil so far as his flesh was concerned, and, if he knew the action of all the drugs he carried, he has obviously missed his vocation and ought to have made a very handy general practitioner.¹⁹

Had Dale and his colleagues known the identity of the pilot, they may have worded the report differently. He turned out to be none other than Hitler's deputy Rudolph Hess, who had flown to Britain on 10 May 1941 seeking to negotiate a ceasefire. He was interned for four days at the Tower of London and then imprisoned, and sentenced at the Nuremberg War Crimes trial in 1946.

Dangerous pathogens: accidents and tragedy

With crowds of Londoners using the London Underground stations as air raid shelters, the government was concerned about the risk of a major disease epidemic occurring. Patrick Laidlaw and others in the Department of Bacteriology therefore began research to find out the level of risk and to test possible aerosol-based disinfectants. Marinus Van den Ende and visiting Australian researcher Dora Lush found that the risk of transmission of bacteria in dust could be reduced by coating floors and blankets with oil to prevent dust dispersal. Robert Bourdillon, Owen Lidwell and James Lovelock tested samples of air taken from shelters, and the effectiveness of various chemicals as possible aerosol-based disinfectants.

Tommy Work recalled being made "poster boy" for a government campaign against the spread of respiratory infection.



Left to Right: James Lovelock, Owen Lidwell and colleague
(Air Hygiene Unit during World War Two)

I had the misfortune to find that one of my intermediates that I was making in this quinine research caused me to sneeze violently. Just the slightest trace of it caused me to sneeze. Bourdillon who was the leader of the group concerned with air raid shelters discovered this and said he wanted me to be photographed in ultraviolet light sneezing. The result was that all over London there were thousands of pictures of me sneezing. The most dreadful pics. Fortunately I'd sneezed so violently that I was barely recognisable and only one person came and said is that you? It really was quite embarrassing.¹³

As the war progressed British troops faced the threat of two different forms of typhus. Firstly, those stationed in the Mediterranean were at risk

from louse-borne typhus fever. Van den Ende led a British Army Typhus Research Team and together with Major C.H. Stuart-Harris went to Algiers and to Naples to tackle the problem, including testing the use of chemotherapeutic agents produced by Institute chemists Harold King and James Walker as possible therapies. However, these proved too toxic for routine clinical use.

The second form of typhus was that caused by a different but related Rickettsial organism carried by mites which inhabited the jungles of south east Asia including Burma. Van den Ende and his colleagues began research on a vaccine for scrub typhus, initially using mice. This was extremely dangerous for the researchers involved. Indeed, Van den Ende, Christopher Andrewes, pathologist Janet Niven and Dora Lush were all accidentally infected in the laboratory with a form of typhus agent. Unfortunately for Lush, her brief illness and recovery did not confer protection when she needed it later: after returning to the Walter and Eliza Hall Institute in Melbourne, she pricked her finger whilst injecting a mouse with scrub typhus agent. She fell ill and died three weeks later.²⁰



Tommy Work sneezing for the Air Hygiene study

Van den Ende collaborated with the Wellcome Foundation Ltd to mass produce the scrub typhus vaccine for the Ministry of Supply using cotton rats, assisted by technician Dennis Busby. They produced large batches of vaccine in a security-controlled compound near the village of Frant in Kent, but just as these were shipped to Asia for testing, the troops were withdrawn and the vaccine was never used.

Retirement

In 1942, at the age of 67, Dale finally handed over the reins of the Institute to Charles Harington. His position as head of the Department of Physiology and Pharmacology was filled by Brown, to whom he had already delegated much supervisory work. Dale had seen the Institute develop against the backdrop of two world wars, expand to a far wider range of research activities, and straddle two different London sites. In the last Council report before Dale's retirement (covering the period 1938-9), the Institute had three main departments: Physiology, Pharmacology and Biochemistry (with a sub-department of Endocrinology); Experimental Pathology and Bacteriology (with sub-departments of Protistology and Microscopy and Physical Methods); and Biological Standards. The number of staff had more than doubled since 1920, with a total of 26 full-time scientists, and 13 attached and visiting workers, plus technical, administration and other support staff.

Dale, however, regarded the Institute as "a young and immature, but already a vigorously viable and intimately cooperative organism" that was ready to mature under its future successors.⁴



The Animal Division at the new Institute in Mill Hill: brown coats for male technicians, white for scientists and women

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Project management: Frank Norman, Head of Library Services, NIMR

Scientific editor: Jonathan Stoye, Head of the Division of Virology, NIMR

Additional contributors

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