

Alexander Fleming Laboratory Museum



A Guide

by Kevin Brown

The Alexander Fleming Laboratory Museum, opened by St Mary's NHS Trust, with financial support from the pharmaceutical firm of SmithKline Beecham, in 1993, features a reconstruction of Fleming's laboratory as it was in 1928 in the actual room in which penicillin was discovered. Fleming had occupied this small, musty, dusty laboratory from 1919 until his move to a modern laboratory in the new Medical School buildings opened in 1933. The laboratory was then used as an on-call bedroom for medical students doing their midwifery; Fleming's son Robert was to be one of hundreds of medical students who slept there over the years. Visitors come from all over the world to see the birthplace of penicillin.



The story of penicillin even appeared in American comic strips in the 1940s.

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Front Cover: Portrait of Sir Alexander Fleming by Anna Zinkeissen, painted posthumously in 1958.

The discovery of penicillin by Alexander Fleming in his laboratory at St Mary's Hospital on 3 September 1928 was perhaps one of the defining moments of the twentieth-century. It has affected the lives of everyone of us. Before penicillin there was little that could be done to combat infections caused by bacteria. Septicaemia, pneumonia, meningitis, enteritis and endocarditis were frequently fatal. Even a scratch from a rosebush could be lethal. A quarter of surgical patients routinely died of post-operative infections. Women commonly died from puerperal sepsis after childbirth. With the discovery of penicillin, the antibiotic revolution in medicine began. Penicillin offered the possibility of a cure for some of these diseases and an inspiration for the development of other antibiotics. Without its discovery, the modern world would be a very different place.

Alexander Fleming was born on 6 August 1881 at Lochfield Farm near Darvel, Ayrshire. In 1895 he moved to London to live with an elder brother and at the age of 16 became a shipping clerk, a job he hated. A legacy from an uncle enabled him to enter St Mary's Hospital Medical School in 1901. He is said to have chosen St Mary's because it had a good water polo team.

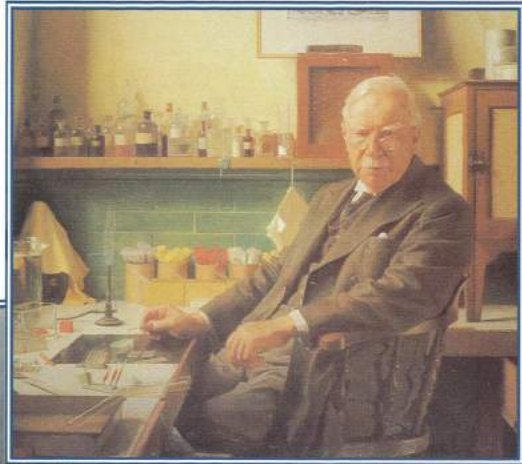
An outstanding student, he was awarded the University of London Gold Medal for the best medical student in 1908. On qualifying as a doctor, he originally wanted to be a surgeon but, in the absence of a suitable vacancy, he was offered and accepted a job in Sir Almroth Wright's Inoculation Department until a suitable surgical vacancy came up. Although he became a Fellow of the Royal College of Surgeons, he decided instead to become a bacteriologist. His discovery of penicillin was to benefit surgery more than if he had actually become a surgeon himself.

Fleming as a young bacteriologist, c. 1909. With him is his friend Dr Hayden, in the wheelchair, who had polio. Fleming persuaded Wright to give him a job in the laboratories.

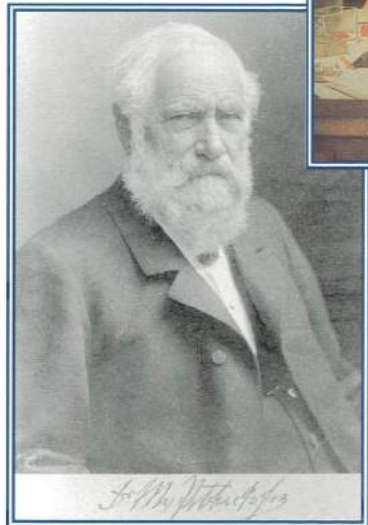


The greatest single influence on Fleming's career was Sir Almroth Wright, head of the Inoculation Department at St Mary's. With the support of wealthy and influential patrons, he set up his own semi-autonomous research institute in the Inoculation Department in 1907, financed from the sale of vaccines, the fees of private patients and help from his benefactors. A brilliant but controversial scientist, immortalised by his friend George Bernard Shaw as Sir Colenso Ridgeon in *The Doctor's Dilemma*, Wright hoped to effect a revolution in medicine by applying in the wards of a general hospital his ideas for vaccine therapy, the use of inoculation to cure as well as prevent disease. His great contribution to medicine was in fact the development of the first effective anti-typhoid vaccine which was to be so effective in saving the lives of men in the allied armies during the Great War.

During the Great War, Wright and his team worked in laboratories at a military hospital set up in the Casino at Boulogne. Here Fleming proved that the antiseptics being used on wound infections were doing more harm than good by killing off the white blood cells which defend against bacteria much more quickly than they were destroying the microbes. He began a search for the perfect antiseptic.

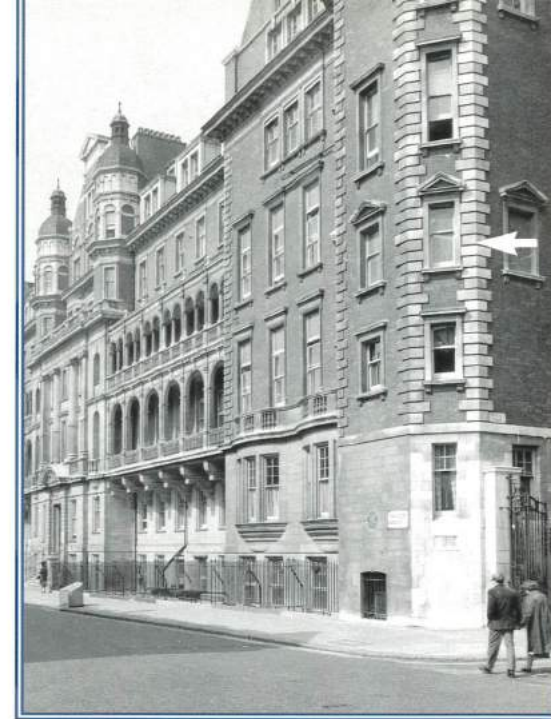


Portrait of Sir Almroth Wright by Sir Gerald Kelly, 1934

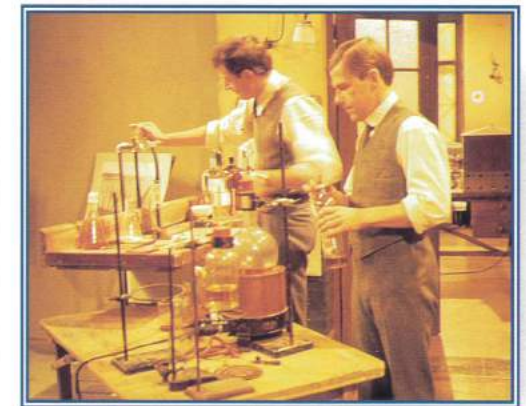


Wright and his colleagues were in touch with the great European scientists of the day such as Koch, Wasserman, Ehrlich and Metchnikoff, who visited him at St Mary's. A picture of Elie Metchnikoff hung in Fleming's laboratory.

St Mary's Hospital was the youngest of the London teaching hospitals, having been founded in 1845. In 1892 the Hospital had begun to build a new wing, the Clarence Memorial Wing, named in commemoration of the Duke of Clarence, eldest son of the Prince of Wales; he had been attended in his last illness by a St Mary's physician, Sir William Broadbent, and nursed by two of the Hospital's Sisters. However, when building of the new wing came to a stop in 1898 due to a lack of funds, only the basement had been built. The Clarence Wing was finally completed in 1904 but the Hospital could not afford to open any of the wards until 1907. Sir Almroth Wright took the opportunity to lease space in the new Wing for his Inoculation Department.



Fleming served as a volunteer private in the London Scottish Regiment in his spare time. His friend the artist Ronald Gray drew this caricature of him in uniform and entitled it Private 606, a reference to Fleming's use of Paul Ehrlich's salvarsan (compound 606) to treat cases of syphilis.



Staff of the Inoculation Department as depicted by actors in a 1970 television drama on the life of Fleming.

In 1921, Fleming had a cold and noticed that the bacteria in a petri dish were being dissolved when he added some of his nasal mucus to the culture plate. He had discovered the body's own antiseptic, lysozyme, present in many body fluids. Fleming always said that his best work as a scientist was done on lysozyme, but it did not affect the most harmful bacteria to mankind.



Cartoon showing children queuing to be caned to produce tear antiseptic (lysozyme), 1922.

On 3 September 1928, Fleming, recently promoted to Professor of Bacteriology, had just returned from holiday. Chatting to a colleague Dr Merlin Pryce, he noticed that a petri dish of *Staphylococci*, on which he had previously been working, had become contaminated by a fungus. "That's funny", he said. The mould, *Penicillium notatum* had produced a substance that had inhibited the growth of the microbes. Initially he called this mould juice. He had discovered penicillin.

In 1915, Fleming married Sareen McElroy, a nurse who ran a private nursing home. Their only child Robert was born in 1924. They lived in Chelsea, but in 1921 bought the Dhooon at Barton Mills, Suffolk, a country home which became a focus of a happy family life for all the Fleming family. Sareen Fleming died in 1949.



Where had the mould come from? Legends abound, but the most often told story is that it came through an open window from Praed Street. However, as a bacteriologist Fleming liked to work in a still atmosphere and the window was never open. It is more probable that the mould came from the laboratory immediately below Fleming's where a mycologist or mould specialist was studying the effects of fungi on allergies.

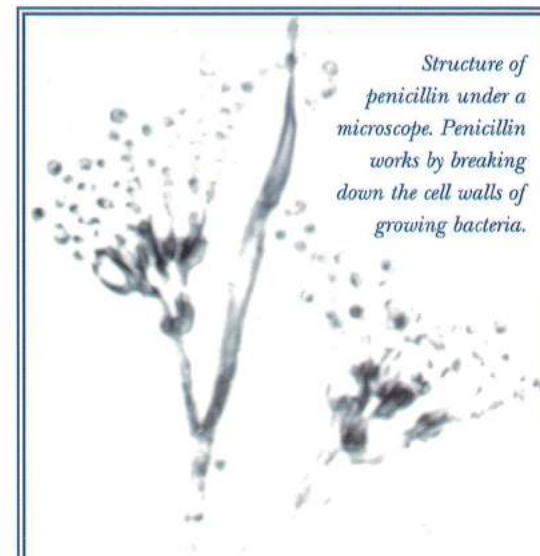
With the help of two young research assistants, Stuart Craddock and Frederick Ridley, Fleming investigated the mould and found that it was not harmful to man but lethal to certain microbes. Their attempts to purify and stabilise penicillin were unsuccessful. This limited any therapeutic potential it may have had, but, as it did not kill all types of bacteria, it could be used for the selective culture of resistant strains of bacteria; Fleming called it a bacterial weed-killer.

Top: Stuart Craddock ate some of the mould and found that it tasted like Stilton cheese. An unsuccessful attempt was made to treat his sinusitis with penicillin in 1929.

Bottom: Frederick Ridley had some knowledge of chemistry but, with Craddock, learned many of the techniques needed for their early attempts to stabilise penicillin from school textbooks as they went along.



Merlin Pryce had been working with Fleming on *Staphylococci* in 1928. He was present when Fleming discovered penicillin.



Structure of penicillin under a microscope. Penicillin works by breaking down the cell walls of growing bacteria.



Laboratory Today

Shortly before the Second World War, a research team at Oxford led by the Australian pathologist Howard Florey began work on penicillin. Co-incidentally they had just completed an investigation of Fleming's other great discovery lysozyme. Multidisciplinary teamwork was vital for the clinical development of penicillin and was a pointer to the future of medical research. A small team by modern standards, they were one of the largest medical research teams in the world in 1939. The Second World War made their task all the more difficult and equipment was ingeniously devised using milk churns, bedpans, fridge coolants and baths. Legend has it that in the event of an invasion, the team had samples of the mould smeared inside their clothes and planned to escape to North America to continue the work.



The pathologist Howard Florey and the biochemist Ernst Chain, a German Jewish refugee, were awarded the Nobel Prize jointly with Fleming in 1945.

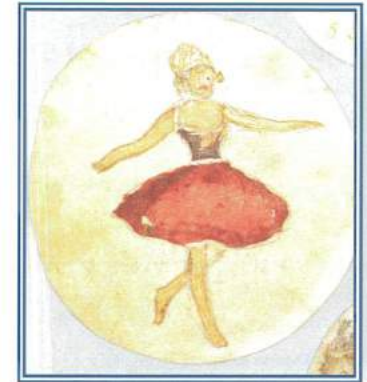
By February 1941, penicillin was first used systematically on a patient. Albert Alexander, a 43 year old Oxford policeman, had become infected with *Staphylococci* and *Streptococci* from a scratch when gardening. The infection spread through his body and he lost an eye. Penicillin was administered and his condition began to improve. Then supplies ran out. For a time it was extracted from his urine and reinjected. Soon nothing active was left and Alexander died. The next patients were children who required less of this scarce commodity.

Fleming used penicillin systemically for the first time in August 1942. His patient Harry Lambert, a partner in the optical firm of John and Robert Fleming, was dying from meningitis. Fleming obtained a sample of penicillin from Florey, but it was not working fast enough to arrest the course of the disease. He decided to inject into the spinal fluid, despite being warned against such a risky procedure by Florey. It saved Harry Lambert's life.

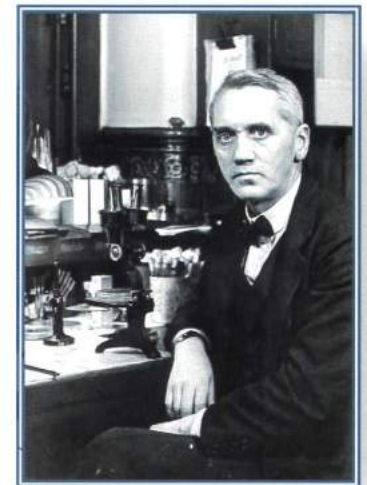
Wartime conditions in Britain made mass production difficult, so Florey and his colleague Norman Heatley went to America to try to seek support there. At the Northern Regional Research Laboratories at Peoria, Illinois, deep tank fermentation techniques and the use of a corn liquor as a growth medium increased the yield of penicillin. A faster growing strain of mould, *Penicillium chrysogenum*, was discovered on a rotting melon in a Peoria market.

Winston Churchill said that penicillin must be used to the best military advantage. This was initially interpreted as treating sufferers from sexually transmitted diseases rather than battlefield casualties. By 1944 sufficient penicillin was being produced for use on the battlefields for the liberation of Europe.

As a much publicised miracle cure not available to the general public, penicillin attracted a lot of attention. It was good news in wartime at a time of interest in post-war reconstruction. For a time there was a penicillin mania with talk of such wonders to come as penicillin snuff and penicillin lipstick for that hygienic kiss!



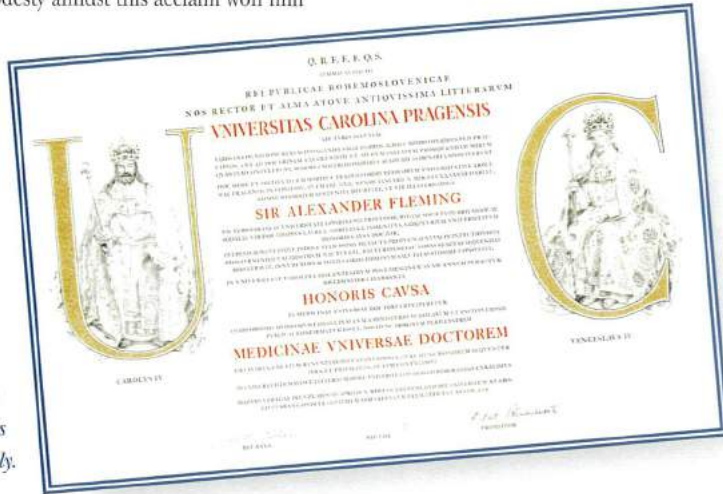
Fleming produced germ paintings using different pigmented bacteria. A quiet man with an impish sense of humour, he loved all sorts of games and to use his ingenuity in solving problems. He was a member of the Chelsea Arts Club. He was not a great conversationalist nor an exciting lecturer; but he was always very popular with his colleagues and students



Fleming in his laboratory.

Fleming received world wide acclaim as the discoverer of penicillin. In 1944 he was elected a Fellow of the Royal Society and knighted. In 1945, he received the Nobel Prize for Medicine, jointly with Florey and Chain. World-wide honours were showered on him. His personal modesty amidst this acclaim won him many friends and much popularity.

This honorary doctorate from Charles University, Prague was to have been awarded in 1947, but the Communist takeover of Czechoslovakia meant that it was not until 1993 that it was conferred posthumously.



During the Second World War, Fleming was Sector Pathologist for the Emergency Medical Service, responsible for all pathology work in a sector reaching out from St Mary's to Buckinghamshire. He was the only Sector Pathologist to remain in London during the Blitz. After the War, he succeeded Sir Almroth Wright as Principal of the Wright Fleming Institute in 1946.



Fleming died from a heart attack on 11 March 1955, not considering the first symptoms important enough to call out a doctor. His ashes are interred in the crypt of St Paul's Cathedral.

In 1952, after the death of his first wife, Sir Alexander married Dr Amalia Voureka, a Greek bacteriologist who had been imprisoned during the Second World War for Resistance activities against the Germans. After Fleming's death, Lady Fleming returned to Greece and was imprisoned in 1967 for opposing the regime of the Colonels but was later in life to head the Greek delegation to the Council of Europe.

Penicillin revolutionised medicine and was a major milestone in the fight against infection. It offered for the first time the possibility of a cure for diseases that had once been life threatening. It also inspired the search for new antibiotics, such as streptomycin and the chephalosporins, which could treat diseases resistant to penicillin. However some bacteria were already resistant to penicillin and others acquired resistance. The story of antibiotics after Fleming is the story of the almost constant development of new antibiotics to wage the ever continuing war against bacteria. Penicillin had shown the way ahead. We all owe an incalculable debt to Sir Alexander Fleming and the other dedicated researchers who transformed penicillin from a chance discovery to a lifesaving drug.



A selection of the medals and other honours awarded to Fleming.

After election as Rector of the University of Edinburgh in 1952, Fleming was triumphantly born aloft by students.





The Museum was opened by Peter Brooke, Secretary of State for National Heritage, on 21 September 1993. He is seen with one of the volunteer guides who have staffed the Museum since it opened.



The Museum has an active education policy. It is visited by school, college, university and adult education groups of all ages. Staff will also go out to schools, universities and other groups to give presentations, using slides, artefacts and video. The Museum's education work was considered a possible model for smaller Italian Museums after the Curator gave a lecture to the Centre for Museum Education of the University of Rome in 1999.

H.M. Queen Elizabeth the Queen Mother viewing Fleming Museum displays in April 1994. The Queen Mother met Fleming himself many times in the early years of her seven decades as President of St Mary's Hospital.



Dr Norman Heatley, who made a major contribution to the clinical development of penicillin, overlooked by a portrait of Fleming, after the unveiling in November 1999 of a plaque at the Museum designating penicillin as an International Historic Chemical Landmark by the American Chemical Society and Royal Society of Chemistry.



Penicillin won a San Marino Ideas Award in the Health category in 1999 as one of the greatest advances of the twentieth century. The Museum also received another award at the Dome, Greenwich, in February 2000 when penicillin was also voted a National Millennium Treasure by readers of *The Times*.

Back Cover: Stained glass window at St James' Church, Sussex Gardens, Paddington by kind permission of St James Church.

