Medical History

Medical science and technology at the Royal Postgraduate Medical School: the first 50 years

CHRISTOPHER C BOOTH

Fifty years ago King George V, in the year of his silver jubilee, formally opened the British Postgraduate Medical School at Hammersmith Hospital (fig 1). It might so nearly not have happened. In the economic gloom of the 1930s it was remarkable that the founding fathers, and particularly Sir Frederick Menzies, chief medical officer to the London County Council, had been able to persuade a reluctant Treasury and the council to part with enough money to enable the school to make a start.[1] The school, however, has never allowed financial stringency to affect its sense of ebullient self confidence, and in reading the contemporary accounts of that spring day in 1935 one senses still the high hopes and optimism that permeated the glittering gathering that greeted the King and included the most distinguished medical men of the day, resplendent in academic regalia. Sir Austen Chamberlain, brother of Neville and chairman of the governing body, told the King that the school was to have three main tasks: the continuing education of general practitioners, the training of specialists, and, most important of all, the pursuit of research and advance of medical knowledge (fig 2). His Majesty graciously responded with the earnest hope

FIG 1—Hammersmith Hospital.

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An address given on 15 May 1985 in commemoration of the 50th anniversary of the opening of the school.

FIG 2—His Majesty King George V being greeted by Sir Austen Chamberlain at the opening of the school on 13 June 1935.

"that the School, with its happy union of ward and laboratory, University and Local Authority, drawing students and teachers alike from all parts of our Empire...may prosper under God's blessing."[2]

Francis Fraser and first full time staff

Unquestionably, the most important feature of the first years of the school was the quality of staff appointed and their wholehearted commitment to research as the major function of a postgraduate institution. Francis Fraser came from his chair at St Bartholomew's Hospital to be head of the department of medicine, Geoffrey Grey Turner from Newcastle for surgery, and James Young to obstetrics. E H Kettle also came from Barts as head of pathology, but he died in early 1936 and was succeeded by J H Dible. These men all attracted excellent younger staff as readers and assistants. Janet Vaughan was an early member of the pathology department, Ashley Miles was reader in bacteriology, and E J King in clinical chemistry. Robert Aitkin was reader in medicine, Lambert Rogers in surgery, and Chassar Moir in obstetrics and gynaecology.

Francis Fraser, who had been deeply influenced as a young physician by his experiences in the United States, was the key figure among this galaxy of talent (fig 3). He had worked as a clinical investigator with A E Cohn at the Rockefeller Institute in 1912-4,[3] the period when Abraham Flexner's reports on medical education were the subject of intense discussion in academic circles. He could not then have foreseen what was to happen at Hammersmith nearly 25 years later. In 1912 there were no full time clinical professorships in London. Fraser and other contemporaries at Rockefeller such as Arthur Ellis must have had great courage, for they were consciously training themselves for full time posts in medicine that did not then exist.

Academic posts in clinical medicine in London were created only after the first world war, when the recommendations of the Haldane commission were reluctantly implemented by the London schools. Fraser duly became professor of medicine at Barts in succession to Archibald Garrod in 1921 and at once set about creating there the type of university department envisaged by Flexner, with research laboratories associated with hospital wards. It was an uphill task at Barts. His young students could see Lord Horder arriving in his Rolls-Royce, and this aspect of the career appealed to them more than did the rigours of laboratory work. Academic medicine was slow to develop in London, and in the 1930s there were still only five chairs of medicine. So

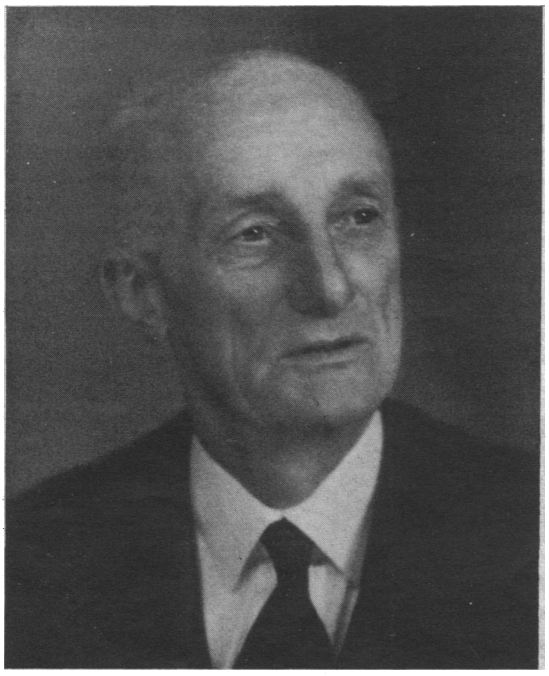

FIG 3—Sir Francis Fraser.

when the opportunity of creating the new school at Hammersmith arose Fraser enthusiastically took up the challenge, and it was he who established the principle of academic control of clinical facilities, with full time academic staff, on the American pattern.

Not everyone shared Fraser's view that the future of the school would depend on its ability to do creative research. Colonel Procter, the dean of those early years, held that the school was there only for teaching and that the new Nuffield departments in Oxford had been created to do research. It was a view of Oxford that has an echo in the modern era. Happily this outlook did not prevail.

The idea that clinical departments required laboratories, however, was still not generally accepted in Britain at that time. H R Dean, professor of pathology in Cambridge, had advised that the school's laboratories should be entirely for pathology, for, as he put it, "Physicians do not need to use laboratories." Fraser insisted that he must have his own laboratories or else he was no longer interested in the school. The result was the temporary building known as the lower medical corridor, which is still there 50 years later.

In those early years before the last war the leadership of Francis Fraser and the enthusiasm and youth of the staff got the school off to a flying start. In medicine there were four assistants: Geoffrey Jennings, Charles Stuart-Harris, Guy Scadding, and Paul Wood. Scadding remembers that by comparison with today it was all very small scale in everything except the clinical workload. Fraser continued with the thyroid work in which he had been involved at Barts, with the help of his technician, Arthur Latham. Scadding, who was given full charge of beds at the age of 28, recalls his studies of influenza during the 1936 outbreak, only three years after the discovery of the virus at Mill Hill. Fraser made available to him beds for all cases of influenza with lung complications. Wood was advancing cardiology with the simplest of equipment combined with astute clinical observations, and when an assistantship in medicine became vacant in 1937 Peter Sharpey-Schafer was recruited by Fraser to work as an endocrinologist. In pathology R G MacFarlane was writing his classic thesis on disorders of the clotting mechanism. He and Janet Vaughan were joined in 1937 by a young haematologist from King's, J V Dacie, whose enthusiasm for his subject had been stimulated by reading Dr Vaughan's book on the anaemias. All three were later to be fellows of the Royal Society. In surgery Geoffrey Grey Turner was continuing his work on the management of oesophageal conditions.

Enter John McMichael

In 1938 Robert Aitkin departed to the regius chair of medicine in Aberdeen and Fraser now made an appointment that was to have a major influence on the future research of the school. John McMichael was one of a group of academic contemporaries who had been inspired by Sir Thomas Lewis and wanted to apply scientific methods at the bedside to the study of human disease. McMichael had spent three years at University College along with George Pickering, Harold Himsworth, Edward Wayne, and Horace Smirk from 1931 to 1934, the height of Lewis's career. In 1935 Fraser had tried to tempt him to join his new department, but McMichael was too well ensconced in Edinburgh, and it was not until the readership became vacant that Fraser was able to attract him south. McMichael was impressed by Francis Fraser's leadership and wholeheartedly supported his determination to create a full time academic department; so in the year of the outbreak of the second world war John McMichael joined the school (fig 4).

And then it all might have come to nothing. On a gloomy Sunday morning, 3 September 1939, Neville Chamberlain, who had contributed so much to the foundation of the school as Minister of Health and had laid its foundation stone, announced the declaration of war against Germany. The dean, Colonel Procter, took the despondent view that the school should be closed down. Professor George Gask, however, then chairman of the school council and as professor of surgery at St Bartholomew's Hospital an ex-colleague of Francis Fraser, had the imagination and courage to insist that

FIG 4—Dr J (Sir John) McMichael in 1940.

the school should continue. In particular he considered that with its equipment and laboratories it was in a strong position to pursue further research in a wartime setting. Francis Fraser left to direct the emergency medical services in London, telling his new reader as he went: "Well McMichael, you just stay here because we have work to do." So it was that McMichael as reader became effective head of the department of medicine at the outbreak of war.

The war years were to have a highly significant influence on the future course of clinical research at Hammersmith, for the skeleton staff who remained rose magnificently to the challenge. Scadding and Wood went away to the war and McMichael was left with only Sharpey-Schafer and Bywaters. The hospital became a casualty hospital of 400 beds and, not being in central London, received the casualties that were dug out of bombed buildings at a late stage and often found with crush injuries. Among these

unfortunates were many who went into renal failure, and in 1941 Eric Bywaters published the first of a series of classical papers on crush syndrome and renal failure.[4]

First liver biopsies in Britain

A second important problem for the military was jaundice. At that time confusion existed between acute infective and serum hepatitis. Many soldiers, treated with arsenic at nearby clinics for sexually transmitted conditions, were developing jaundice. To investigate these problems John McMichael, whose MD thesis had been on liver disease, began to carry out liver biopsies in the early years of the war, the first liver biopsies to be performed in this country. Dible undertook the pathology and together with Sheila Sherlock, who later joined the department from Edinburgh, they were able to define the pathology of hepatitis.[5] This effectively established the school as a centre for consultation, and they advised the American army in Britain on the problem of jaundice among its troops. Sheila Sherlock soon took over the liver work from McMichael, the first step in her career as an outstanding teacher and investigator in liver disease. Like Scadding, she was to be given full charge of beds at the age of 28.

The third important field of research involved McMichael's other major interest, cardiovascular physiology. It was obviously important at a time of war to know more about the effects of haemorrhage, and to do this a method of measuring cardiac output was essential. The acetylene method then in use was tedious. Sharpey-Schafer and McMichael were now stimulated by the paper by Cournand and Ranges, published in the United States in 1941,[6] to use cardiac catheterisation to measure cardiac output. During this busy period in the department's activities they began their own studies[7] and with Otto Edholm and Henry Barcroft clearly established the physiological reaction to blood loss.[8] There were, as McMichael has pointed out, no ethical problems with liver biopsies or cardiac catheterisation at that time, as the whole civilian population was anxious to help the war effort, and there was no lack of volunteers. There were those, however, who did express doubts on ethical grounds. Sir Thomas Lewis, hearing the first paper Sharpey-Schafer and McMichael gave to the Physiological Society at University College Hospital Medical School in December 1943, described their work as "startling" and hinted that they should abandon the procedure. It was Sir Henry Dale who gave powerful and influential support. He argued that the accumulated experience of 394 cases, more than 100 of which were their own, established the safety of the procedure.[9]

The war firmly established the school's reputation for teaching. Numerous courses were held throughout this period in all subjects, but the international reputation of the school was established by the many Americans and Canadians who came to hear McMichael and his colleagues expounding what to all must have seemed a radical new approach to medicine (fig 5).

Reappointments and expansion

In 1946 Sir Francis Fraser took over the directorship of the newly founded Postgraduate Medical Federation, and McMichael was now appointed professor of medicine. With the return of doctors from the war a series of other important appointments were made. J V Dacie took over the direction of haematology in that same year and soon afterwards Ian Aird was confirmed as professor of surgery. Later John McClure Brown became professor of obstetrics and gynaecology. Pat Mollison came to Hammersmith in 1946 with the task of directing the Medical Research Council's blood transfusion research unit and with an honorary appointment to the department of medicine.

At this time the most important influence on the practice of medicine was the introduction of the new antibiotics. This had, of course, been first achieved in Oxford, where C M Fletcher, as a young physician, had given the first injections of penicillin.[10] At Hammersmith there began a period of expansion, which lasted for the next 20 years and was associated with a flowering of the research effort, which, despite everything, had been so effectively established during the school's first decade.

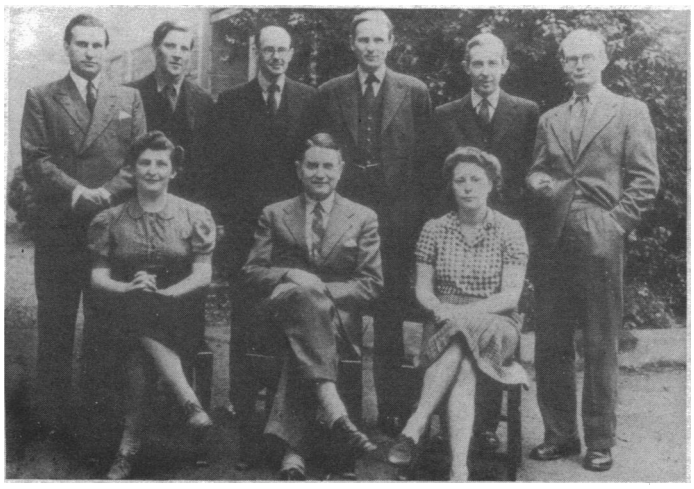

FIG 5—The department of medicine in 1945. Sitting (L to R): Sheila Sherlock, John McMichael, Sheila Howarth (Lady McMichael). Standing (L to R): Maurice Nellen, Erasmus Barlow, Otto Edholm, Charles Fletcher, Peter Sharpey-Schafer, Eric Bywaters.

FIG 6—Dr C E Newman, dean of the school from 1946 to 1965.

It was an era that was to be dominated by new technology. Biochemical techniques such as flame photometry and paper chromatography, mass spectrometry for the analysis of gases, metabolic balance studies, techniques for vascular imaging, and the introduction of radioactive isotopes into clinical investigation all had a major impact on the school's researches during those years. At the same time the school itself was to be concerned with the introduction of new techniques, some highly complex, of which the best example was the work of the department of surgery on heart and lung machines.

In the department of medicine McMichael set about the task of building a comprehensive department staffed by full time academics and covering an extensive range of medical specialties. He was to be greatly helped by the agreement made by the school with the Ministry of Health in 1951, which established that the school would provide the consultant staff to the hospital, while junior staff would be paid by the National Health Service. He had a remarkable ability of bringing together some of the most outstanding men and women of their generation. He encouraged great intellectual freedom, but, as C E Newman once remarked, it was a freedom that was never allowed to degenerate into licence (fig 6).[11] He also greatly enhanced the quality of the Wednesday morning staff rounds, which Fraser had started, where the demonstration of intensive, in depth studies of individual patients and their problems has continued to this day.

The work on acute renal failure continued. In 1946 A M Joekes joined Bywaters in the use of the first artificial kidney in Britain, which Kolff had given to Bywaters when he visited Holland after the war ended. It was a thankless task and Joekes remembers nostalgically "the full horrors of setting up the machine during the day and dialysing all night in an empty room on the north block using up to 2 grams of dry heparin to prevent clotting." When Bywaters left in 1947 to direct the Medical Research

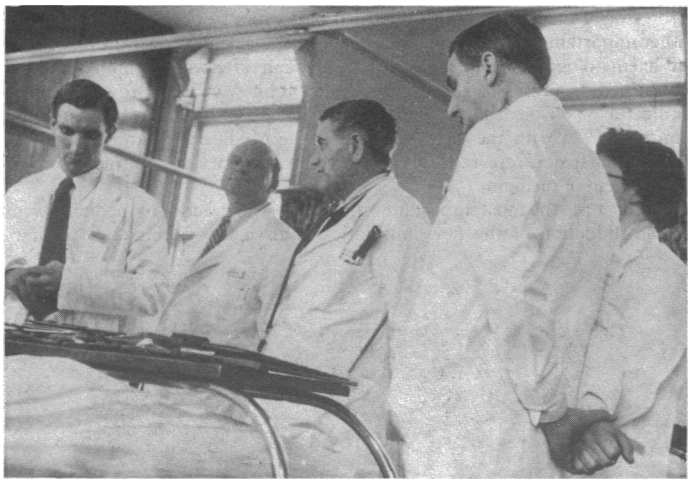

FIG 7—Ward round in the department of medicine in 1958. (L to R): Dr (Professor) D L Wilcken, Dr (Professor) M D Milne, Professor Sir John McMichael, Dr (Professor) J P Shillingford, and (obscured) Dr L W Loughridge.

Council's rheumatology unit in Taplow the machine was given to the department of surgery. It was in fact to be temporarily superseded by G M Bull's work with A M Joekes and K G Lowe on the conservative management of acute renal failure, as they found they could get far better results from treatment with a high energy diet given by intragastric drip feeding, with fluid restriction and careful attention to electrolyte balance.[12] Their work established the pattern of renal functional disturbance in this condition and effectively disposed of the "Trueta shunt" hypothesis then in vogue.

Progress in hepatology and cardiac physiology

In hepatology Sheila Sherlock went on to establish liver biopsy as a routine procedure in this country. She pioneered the use of the cardiac catheter in studies of hepatic haemodynamics and metabolism[13] and, with Summerskill and colleagues, described the clinical features of hepatic coma and its treatment with low protein diets and antibiotics.[14] Her group also achieved a remarkable first during the 1950s, with the introduction by Dr Margot Shiner of the technique of jejunal biopsy.[15] This was in part due to the school's relationship with the old Commonwealth countries at that time. The instrument she first used was Ian Wood's gastric biopsy tube, invented in Australia and brought to the haematology department at Hammersmith by a research fellow from Melbourne, Selwyn Baker. I Doniach provided the pathological expertise, just as Dible had done for the work on liver biopsy.[16]

McMichael's own work on cardiac physiology had established the nature of high and low output cardiac failure and now began to focus on the mode of action of digitalis and its possible primary effect in reducing venous pressure, a view that he modified after subsequent research.[17] He was joined in the early 1950s by J P Shillingford, who continued the physiological studies of cardiac function in health and disease, first in tricuspid incompetence. He went on to use dye dilution techniques for assessing heart valve function, but undoubtedly the best contributions were made in the studies of the haemodynamics of coronary artery disease and the development of the coronary care unit. For this work he was later to be given his own unit by the Medical Research Council.

McMichael had begun to study hypertension and was one of the earliest to treat patients with the newly discovered hexamethonium compounds. Brenda Morrison, Priscilla Kincaid-Smith, and later C T Dollery all joined in this work. McMichael himself, with his commitment to physiological studies, made no more than a start in the use of cardiac catheterisation for the diagnosis of congenital or valvular heart disease. After Paul Wood went to the National Heart Hospital in 1947 J F Goodwin did this with the enthusiastic cooperation of R E Steiner in the department of radiology. In later years the studies of the natural history of the cardiomyopathies were to be a major contribution of the clinical cardiology group.

Throughout this era a strong emphasis was laid on applied physiology. In the field of pulmonary physiology there was outstanding work by W A Briscoe, who was followed by P Hugh-Jones, J B West, and E J Moran-Campbell. C M Fletcher, who succeeded John Crofton in respiratory medicine, was the only member of the department to adopt an epidemiological approach. With his colleagues he carried out comparative studies of bronchitis and emphysema in Britain and the United States. He also showed, in a mammoth study carried out locally, that stopping smoking was far more effective than treating bronchitis with prophylactic antibiotics.

In endocrinology Russell Fraser used the newly available radioiodine to study thyroid function. He also developed important research programmes in osteoporosis and calcium metabolism. Russell Fraser started the metabolic ward at the north end of the B block, with laboratory support from I McIntyre and the department of clinical chemistry. He was not the first to introduce the technique of pituitary implantation, but with G F Joplin he played a major part in developing this procedure in endocrinology. Russell Fraser's unit was the only one to lose a member of staff on what may be termed active service. In July 1966 Alice Dimitriadou died in a tragic helicopter accident while collecting samples from patients with thyroid disease near Bogota in Columbia.

R I S Bayliss worked on the newly discovered corticosteroids until his appointment to the Westminster Hospital in 1955. C L Cope was a meticulously careful student of adrenal steroid secretion for many years, and the excellence of his work continued after his retirement in 1968. He was a man of sterling integrity, sadly no longer with us. He thought that his last paper, published in *Clinical Science* in 1975 within a few days of his death at the age of 71, was one of his best.[18] J Vallance-Owen worked as Cope's senior registrar during the period when he was developing the use of the rat diaphragm for measurements of plasma insulin.

Undoubtedly the most impressive figure in those days in the 1950s was M D Milne. He had a scientific pugnacity and encyclopaedic scholarship before which all quailed (fig 7). He did not get Conn's syndrome right first time, even though Cope and Garcia-Llaurado had found excessive aldosterone in the urine of his patient with so called potassium losing nephritis.[19,20] But he became interested at the same time in non-ionic diffusion, publishing his studies in the *American Journal of Medicine*.[21] This led, by a remarkable feat of scientific intuition, to his outstanding work on Hartnup disease and cysteinuria, in which he showed for the first time the jejunal transport defects for different amino acids in those conditions.[22] He went on to become one of those rare clinicians to be elected to the Royal Society.

Intellectual revolution

It was an exhilarating era in the department of medicine. Its most exciting features were the revolution in the intellectual approach to medicine, an encouragement by McMichael of the young that was unrivalled in Western Europe, and the opportunity to work in an atmosphere in which no established medical belief went unchallenged.

Ian Aird, now firmly in charge of surgery, was, in McMichael's own words, undoubtedly a genius. His book, *A Companion in Surgical Studies*, was one of the most remarkable surgical texts ever written. He had extraordinary vision and was far ahead of his time. When he became professor of surgery in 1947 he decided that his department should concentrate on two areas of research that he believed were vital for the future of surgery. One was a pump oxygenator to permit open heart surgery, the other renal transplantation. He had no experimental surgical facilities at Hammersmith and had to find space for himself in a floor of the old north block. But D G Melrose was set up to work at the Buxton Browne farm of the Royal College of Surgeons, where he successfully developed a pump oxygenator that could take over the circulation in dogs (fig 8).[23] It was not easy to initiate studies in man, but by 1954 the first operation had been

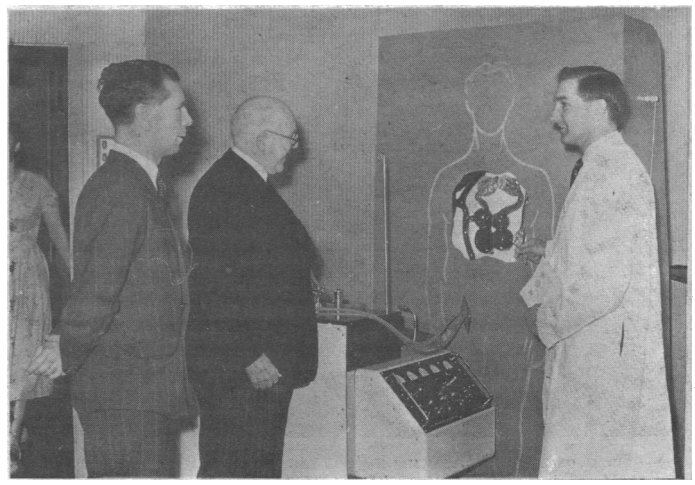

FIG 8—Professor Ian Aird introducing Sir Alan Daley to Denis Melrose and his heart and lung machine.

carried out in a patient undergoing surgery on the aortic valve by W P Cleland, the pump oxygenator on that occasion being used simply to assist the circulation.[24] Open heart surgery, however, soon followed, particularly after the development by Melrose and his colleagues in 1955 of a method of producing elective cardiac arrest. They worked closely with Goodwin and Steiner, whose diagnostic skills were essential to this endeavour. The cardiac surgery group at Hammersmith soon became world famous, and in 1959 the entire team was invited to Moscow to help develop open heart surgery in Russia.

Meanwhile renal surgery was being developed by Ralph Shackman, and in the mid-1950s, after the commercial development of new and more satisfactory dialysis machines in France, the department reintroduced haemodialysis for the treatment of acute renal failure. Shackman and his colleagues were later to set up a unit for the treatment of end stage renal failure by dialysis, but this was not until after the pioneering work of Scribner in Seattle. Aird's dream of successful transplantation was to be realised at Hammersmith in the 1960s, but despite the early studies by W J Dempster of experimental renal transplantation that Aird had stimulated, the first renal transplants were to be done not at Hammersmith but in Boston, Paris, and Edinburgh. The school's hesitation in exploiting early work in this field has to be accounted as one of its failures by any critical historian.

Contributions from part time staff

In the interests of historical accuracy it has to be said that operative surgery was not always Aird's own strongest suit, particularly in his later years. Nevertheless, he ensured that his department maintained the highest standards of practical surgery, and it was the part time staff who made the major contribution to this. W P Cleland, whose part in the development of cardiac surgery at Hammersmith was crucial, R H Franklin, who made major contributions to gastrointestinal surgery, carrying out the first operation for tracheo-oesophageal fistula in Europe, Peter Martin in vascular surgery, Geoffrey Knight in neurosurgery, and Selwyn Taylor in the surgery of the thyroid and parathyroid were all loyal and devoted members of Aird's department.

With the development of complex modern surgery anaesthesia became vitally important in ensuring success, and anaesthetists were to become increasingly concerned in postoperative and intensive care. The work of Nunn and Payne, who both worked at Hammersmith, on postoperative hypoxia was particularly important. In the early years anaesthetists were members of the department of surgery, but anaesthesia achieved independent departmental status with the appointment of Sir Gordon Robson as professor in 1964. His researches in neurophysiology were to stimulate vigorous research developments in this subject.

The other major clinical department of that era was obstetrics and gynaecology. J McClure Brown had succeeded Professor James Young at the end of the war, and his department was to make important contributions. Mollison carried out his early studies of exchange transfusion in haemolytic disease of the newborn, and Brown himself soon began to develop techniques for studying placental function. He had a succession of readers and assistants during this period, Robert Keller, Ian Donald, and Norman Morris among them, who went on to greater things. At the same time Erica Wachtel was introducing new techniques of gynaecological cytology and in operative gynaecology V B Green Armitage was one of those who pioneered tubal reconstructive surgery for women suffering from infertility.

There was no academic department of paediatrics in the early days of the school, but in 1954 the Institute of Child Health set up a readership at Hammersmith and Peter Tizard was appointed to the post. He soon established an international reputation for himself and his colleagues with his work on fetal resuscitation and neonatal physiology, and in 1964 he was awarded a richly deserved professorship. He went on to become professor of paediatrics at Oxford and his reader, John Davies, was subsequently appointed to the chair of paediatrics in Cambridge.

Collaboration between departments

But if during those first three decades of the school's existence the clinical departments had established the school's international reputation for clinical research, this was due in major part to the collaboration and support they received from the departments of pathology, radiology, and medical physics, as well as from those Medical Research Council units that had been set up on this site. Nor should the workshop and its staff, so ably directed by Con Lorden, be forgotten, for they made major contributions to research throughout the school and were closely associated with D G Melrose in his work on the development of the pump oxygenator. Both the library and the department of medical illustration have also given excellent support to the research activities of the school, often providing a service going beyond the call of duty.

In many ways the pathology departments have been the scientific success story of the school. By the end of the war Lord Stamp and Earl King had emerged as professors of their respective subjects of bacteriology and clinical chemistry, and after Dible became emeritus in 1955 Dacie became professor of haematology (fig 9) and C V Harrison of histopathology. Increasing specialisation through the years led to the four departments becoming autonomous, though they still retained a rotating headship of pathology. The lunchtime clinicopathological discussions, a tradition brought from Barts by Fraser and Kettle, were in those days one of the most important features of the school. In histopathology A G E Pearse was pioneering the histochemical techniques that have made him a household name in so many laboratories throughout the world.[26] He was later to develop his APUD (amine precursor uptake and decarboxylation) cell concept, linking together the cells of that diffuse endocrine system that is a particular feature of the gastrointestinal tract and its associated glands. Doniach's work on the thyroid was by no means his only or even his major contribution; one of the most enchanting and generous of men, many of us in other departments turned to him for advice. It was also in pathology that George Popjak started his distinguished research career in lipid biochemistry in this country. He began with a bunsen burner in a corner of Dible's department.

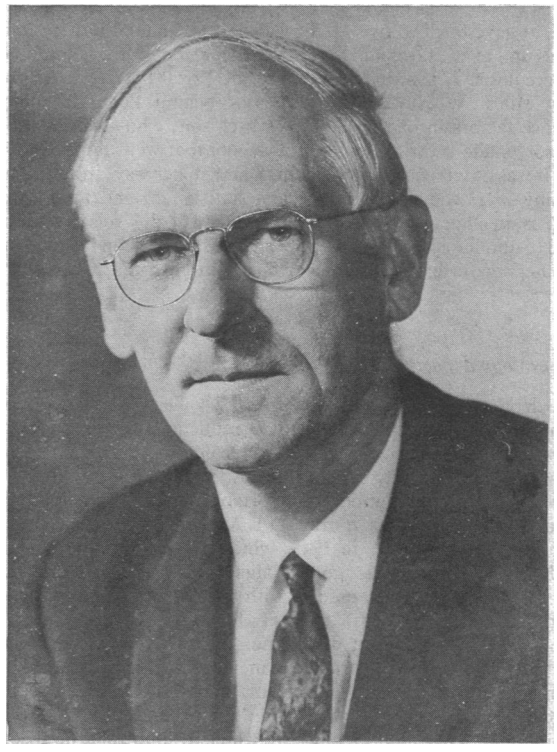

FIG 9—Professor Sir John Dacie.

Clinical chemistry department

In clinical chemistry Earl King was working on silicosis as well as setting standards for measurement that were to be increasingly important as techniques multiplied. Bill Klein's work on steroid chemistry was an important contribution to the department. McIntyre, initially involved in divalent cations such as magnesium, went on to follow up the discovery of calcitonin by Copp and his associates.[27] With Pearse and his colleagues he investigated its localisation in the thyroid C cell. Nor should one forget the contributions of C E Dalgleish to paper chromatography. I D P Wootton continued to develop automated methods in clinical chemistry when he succeeded King as professor. He also played an important part in introducing computing at the school.

Bacteriology department

The two other pathology departments have a record of outstanding distinction. The department of bacteriology has an unequalled scientific

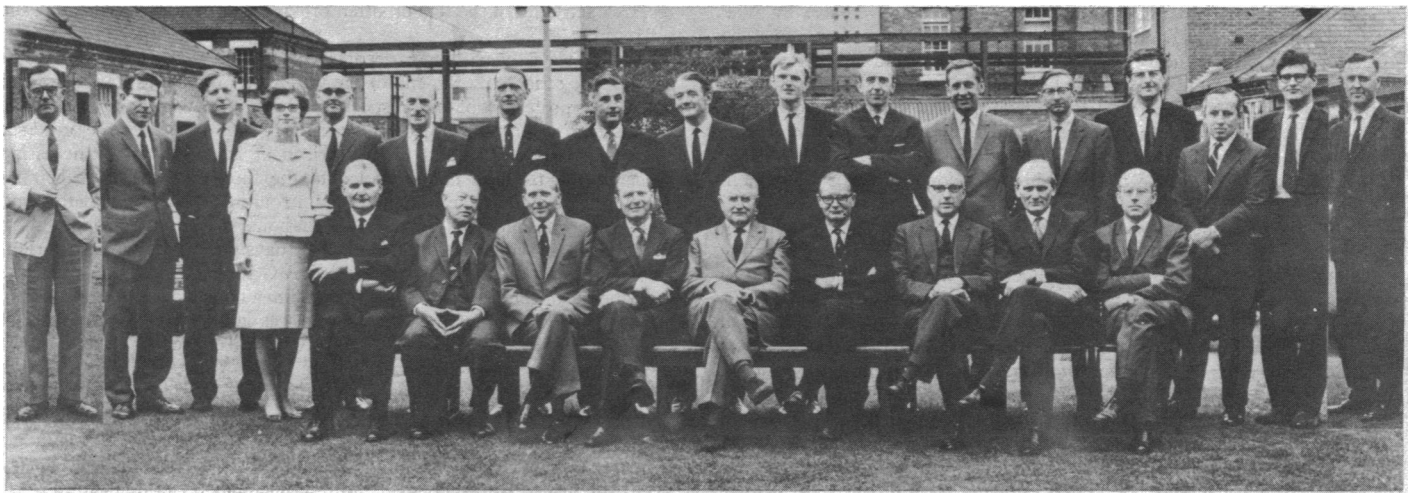

FIG 10—Department of medicine on the occasion of Sir John McMichael's retirement (1966). The future professors of paediatrics in the universities of Oxford (Sir Peter Tizard) and Cambridge (Professor John Davies) are also included.

record. It gave birth to two Medical Research Council units: the bacterial genetics unit of W Hayes and D A Mitchison's unit for the laboratory studies of tuberculosis. It has three fellows of the Royal Society to its credit, Sir Ashley Miles, W Hayes, and Professor Naomi Datta, the pioneer of resistance factors in bacteria.[28] D A Mitchison, who succeeded Stamp as professor, made contributions to the school that went far beyond his own work. It was he who helped set Naomi Datta on her way. In addition, he was for many years the school's unofficial statistician, and there were many among us, in all departments of the school and at all levels of seniority, who turned to him for advice. Mary Barber, with her work on hospital infection, was a charismatic figure in the department until her untimely death in 1965.

Haematology department

The department of haematology, under J V Dacie's exacting leadership, set standards for this subject that have influenced the practice of haematology world wide. Dacie's own work on haemolytic anaemia, enshrined in his classic textbook, duly earned him his fellowship of the Royal Society. The department has a number of important firsts to its credit. One was the vitamin B_{12} assay. Mitchison drew D L Mollin's attention to the paper by Hutner and his colleagues in 1949, which showed that vitamin B_{12} was a growth factor for the green alga, *Euglena gracilis*, and this led to his successful development, with G I M Ross, of the first assay for vitamin B_{12} in serum, a major step for those studying megaloblastic anaemia.[29] Other important discoveries included Dacie's demonstration, with J G Selwyn, of the importance of metabolic defects in the red blood cell in non-spherocytic haemolytic anaemia[30] and the first description, with Oxford colleagues, of Christmas disease.[31] In the late '50s I was working with Mollin in that department, and we were able to show that the absorption of vitamin B_{12} is a function of the ileum,[32] which was effectively the first time that absorption had been shown to be localised to a particular area of the small intestine. A fifth department was added to pathology when the school appointed Professor A P Waterson to a newly established chair of virology in 1967. Particularly distinguished work was carried out on hepatitis virus by June Almeida when she worked in this department.

Radiology department

The department of radiology has also been of great importance to the research achievements of the school. Originally a department of the hospital under Dr Duncan White, it was not until the 1960s that the school began to take over responsibility for the consultant staff. R E Steiner, who had originally joined the department as a hospital consultant in 1950, became professor of radiology 10 years later and with J W Laws and F H Doyle created a department that was to be described by the *British Medical Journal* in later years as a "beacon light" to British radiology. All departments in the school owe a great debt to this department, which was particularly important to developments in cardiology. Equally important, however, were their contributions to hepatology, small intestinal disease, renal disease, endocrinology, and bone disease, to quote just a few examples.

The department of medical physics also made important contributions to imaging techniques. Some of the earliest brain scans were carried out at Hammersmith by J R Mallard, and this department was vitally important to all who used radioactive isotopes in their researches, as many did.

Medical Research Council units and other "developments"

The development by the Medical Research Council in the postwar years of several units on the Hammersmith site was an indication of the increasing importance of the school in clinical research in this country. The radiotherapeutic unit, moved to Hammersmith during the war, evolved into the cyclotron unit after the cyclotron first produced a beam in 1955. It was the use of short lived isotopes from the cyclotron that enabled J B West and C T Dollery to carry out their classic studies on ventilation and blood flow in the human lung.[33] More recently Mary Catterall has conducted her careful trials of neutron treatment at Hammersmith. Court-Brown worked at Hammersmith in the Medical Research Council's radiation sickness unit and carried out the studies that established the importance of radiation in causing myeloid leukaemia in patients with ankylosing spondylitis. Mollison's Medical Research Council blood transfusion research unit was housed in the hut between the C and D blocks, and he and his colleagues, between 1946 and 1960, did for blood transfusion what Dacie had done for haematology. N B Myant's lipid research unit was set up after Popjak left in 1962, and distinguished work was later done on the relation of hyperlipidaemia to atheroma.

By the 1960s the school had become, in the words of the historian Noel Poynter, "the most advanced and successful medical school in the British Commonwealth. It was," he wrote, "an example of what can be achieved when the restrictions imposed by tradition and vested interests are loosened. This Institution with its brilliant record has been of tremendous value in radically changing the attitudes of British doctors to medical education and the way it should be organised."[34]

There then occurred two events that were to be landmarks in the history of the school. The first was the tragic and untimely death, by his own hand, of Ian Aird, that lovable but wayward genius, in 1962; the second was the retirement in 1966 of Sir John McMichael (fig 10). A fellow of the Royal Society, knight bachelor, Wellcome trustee, and the recipient of numerous honorary degrees and other distinctions, he had become a towering figure in the school. In nearly 30 years at Hammersmith he had not only served the school with greater devotion but had also had a greater influence on British academic medicine than any one of his contemporaries.

R B Welbourn, who succeeded Aird as professor of surgery, inherited the excellent experimental surgery facilities that had now been built in the cyclotron building with the help of the Wellcome Trust, and at the same time the school obtained further support for a floor at the top of the new Commonwealth building for the department. The two main areas of surgery were to be linked by a bridge named in memory of Ian Aird. Welbourn believed in advancing knowledge through the careful study of surgical patients and by using the special opportunities provided by surgical operations to study normal and abnormal structure and function. He organised clinical trials for the treatment of breast cancer and made an important contribution to the study of patients with Cushing's syndrome, phaeochromocytoma, and neuroendocrine tumours of the gut. He particularly encouraged plastic surgery under James Calnan, who did important

work on lymphoedema. In orthopaedics Charles Galasko carried out extensive studies on skeletal scintigraphy. He was subsequently appointed to the chair of orthopaedics in the University of Manchester. Welbourn firmly believed in the value of personal involvement in research as the best education for a surgeon, and he encouraged many younger members of his department to undertake research.

After Sir John McMichael

In October 1966 I undertook the daunting task of continuing in the steps of Fraser and McMichael. I had been a house physician with Sir John in 1952 and had subsequently worked in the department since 1954. For five years I was seconded to haematology to work with D L Mollin. After Sheila Sherlock's departure to become professor of medicine at the Royal Free Hospital in 1959 I took over gastroenterology and developed a unit for the investigation and treatment of small intestinal disease. The work on sites of absorption in the small intestine continued. Later G R Thompson carried out the first studies of vitamin D absorption in man. R H Dowling investigated the important question of how the small intestine adapts to resection or disease—work that he continues as professor of gastroenterology at Guy's Hospital—and Soad Tabaqchali, currently head of medical microbiology at St Bartholomew's Hospital, began her definitive studies on how bacteria affect absorption in the small intestine. Graham Neale was the outstanding clinician of this group.

There were now wider issues to be considered. The first was the commitment to teaching of the department of medicine. With increasing specialisation in different subjects a need for specialist rather than general courses developed and in 1968, under the direction of Graham Neale, the format of teaching was changed from courses in general medicine alone to short courses covering a wide range of specialist subjects. At the same time it was clear that Britain was no longer the imperial power of which George V had been King Emperor in 1935. The school had many links with the United States, Canada, and other Commonwealth countries such as India. A particularly fruitful exchange had been established with the University of California in Los Angeles. With encouragement and support from the Wellcome Trust, D A Warrell was seconded to the University of Zaria, northern Nigeria, where he developed his interest in snakebite. There were also important exchanges with the University of the West Indies, where Hughes studied cerebral lupus erythematosus. But it was now time to become European. Dollery had been secretary and later president of the newly founded European Society of Clinical Investigation and many of us were members. In Germany there was a Pearse Club. The gastroenterology group had established cordial links with the department of Professor J J Bernier at St Lazare in Paris. Philippe Bordier from the Centre du Metabolism Phosphocalcique at Lariboisière held a part time lectureship in the school.

With the help of the British Council the school's courses were advertised in many European countries. They were an immediate success and brought increasing numbers of postgraduates from other European countries. The department of surgery followed suit and also began to attract European postgraduates. At the same time the department of medicine introduced a scheme of inviting a distinguished European clinical scientist as a visiting professor for one week during each of the year's three terms. In this way important links were created between the school and some of the best clinical research workers in Europe, and the development of a group of European clinicians at senior level, all of whom knew each other well, was further encouraged.

New direction of research

The overall direction of research in the department of medicine also needed reconsideration. Sir John McMichael, in the open day address that he gave on the school when he retired in 1966, showed a diagram of how he then viewed the relations between the different departments (fig 11). His commitment to clinical physiology was expressed by his view, a reflection of Sir Thomas Lewis's philosophy, that every physician should be a physiologist.[35] It all depended, of course, on what you meant by physiology. But by now it was clear that there were scientific lacunae within a school that sought to be in the forefront of clinical research.

We then needed doctors who were pharmacologists, biochemists, cell biologists, and immunologists just as now we need clinical molecular biologists. Sir John had set the scene for future developments in clinical pharmacology, and in the new Commonwealth building, opened by Her Majesty the Queen in the year of his retirement, he had ensured that there was space for C T Dollery to pursue his interests in pharmacology. Dollery's extraordinary energy had led him into a wide range of activities during his earlier career, starting with hypertension with McMichael and including the studies of the lung using isotopes produced by the cyclotron with J B West already referred to as well as the investigation and treatment of hypertensive and diabetic retinopathy with Eva Kohner and Graham Joplin. He was now focusing his work in the subject of clinical pharmacology. At the same time Sir Charles Stuart-Harris, one of the department of medicine's original assistants who was then chairman of the medical subcommittee of the University Grants Committee, told us that there was a real need for a department of clinical pharmacology that could train the teachers of the future. In 1969, with the help of the Wellcome Trust, Dollery was appointed professor of clinical pharmacology with his own independent department. It was an excellent move, which has been fully vindicated by the extraordinary success of the department in training a whole new generation of professors in this subject. Research in the department has included studies of the relations between different drugs when multiple prescriptions are given, and more recently the pharmacology of adrenaline, noradrenaline, and the prostaglandins.

Several members of the school were also interested in the possibility of developing a department of biochemistry, but this proposal failed on the grounds that there was no apparent postgraduate student body. We therefore turned to the creation of multidisciplinary groups that would bring biochemistry and clinical medicine together. This led to the formation of the endocrine unit under the joint direction of Russell Fraser and Ian McIntyre, again with support from the Wellcome Trust. In addition, individual research teams were to recruit biochemists to their strength, as both Milne and Sherlock had done earlier.

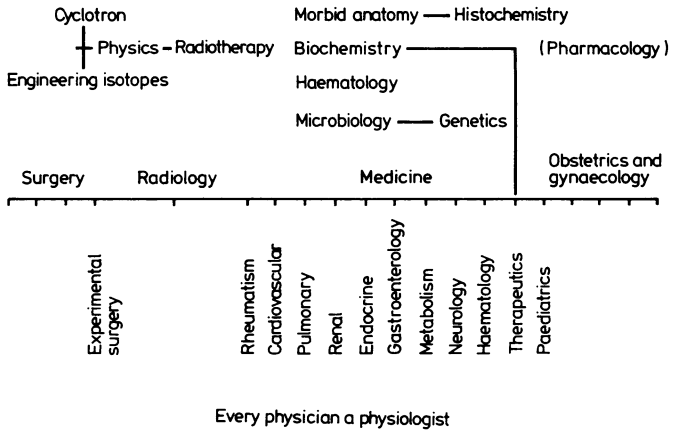

FIG 11—Organisation of the Postgraduate Medical School in 1966[35]. Reproduced by kind permission of the editor of the *Postgraduate Medical Journal*.

The third subject that required examination was immunology. It was a subject that was burgeoning but it had been little exploited in the school at that time, except in the department of haematology, where Sheila Worledge was carrying out excellent serological work in the blood transfusion laboratory, and in the department of clinical chemistry, where J R Hobbs was studying immunoglobulins. The first of the European visiting professors to the department of medicine, the late Professor J F Heremans of Louvain, played an important part in stimulating interest in immunology in the school. His lectures to the department of medicine were given every morning for a week to more than 200 people. Soon after his visit C L Cope retired. It might have been possible to have developed the subject within programmes of research in the department of medicine itself, but it was decided instead to create a new department within the division of pathology, and Cope's readership was transferred to pathology for the purpose of creating a chair. Robert Steiner as chairman of the academic board did sterling work in providing support for this development, and Peter Lachman was the first professor. He has since been elected a fellow of the Royal Society. In the mean time D K Peters had joined the department of medicine from the Welsh national school in succession to O M Wrong. His renal interests and his close association with Lachman led to a series of important studies on the role of complement in renal disease. Peters went on to pioneer the use of plasmapheresis in the treatment of renal disease associated with antibodies to the glomerular basement membrane.[36] His work has had important implications for other immunological diseases, in particular for the treatment of myasthenia gravis.[37] In gastroenterology W F Doe, a young Australian now professor of medicine at the National University at Canberra, was studying gut immunology and he too derived considerable inspiration from the new department.

Times of great activity

There was a price to pay for the move away from traditional clinical physiology, still dominant in many academic departments of medicine in Britain. J B West left in 1969 for California, depriving us of one of the world's best respiratory physiologists. The previous year E J Moran Campbell had been appointed to the foundation chair of medicine in the new school at McMaster, where he created an outstanding department.

Another opportunity arose to develop a multidisciplinary group crossing departmental boundaries when R H T Edwards, who had trained with Moran Campbell and was now working on muscle physiology in the department, obtained financial support from the Jerry Lewis Foundation to put up a building on a vacant rooftop to house his own research and that of Dr D K Hill from biophysics, as well as the studies of muscle biochemistry that Victor Dubovitz, Tizard's successor, was carrying out in children with muscular dystrophy. This highly successful group continued until Edwards succeeded C E Dent in the chair of human metabolism at University College Hospital in 1977.

Other influences during the period of the late 1960s were bringing departments together. The different cardiology groups, for example, formed themselves into a division. Haematology had originally been part of the department of pathology, and its members did not care directly for patients. Dacie's patients with paroxysmal nocturnal haemoglobinuria, whom he always himself painstakingly transfused with red cells washed in saline, were usually admitted under the care of a physician. McMichael in his later years, however, gave beds within his department to haematology, and with the building of the leukaemia unit to house the clinical work of the Medical Research Council unit directed by D A G Galton haematologists were increasingly to be seen on the wards, and Sir John Dacie himself would conduct ward rounds. In this way haematology at Hammersmith became a clinical as well as a laboratory discipline, an essential step in the development in recent years of the bone marrow transplantation programme.

Russell Fraser's retirement in 1974 led to a reappraisal of the research direction of endocrinology. Dr S R Bloom, then at the Middlesex Hospital, was making a name for himself in the measurement of the newly discovered gut hormones using radioimmunoassay and he now joined the department of medicine. Like D K Peters, he was appointed at the age of 30. He at once joined up with A G E Pearse and Julia Polak in histochemistry to form the team that has been so successful in the subject of regulatory peptides. New radioimmunoassays were developed for measuring these substances and immunocytochemical techniques made it possible to identify the types of cells associated with their secretion. This made possible the study of the pathophysiology of peptides such as vasoactive intestinal polypeptide and enteroglucagon, as well as many other substances, for the first time.[38] The group has a number of important firsts to its credit. Professor R B Welbourn, with his interest in endocrine surgery, collaborated fruitfully with this team, and the department of surgery contributed important expertise in experimental surgery.

In 1977 D K Peters was chosen to succeed me as professor of medicine. I had been asked by Sir John Gray, then secretary of the Medical Research Council, to consider becoming director of the Medical Research Council's clinical research centre at Northwick Park in succession to Sir Graham Bull. It was a difficult decision. At Northwick Park, however, there would be an opportunity to develop new initiatives in clinical research in this country, particularly in molecular medicine and in cell biology. Furthermore, I had been professor of medicine at Hammersmith for 11 years and from the point of view of the school there was clearly an opportunity to appoint someone younger and fresher than myself. In addition, it was clear that the type of work carried out at Northwick Park, with its emphasis by the Medical Research Council on the work of a district general hospital and service to a defined community, was entirely complementary to the high quality tertiary referral work that through the years had come to dominate clinical activities at Hammersmith.

Up to the present

My acceptance of the Medical Research Council's offer was obviously right for the department of medicine, which has gone from strength to strength. Immunological medicine has, naturally, been encouraged. There has also been a commendable zeal for the promotion of infectious disease as a clinical specialty. Dermatology had a much needed research boost, and a geriatric department, at first headed by Professor M Hodkinson from Northwick Park, was set up. Gastroenterology continued to carry out distinguished work, initially under the direction of V Chadwick, who has now been appointed to Horace Smirk's old chair in the University of Dunedin.

In radiology the development of modern imaging techniques for diagnostic purposes has accelerated in both quality and quantity. Professor D Allison has succeeded his legendary predecessor, who continues with support from the Medical Research Council to direct the school's excellent work on the exploitation of magnetic resonance imaging. Allison himself has developed techniques of interventional radiology, particularly in the treatment of vascular and malignant disorders. Other imaging techniques have included the work on positron emission tomography in the Medical Research Council cyclotron unit, which has recently been rewarded by the promise of a new machine.

The characterisation of the calcitonin gene was the result of a collaboration between McIntyre and the molecular biologist, R K Craig, working at the Middlesex Hospital,[39] but in other respects molecular biology has perhaps been slow to develop in clinical research at Hammersmith. Its importance in the modern era, however, was recognised by the appointment of Professor Lucio Luzatto to the chair of haematology, where he carries out distinguished work on the molecular genetics of glucose-6-phosphate dehydrogenase deficiency. Both the presence of Professor Beverley Griffin in virology and the recent acquisition of a distinguished microbial geneticist as professor of bacteriology strengthen molecular biology in the school. The school's European connections have been encouraged not only by Professor Luzatto's appointment but also by Professor Attilio Maseri's acceptance of the Sir John McMichael chair of cardiology in the school in succession to J P Shillingford. Professor L H Blumgart's innovative and original work in hepatobiliary surgery has stimulated the department, which he now heads. There have also been changes in the department of histopathology, where Professor N A Wright's studies of cellular kinetics are achieving international distinction.

Respects due

The importance through the years of good administration by the office of the dean deserves special notice. C E Newman, who began his decanal career as Colonel Proctor's assistant, provided a quality of self effacing integrity at a time when the school was growing, and he ensured that none of the giants who were his colleagues ever got their hands in the till at the expense of another. Selwyn Taylor was an excellent courtier when Her Majesty the Queen opened the Commonwealth building in 1966 and he presided over important changes in the school. Finally, M P W Godfrey provided the school with inspired leadership during the most difficult period of its history and brought it through stronger than ever. Dr D N S Kerr bravely continues in his distinguished footsteps.

Hammersmith has been, as Richard Crossman once said on a visit as Secretary of State, "a triumph of the human spirit over adversity." It is a place where there is always a fizz of excitement that gives a champagne quality to every day. Some years ago a Swedish visiting professor to the department of medicine wrote afterwards to tell me that he had never been anywhere where there was such a glow of enthusiasm for clinical research. Yet accustomed as he was to Sweden's immaculate clinical facilities, he could only bewail the fact that the work had to take place in such inadequate surroundings. He went on to comment that it must have been intentional so as to show students from the Third World how much could be done with how little. Happily this era is coming to an end with the approval of the building plan for the new hospital and the immediate start on the first stag#.

So to today and the beginning of a new half century. The opportunities for clinical research have never been so challenging or exciting. We stand at the threshold of an era when it will be possible to treat virus diseases, unravel the causes of cancer, understand the biology of mental illness, and probably introduce gene treatment. There is, therefore, even more need for this school now, with its commitment to clinical research and its radical and non-conformist tradition, than ever there was 50 years ago.

Many members of the Royal Postgraduate Medical School, past and present, have kindly responded to my queries about their experiences and contributions; to these, my friends and colleagues, I express my warmest thanks. I thank the Dean, Dr D N S Kerr, for permission to delve into the school archives, Sir John and Lady McMichael for particularly generous help and for permission to quote from the transcribed recordings of Sir John's memories of the early days of the school, and Dr M P W Godfrey, who kindly read the preliminary manuscript and made valuable suggestions.

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Isaac Newton

ANTHONY STORR

Isaac Newton is generally acknowledged to have been one of the greatest creative men of genius who ever existed. It also happens that he showed many striking abnormalities of personality, and at one time was considered mad by his contemporaries. His early history, moreover, is such that, to my mind, it is not surprising that he grew up to be eccentric. I want to examine two questions that may or may not be related. Firstly, how far were his adult peculiarities the consequences of his childhood circumstances, and, secondly, were his scientific achievements in any way connected with his personality?

There are those, even among psychiatrists, who deny that the experiences of early childhood play any important part in the formation of adult character, believing this to be the consequence of inheritance, hardly modified by circumstance. I do not find myself among their number, although I recognise that heredity must not only influence a child's response to adverse circumstance but may also determine which experiences he perceives as harmful. Newton's early childhood, however, was, as we shall see, so classically traumatic that I find it impossible to believe that it did not play a major part in shaping his personality.

The relation between his personality and his achievement is more dubious. Some like to believe that scientific discovery is entirely the result of intelligence combined with application. When I ventured to suggest that the structure of Newton's character and his discoveries might be related Sir Karl Popper, who was at the meeting at which I spoke, said: "I do not believe in the currently fashionable psychopathological interpretation of Newton. I think that Newton's theory is a clear answer to a definite problem situation. The problem situation was set by the work of Galileo and Kepler, and subsequent to their work various people attempted to solve the problem that Newton eventually solved. Newton was certainly one of the greatest geniuses of all time, and he exhibited talents of a very special order; but to explain his work as the result of, say, an obsession with unity seems to me empty talk, and to represent a very dangerous kind of psychologistic approach."[1]

I should, I suppose, have been abashed by being put in my place by one who has been described as the greatest living philosopher of science. Despite Karl Popper's strictures, however, I find it difficult to believe that intellectual achievement can take place in isolation from other features of personality. Although the mind of a scientist may seem, at times, to act like an impersonal calculator, there are, it seems to me, traits of character and circumstances that render this possible that are not shared by all of us. Even the most detached intellectual operations are motivated, I believe, by forces that are emotional in origin rather than purely rational, a conclusion supported by the philosopher Hume, who wrote: "Reason is, and ought only to be, the slave of the passions, and can never pretend to any other office than to serve and obey them."[2] This is not to say that I subscribe to the kind of interpretations that the more fundamentalist psychoanalysts are only too ready to advance. I do not believe that the wish to make sense out of the universe is a sublimation of sexual or aggressive drives in any direct or simple sense, but I do consider it likely that those who, like Newton and Einstein, prove capable of creating new models of the universe are unusual in ways besides the obvious one of being unusually intelligent.

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Formative years

Isaac Newton was born prematurely on Christmas day 1642. He was so tiny that his mother often remarked that at birth he was small enough to fit into a quart pot. His father, a yeoman without education, unable even to sign his name, had died three months