SIR REX EDWARD RICHARDS
28 October 1922 — 15 July 2019
Rex Richards was renowned for his research in the field of nuclear magnetic resonance (NMR). Very early on, in the late 1940s, when NMR was in the domain of physicists, he foresaw that the technique might play an important role in chemistry. He embarked on a highly successful research career in which he combined the design and development of new NMR spectrometers with novel applications, initially in chemistry and subsequently in the biological sciences. One major outcome was the establishment of the Oxford Enzyme Group’s NMR research programme. Another was the development of $^{31}$P NMR spectroscopy as a non-invasive method of probing the biochemistry of intact biological tissue. Rex was an outstanding teacher and mentor. He also had highly impressive administrative skills, as recognized through successive appointments at the University of Oxford as head of the Physical Chemistry Department, then warden of Merton College and finally vice-chancellor. He was subsequently appointed director of the Leverhulme Trust and became widely respected in the arts world, as reflected by his remarkable array of committee memberships at the National and Tate Galleries.

FROM COLYTON TO OXFORD

Rex Richards was born on 28 October 1922 in Colyton, Devon, the only child of Harold and Edith Richards. Harold was a builder by trade. He had inherited the business from his father and grandfather, and employed a dozen or so men. He was a gentle man, not very ambitious, a craftsman, and a sportsman—a natural ball player. Edith was a strong character, emancipated
Rex had a very happy childhood in Colyton (figure 1). It had been described in the mid-nineteenth century as a small market town (Jones 2020), and it remains a small town. The population of its parish, including the hamlets of Purlbridge and Colyford, increased from 1641 in 1801 to 2451 in 1841 (Jones 2020), to just 3165 at the 2011 census (Colyton Parish History Society, not dated). Yet the town has a rich history, and its grammar school, which Rex entered in 1932 following his primary education at the local elementary school, dates back to 1546. In Rex’s time, the school was sited in the neighbouring village of Colyford, following its recent relocation from Colyton (see Colyton Grammar School 2021).

As a child, Rex played lots of outdoor sports, and at home he used an upstairs room as a workshop/laboratory in which he built gadgets and carried out chemical experiments—in those days he could buy chemicals from the local pharmacist. His father was interested in radio, and Rex had access to numerous boxes of electronic ‘odds and ends’. At school, where he was head boy for two years, he was fortunate in having inspirational chemistry and physics teachers. In the sixth form he evidently made a very strong impression, and the headmaster, a gentleman called Mr Mackay Ohm, decided to enter him for the University of Oxford. Mackay Ohm made a special visit to Oxford on Rex’s behalf, walking around the science area and
Sir Rex Edward Richards

asking passers-by for advice about suitable colleges for a prospective chemistry student. One such conversation was with Freddy Brewer, of the Inorganic Chemistry Department, who told him: ‘Send him to St John’s where “Tommy” Thompson is the tutor.’ So Rex was duly entered for St John’s College, Oxford.

Rex, with his rural Devon upbringing, found Oxford a rather extraordinary and strange place when he went up for the entrance exam around Easter time in 1941. He had a nosebleed during the exam and covered his papers with blood, but nevertheless it must have all gone well as he was offered a place at St John’s as an exhibitioner. But all was not totally straightforward, for it was discovered that he needed some Latin (which he hadn’t been taught) to get into Oxford. Fortunately the headmaster’s wife, Mrs Mackay Ohm, stepped in and was able to coach him in the evenings, and he learnt sufficient from her to get through ‘Responsions’ that September. Then Rex was struck down with infective jaundice, so he missed the Michaelmas term. Eventually he went up as a chemistry undergraduate in January 1942, the first pupil of Colyton Grammar School, as far as is known, to enter Oxford.

Early years at Oxford

Rex must have found Oxford pretty tough at the beginning, especially as he started a term later than the other undergraduates. His tutor, Harold ‘Tommy’ Thompson (later Sir Harold Thompson, FRS 1946), was a distinguished young academic with a wide range of cultural and sporting interests; in due course he became perhaps most widely known as chairman of the Football Association. For his first tutorial with Tommy, Rex had been told to read up about monosaccharides. Tommy began the tutorial by saying: ‘Well, Richards, just write down the formula of galactose, will you.’ Rex succeeded with that one, but was soon floored and after about 10 minutes was told: ‘Oh well, Richards, I think you’ve got a lot to learn. You’d better do this again next week.’ That was the end of the tutorial. But Tommy’s tremendous energy and enjoyment of chemistry proved to be extremely stimulating, and Rex was evidently very appreciative of the tuition that he received during his time as an undergraduate. He was also able to build on the sporting skills that he had developed as a child—he played a lot of squash and represented the university at tennis.

These were war years, and there was a system at Oxford whereby each year a number of undergraduates were weeded out, based on special examinations. At St John’s there were about 60 undergraduates in Rex’s first year, of whom only about 15 remained to take finals. At the end of his first year, Rex assumed that he would be called up, and indeed he spent the whole of the summer vacation at Exeter barracks, but then he received a letter telling him to come back to Oxford. After his second year, he received his call-up papers, but again he was summoned back to Oxford. At the end of his third year, he took his Part I finals and then was able to continue into his fourth year, joining Tommy’s laboratory for his Part II research project on infrared spectroscopy. The lab’s research was directed towards the war effort and included analyses of aviation fuels, of synthetic rubbers used by the German army and of pesticides pertinent to the war in the tropics. Rex’s main project for his Part II was to work out the structure of benzylpenicillin. By that time it had been narrowed down to one of two structures. Rex’s infrared studies were suggestive of the oxazolone structure, which put him at odds with Dorothy Hodgkin (later Dame Dorothy Hodgkin, OM FRS 1947), who was working at the time on X-ray analysis of the crystal structure. She concluded—correctly—that it was
the beta lactam structure. It turned out that Rex had backed the wrong formula because of certain effects in infrared spectra of crystals that were unknown to them at the time. But it was a wonderfully exciting learning experience for Rex, especially as he also had the opportunity during his Part II year to work on designing and building infrared spectrographs; in those days commercial systems were not available.

Rex obtained a first class degree in 1945, and stayed on in the same laboratory for his DPhil studies. The work of the laboratory has been described in considerable detail by Rex in his memoir of Tommy (23). Here, suffice it to say that Rex continued to contribute both to the building of infrared equipment and to the use of this equipment to investigate the structures of a wide range of organic molecules (1, 2).

In 1947, at the age of 25, Rex was elected a fellow and tutor of Lincoln College, succeeding Nevil Sidgwick (FRS 1922). Meanwhile he had met his wife-to-be, Eva Vago, who had escaped with her parents from Hungary just before the war and was doing graduate work in chemistry. They married in 1948 and had two children: Jill was born in 1950 and Frances in 1953 (figures 2 and 3).

Following his appointment at Lincoln, Rex continued to use Tommy’s infrared apparatus for a while, focusing on the use of infrared intensities (3), an approach that had until then attracted little interest but became widely exploited in later years. However, it was soon time to become fully independent and to find another research avenue. He began to work on magnetic
susceptibility, including investigations of clathrate compounds (5). These are complexes in which molecules of one component (e.g. oxygen) are trapped in a cage formed by the other component (e.g. beta-quinol). Rex’s manufacturing skills came to the fore, and he designed a very sensitive calorimeter that, together with his student Dennis Evans (FRS 1981), he used to examine the thermodynamics of the clathrates; this was of considerable interest because of the unusual molecular environment of the trapped molecules (6, 9).

Meanwhile, Rex’s interest in magnetic susceptibility had led him to the initial papers from the USA reporting on the observation of nuclear magnetic resonance (NMR) signals (Bloch 1946; Purcell et al. 1946). It turned out that Bernard Rollin, in the Clarendon (physics) Laboratory just down the road, had built an NMR instrument and published his work on low temperature NMR measurements in *Nature* (Rollin 1946) not long after the Bloch and Purcell papers, so Rex went to see him. However, Rollin was discouraging, saying Rex would never get it to work and in any case it wouldn’t be useful in chemistry. But around that time (1947–1948) Linus Pauling (ForMemRS 1948) came to Oxford as the Eastman Visiting Professor. He was an old friend of Sidgwick, and one evening, over dinner at Lincoln, Rex mentioned to
Pauling that he’d like to have a go at NMR but that his physicist friends had advised against it. Pauling replied that he had learnt never to take the advice of physicists. So Rex returned to the Clarendon for further discussion with Bernard Rollin, who from then on was extremely helpful.

**NMR research**

*Research in the Physical Chemistry Laboratory*

NMR uses a magnet and radiofrequency transmit/receive technology to detect the intrinsic magnetic properties of atomic nuclei. Rex had to build his own spectrometer and, following Rollin’s advice, he chose to obtain a magnet from Tickfords. He managed to convince his head of department, Sir Cyril Hinshelwood (OM FRS 1929), to give him the £100 needed to buy this little 4-inch magnet (0.28 T). To achieve a stable field Rex made some ingenious improvisations, which are described in considerable detail elsewhere (see Oxford Brookes University 2011a). For the associated electronic equipment, he resorted to the equivalent of his father’s box of electronic odds and ends. This involved going to a place known as ‘the dump’ at the airport hangar in Abingdon, where he could buy surplus RAF and army radar sets for next to nothing. These sets contained electronic components that Rex used to build his spectrometer. After a number of false starts and after hour after hour of evening endeavour, he eventually obtained an NMR signal.

Rex soon set to work on using analysis of NMR line shapes to examine crystals whose structure was unknown. At the time there was some controversy about the structure of acid hydrates. One question was whether nitric acid monohydrate was HNO₃.H₂O or NO₃⁻.H₃O⁺. Rex and his student John Smith were able to show that it was the latter. Their paper on acid hydrates (4), published in 1951, was arguably the first in which a chemical problem was solved by NMR. The work describes determinations of molecular structures in simple crystals, proton–proton distances and potential barriers to molecular motion.

For several years, Rex continued in this line of research (7, 8), focusing in the first instance on ¹H (proton) NMR, in part because protons (i.e. hydrogen nuclei) are so abundant and give rise to strong NMR signals, but also because the results complemented findings from X-ray crystallography, which was not good at seeing the hydrogens.

Meanwhile, the chemical shift and spin–spin coupling interactions had been discovered (Gutowsky *et al.* 1951; Hahn & Maxwell 1951; Levine 2001). These discoveries greatly extended the potential of NMR as a means of tackling chemical problems, for now different chemical groups could, at least in principle, be distinguished according to the frequencies of their NMR signals. For example, the protons in a CH₃ group could be distinguished from those in a CH₂ group because they gave rise to signals of different frequencies. This ‘chemical shift’ arises because of the effects of local magnetic fields, which differ for the CH₃ and CH₂ protons. However, detection of the chemical shifts was problematic for many nuclei, including the proton. This is because the frequency differences are very small and, in order to visualize them, the field of the NMR magnet has to be extremely stable and homogeneous. For example, if the frequency difference between two signals is 1 part per million, the magnet stability and homogeneity need to be better than 1 part per million if the two signals are to be resolved from one another.
With a view to exploiting these effects, Rex obtained a sum of £180 to build a new magnet, a large electromagnet with a yoke made from cast iron that was obtained from the Cowley Iron Works just outside Oxford. This was a huge undertaking and required a great deal of perseverance (Oxford Brookes University 2011a), but unfortunately in the end the field homogeneity proved inadequate for proton spectroscopy. Instead, the magnet, which had a field strength of field 0.43 T, was used for looking at other nuclei that had larger chemical shifts. Rex then managed to persuade the Mullard company to build a permanent magnet that they would design together. He obtained a number of grants that together brought in the £2000 costs that he had agreed with Mullard, and when eventually the magnet was completed it was a great success, with excellent spectral resolution—about 1 part in $10^8$ (11). This magnet, as well as other magnets referred to in this memoir, is shown in figure 4.
The success of the Mullard magnet was in no small way a result of a discussion that Rex had with Marcel Golay in 1955. This took place during a period that Rex spent at Harvard. Rex went there as a research fellow in January 1955 for six months at the invitation of Robert Pound, who worked with the Nobel Prize winner Ed Purcell (ForMemRS 1989). This was a wonderful educational experience for Rex. Purcell had remarkable insights into all sorts of physical processes and Rex learnt more physics from him than from anyone else. At the same time, Rex acquired from Robert Pound a much deeper knowledge of the art of radiofrequency electronics. While in the USA, Rex visited the Perkin Elmer Corporation, and this was where he met Marcel Golay, who was an extremely bright inventor. Rex knew Perkin Elmer through the company’s interest in infrared, and Dick Perkin was a friend of Tommy Thompson. Over dinner with Golay, Rex mentioned the Mullard permanent magnet and the problems of compensating for residual field inhomogeneities.

After returning to Oxford, Rex received a letter from Golay setting out a design for a set of field-correcting coils (later known colloquially as ‘Golay coils’) that could in principle cancel out field inhomogeneities by means of a series of orthogonal adjustments. A set was installed on the Mullard permanent magnet and worked extremely well, although the adjustments proved not quite orthogonal. This magnet, though of relatively low field (0.7 T, or 30 MHz for protons) was subsequently used as the basis for a series of spectrometers manufactured by Perkin Elmer in the UK and later by other companies.

Rex and his group continued to work with a wide range of nuclei, one example being investigations relating chemical shifts to optical spectra in a number of cobalt complexes. The experiments provided an improved value for the magnetic moment of the $^{59}$Co nucleus and had important implications for Ramsey’s theory of the chemical shift (10). Ray Freeman (FRS 1979), the DPhil student who carried out these experiments, went on to have an extremely distinguished career in NMR.

In addition to relatively esoteric experiments such as this, Rex also maintained an interest in more practical applications of NMR, one example of which was the study of the liquid/solid content of fats (12). This collaborative work with Unilever was an early precursor of the subsequent use of NMR in the food industry.

Moving now into the 1960s, Rex continued with building new apparatus, and with exploring the NMR properties of a wide range of nuclei (e.g. 14, 15). With his postdoc John White (FRS 1993), he set up nuclear electron double resonance equipment (13), which was used for a series of experiments exploiting the so-called Overhauser effect (16,17). One of the main reasons for investigating the phenomenon was its ability to enhance nuclear polarization, but in this respect it proved a little disappointing as a general approach to enhancing the signal-to-noise ratio of weak NMR signals. However, the research provided a number of fresh insights into mechanisms of nuclear relaxation. Students involved in this research included Raymond Dwek (FRS 1998), who continued with NMR before moving on to a highly successful career in the field that he coined glycobiology.

Meanwhile important new developments in magnet technology were on the horizon that proved perfect fodder for Rex. The requirements for NMR magnets for use in chemistry were quite clear: they should produce a magnetic field that is as strong, stable and homogeneous as possible. This would optimize sensitivity (separation of signal from underlying noise) and spectral resolution (ability to distinguish signals from different chemical groups). The magnets that Rex had been developing and working with thus far, despite all the improvements over
the years, had a number of limitations in this respect, including the limited field strength of iron core electromagnets (approximately 2 T).

Superconducting magnets were to provide the solution. The commercial production of niobium/zirconium superconductors in the early 1960s made it possible to construct higher field homogeneous and persistent magnets, and Varian Associates rapidly took the initiative in producing their 220 MHz (5.2 T) spectrometer. However, this instrument was too expensive and insufficiently flexible for the type of research that Rex wanted to carry out at the time.

It so happened that in 1959 Martin Wood (FRS 1987) of the Clarendon Laboratory in Oxford had set up a new spin-off company, Oxford Instruments Ltd, to design and manufacture magnets for the academic world. When the superconducting technology became available, Oxford Instruments rapidly took it on board. Rex and Martin soon established close links, and thus began Oxford Instruments’ entry into the world of high-resolution NMR spectroscopy. Rex obtained funding from the Science Research Council for two high-homogeneity superconducting magnets that Oxford Instruments would build; the first would be a small model to test the design details, and the second, a bigger one, would take advantage of the lessons from the first.

After various struggles, the first magnet, which operated at 5 T, was delivered to Rex’s laboratory in 1966 and the second (operating at 7.5 T and built with niobium/titanium wire, which is much more stable than niobium/zirconium and works at higher fields) was delivered a couple of years later. However, major career changes were imminent.

Switch to biochemistry

In 1968 Rex was invited to be a candidate for the wardenship of Merton College, Oxford. Although this would mean standing down from his professorship, and would inevitably take time away from his research, he saw that it might be a timely opportunity for a switch in research direction towards an area he had been considering for some time, namely biochemical applications of NMR. So he put his name forward for the wardenship, was subsequently elected and by 1970 he had moved his research lab down the road to the Biochemistry Department, courtesy of Rodney Porter (FRS 1964), the professor of biochemistry.

Moving NMR equipment from one building to another is not an exercise to be undertaken lightly. But strategically the relocation proved to be a huge success, largely because it encouraged the integration of Rex’s team of physicists and chemists with biochemists, particularly those in George Radda’s team. George (FRS 1980) was a tutorial fellow at Merton and had built up an impressive young team of scientists exploring the structure and function of biological molecules. In addition, a stream of very bright postdoctoral scientists came from many parts of the world, contributing, for example, to new investigations of biological membranes (20). Lots of new ideas were bounced around, and the mix of scientific disciplines generated an unusually vibrant environment.

Unlike most other NMR groups, the team had decided to focus on the $^{31}$P nucleus. This was partly because of the biological relevance of phosphorus-containing compounds, but there was also a technical factor: field homogeneity remained problematic with these early superconducting magnets despite the continuing use of field-correcting coils, and $^{31}$P NMR was less demanding of field homogeneity than, for example, $^1$H NMR. The decision to focus on the $^{31}$P nucleus proved highly serendipitous, for in 1974 the 7.5 T spectrometer was used to obtain the first $^{31}$P NMR spectra of intact biological tissue. Signals could be seen from a number of key metabolites within excised rat leg muscle, including
adenosine triphosphate, phosphocreatine, inorganic phosphate and sugar phosphates (19). Energy-dependent metabolic processes could be monitored in real time by seeing how the signals changed over the course of the measurements. These findings opened up a brand new area of research, namely the non-invasive study of tissue biochemistry in vivo using NMR spectroscopy.

These were ground-breaking experiments that would not have taken place had it not been for the strongly interdisciplinary team that had emerged out of Rex’s relocation to the Biochemistry Department. While the integration with Georga Radda’s biochemistry group became increasingly influential, a central component was Rex’s team of physicists. Earlier on, Howard Hill had been a key figure in the design and construction of the 5 T spectrometer (18), but he left to join Varian in the late 1960s and David Hoult took over the reins, joining the group as a DPhil student in 1968 to work primarily on building the 7.5 T spectrometer. The system that he constructed (21) had the flexibility that permitted innovative studies such as those of living biological tissue, and the sensitivity that was needed in order to detect the relatively weak $^{31}$P signals generated by tissue metabolites.

Following the initial investigations of excised muscle, developments continued apace. These included the incorporation of techniques for maintaining tissues viable and functioning within the NMR spectrometer (Dawson et al. 1977, 1978; Garlick et al. 1977), and the emergence of wider bore magnets that permitted $^{31}$P studies of tissue metabolism, both in anaesthetized animals (Ackerman et al. 1980; Gordon et al. 1980) and then in human forearm muscle (Ross et al. 1981; Taylor et al. 1983). In parallel with all of this, a number of other centres were making remarkable progress in the development of magnetic resonance imaging (MRI) techniques, so that whole-body NMR machines became available that could be used both to image the human body and to investigate the chemistry of our tissues.

There was a second arm to Rex’s involvement in biochemistry research. When he had decided to move into the Biochemistry Department, it was not on the premise that NMR might be used for metabolic studies in vivo; this was unforeseen at the time. Rather, the idea was to use NMR spectroscopy to examine the structure and function of biological molecules (in particular enzymes) in solution, complementing X-ray studies of the molecules in crystalline form. The interest in this type of work had become so widespread, and came from so many Oxford departments, that it was decided to construct a new magnet, building on the experience gained with the 7.5 T system. A larger bore was required to give more room for the radiofrequency probe and to make homogeneity adjustment easier. The design of the spectrometer was very much a team effort. It involved collaboration between the magnetic resonance scientists, Oxford Instruments and Bruker, and a field strength of 270 MHz was chosen, which was three times that of the standard Bruker systems. This spectrometer was a great success and formed the basis of a long line of high-resolution magnets manufactured by Oxford Instruments. Under the guidance of Iain Campbell (FRS 1995), formerly a postdoctoral scientist in Rex’s lab, it was used extensively for many years for a wide range of enzyme studies. Rex was a strong enabling figure in this research, partly through his continuing links with Oxford Instruments and partly through his role as chairman of the Oxford Enzyme Group (see below; see also figure 5 for a photo of Rex with two members of the Enzyme Group).

This was a hugely successful period for Oxford NMR in many different ways. In addition to the various new spectrometers and novel biochemical applications, there were major developments too with some of the fundamental aspects of NMR signal detection. In particular, David Hoult generated a remarkable stream of innovative ideas and, together with
Rex, produced classic papers on spectrometer design and signal-to-noise (21, 22). Also, Ray Freeman, who had been one of Rex’s DPhil students in the 1950s, had returned to Oxford to embark on what would prove to be a highly successful NMR techniques programme in the Physical Chemistry Laboratory.

Yet, in the midst of this success, Rex’s role as an active research scientist was gradually coming to an end. Perhaps it was just that he thought the time had come for others to take over, but a key factor was that he was increasingly sought after for his administrative skills (see below). It had become clear that these skills were much admired in Oxford and beyond. Within Oxford, this all culminated in his appointment as vice-chancellor for the period 1977–1981, as a result of which he inevitably had little time for the lab. In retrospect, this was a pity, in part because it would have been good for Rex to share more fully in what proved to be a golden period for the laboratory and for NMR in Oxford more generally, but also because, had he stayed more active in the field, it might well have been that the Oxford research effort, impressive as it was, could have been even more outstanding, not least through Rex’s enabling skills and encouragement of cross-disciplinary collaboration.

**ACADEMIC ADMINISTRATION AT OXFORD**

Rex’s first major administrative responsibilities came with his appointment as Dr Lee’s Professor of Chemistry in 1964, which was associated with a departmental role as head of the Physical Chemistry Laboratory. He made many changes in the way the department was run, putting much more emphasis on the weekly seminars, on consultation with his colleagues.
and on promoting interactions among the various research groups. This consultative and enabling manner pervaded his whole career. Through a number of retirements and creation of new lectureships he was soon able to put his stamp on the department, and several new appointments were made, including Keith McLauchlan (FRS 1992), John White (FRS 1993), John Albery (FRS 1985), Graham Richards (FRS 2018), Peter Atkins and Richard Wayne. All introduced new areas of research into the Physical Chemistry Laboratory, which was seen as unusually innovative on a world scale.

In 1969 Rex became warden of Merton College, a position he held until 1984. During his tenure there, major initiatives included recruitment of undergraduates from a wider range of schools, as well as the admission of women as fellows and students. The college achieved extremely impressive standards of scholarship, while maintaining a high level of informality. This informal style was epitomized by the delightful way in which Rex and his wife Eva entertained students in the warden’s lodgings, six at a time, both to lunch and to dinner. They could make the shiest and surliest of students feel at ease. Rex was very much a modernizing influence, and the college thrived under his leadership.

During his time as warden of Merton, Rex was also chairman of the Oxford Enzyme Group, which brought together a number of distinguished scientists with interests in exploring enzyme structure and function. It was the funds obtained by the Oxford Enzyme Group that enabled Rex and his colleagues to commission the 7.5 T spectrometer mentioned above. Rex later wrote:

During the first 10 years, we managed to keep about 20 prima donnas from a wide range of departments meeting regularly every other Monday evening and collaborating in a range of work, mainly on the enzymes of glycolysis. There were some difficult times, but for most of the time the collaboration worked very well indeed and the relationships between the members were good.

Given that Rex was invariably a model of politeness, his words perhaps suggest that some of his fellow Enzyme Group members did not always embrace the spirit of cooperation and collaboration quite as enthusiastically as he would have wanted!

With Rex’s appointment as vice-chancellor of Oxford for the period 1977–1981, his other commitments inevitably took a back seat. Not only was he kept exceedingly busy for these four years, he also had university responsibilities during the two year run-up to his vice-chancellorship, and as understudy for the subsequent vice-chancellor for two years afterwards. Among the achievements of his tenure, Green College and the Nissan Institute of Japanese Studies were founded, and money was raised to build an annex to the Biochemistry Department that included housing for the high-resolution NMR equipment—this was named the Rex Richards building.

LEVERHULME TRUST

In 1983 Rex was invited to become director of the Leverhulme Trust. By this time, he had had a long break from science and it would not have been easy to return to the lab, especially as so many of the developments that had taken place in the intervening years were in areas of biochemistry and biomedicine that were new to him. It was also time to hand on the reins at Merton. So he decided to accept the invitation from the Leverhulme Trust, and he moved there in 1984. The Trust, a large grant-making organization, supported a wide range of disciplines
embracing both the arts and the sciences, a mix that appealed very much to Rex. Although most of the grants were for research, the Trust also supported the major institutions for the performing arts, such as the music academies, the Royal Ballet School, the Contemporary Dance School and the Royal Academy Arts School. Rex was fascinated by the variety of topics and the quality of the projects that the Trust was able to support, and greatly enjoyed the continuing links that he was able to maintain with young people. Again, he was a great modernizing influence, not least on the office system. Not only did he furnish the Trust with new computer hardware, he also designed and wrote the office software—so successfully that it remained in use for years after his retirement in 1994.

**Academic medicine**

Rex was much sought after in the medical world for his skills as a committee man. He was well-organized and well-prepared, polite, patient and charming, always ready to listen to others’ views but strong enough to be decisive and to make unpopular decisions if necessary.

His incursions into medical politics began on his first day as vice-chancellor of Oxford when he was informed that the new John Radcliffe Hospital, to which the university had added a building costing many millions of pounds, was ready for opening but the Health Authority did not have the money to open it. Rex immediately decided that he should chair the Medicine Board, and he continued to do so for the next four years.

After joining the Leverhulme Trust in 1984, Rex was asked to chair the British Postgraduate Medical Federation (BPMF), which was the controlling body of a group of major medical research institutes in London. A year into the post, he was asked to find a new director and he was fortunate to be able to appoint Michael Peckham. Together they and their committee made great progress in modernizing the BPMF and helping to strengthen the institutes in the face of the numerous challenges confronting state-of-the-art medical research. Soon after he retired, the various institutes, much invigorated, were incorporated into the London colleges as part of a major reorganization within London academia.

Then Rex was asked by the House of Lords Select Committee on Science to chair a working party to look into the conditions of academic medicine. He persuaded a number of very high powered people to join the group, and after much endeavour over a period of about 18 months, they reported in 1997. Numerous conferences and discussions arose out of the report, and there was a particularly favourable response from the surgeons.

**The arts**

Over the years, Rex developed a strong interest in the arts, and he and Eva gradually built up a distinguished modern art collection. Rex’s involvement with the arts can be traced back to the 1950s, when he was a fellow of Lincoln. At the time, the college received a generous benefaction subject to the condition that part of it should be used for the encouragement of the visual arts. The college decided to have an art exhibition from time to time, with associated lectures given by the selected artist. Rex suggested that they invite Henry Moore. An exhibition was duly held, but as Moore did not believe in talking about his work, Kenneth Clark gave the lectures instead. Moore stayed at Lincoln for about a week, and this was when he and Rex first got to know each other.
Much later on, during the early 1970s, Rex, together with Sir John Cornforth (FRS 1953) and Sir David Phillips (FRS 1967), was asked by the Royal Society to organize a portrait of Dorothy Hodgkin. Dorothy was a member of the Order of Merit, as were Graham Sutherland and Henry Moore, and Rex correctly presumed that they all knew each other. So Rex wrote to Graham Sutherland, who replied very warmly and agreed to do a portrait of Dorothy, even though an appeal had raised only a modest sum of money for the commission. Sadly, Sutherland died before he was able to complete the portrait. However, about a week after his death, two of Sutherland’s water colour sketches of Dorothy were delivered to Rex’s house. Rex passed these on to the Royal Society, where one of them is displayed. Rex then wrote to Henry Moore, who had a particular interest in portraying hands. He did several pencil drawings of Dorothy’s hands, which had been deformed by arthritis when she was a child and yet were capable of highly delicate work. One of these pencil studies was worked up into an ink, crayon and wash drawing. That, too, is hanging in the Royal Society, while the original pencil drawing belongs to the Henry Moore Foundation. Some years later, Rex was able to fulfil his original mission by persuading Bryan Organ to paint a portrait of Dorothy Hodgkin for the Royal Society. Organ had previously painted Rex’s portrait for Merton College (figure 6), the style of which no doubt raised numerous eyebrows at the time, for its modernity was in stark contrast to the more traditional portraits that had hung in the Merton dining hall over the centuries.

Following Rex’s renewed acquaintance with Henry Moore, Rex and Eva visited him on a regular basis until Henry’s death in 1986. Then in 1989 Rex was invited to become a trustee of the Henry Moore Foundation, and in due course he took over as chairman from Lord Goodman. He greatly enjoyed it there, particularly when various legal issues had been settled and they were able to focus more fully on the real affairs of the Foundation. It is worthy of note (for by now he was hardly a young man) that Rex made use of the programming skills that he had built up at the Leverhulme Trust to write a comprehensive system that would look after the grants programme of the Foundation.

Rex was evidently hugely respected in the arts world, and this is reflected in his remarkable array of committee memberships. In 1978, he was invited to be a member of the Scientific Advisory Committee of the National Gallery, and later on, in the 1990s, he chaired the committee. Through his work on the committee, he was able to help the gallery keep their equipment and techniques at the forefront of technology. In 1982 he was appointed a trustee of the Tate, at which time he was also asked to be cross-representative of the Tate on the board of the National Gallery. He was a trustee of both until 1988, and was later asked to return as trustee of the National Gallery in 1991 and to be cross-trustee at the Tate, so he served both galleries again from 1991 to 1993. After 1993, Rex continued to be a member of the Scientific Advisory Committee of the National Gallery. He was also chairman of the National Gallery Trust and of the National Gallery Trust Foundation for many years. He gave up the chair in 2000, but was asked to stay on as a trustee. Rex was very proud to have played a significant part in the appointment in 1987 of Neil MacGregor as director of the National Gallery.

**REX AND THE YOUNGER GENERATIONS**

Rex was very much at ease with the younger generations, and this came to the fore in his role as warden of Merton (see above). Despite his remarkable achievements within so many
arenas, he displayed no signs of pomposity or arrogance. He showed none of the trappings of fame and glory (apart perhaps from his art collection, which in any event was a private matter); in fact, he seemed to have a relatively modest lifestyle—and he was very much a family man.

Rex was much admired not just for his research but also for his teaching skills. According to Keith McLauchlan, in the 1960s Rex was several times voted the best lecturer in Oxford (not just chemistry) in student surveys. Rex’s style as a research supervisor has been commented on by Ray Freeman, one of his students from back in the 1950s. Ray wrote (Freeman 2012):

I learned a great deal by simply observing Rex in action – teaching by osmosis. Rex clearly understood the importance of a ‘hands off’ style of supervising research. A neophyte student was allowed the chance to shrug off the doctrine (inherited from the undergraduate courses) that there is always a correct, prescribed way to attack a scientific problem. For the very first time, one could use one’s own initiative and perhaps discover new things for oneself. Trial and error, with a large
dose of the latter. I suppose it was inevitable that, many years later, I adopted a similar *laissez-faire* approach to supervising my own students. In retrospect I realize that in the background Rex had been quietly guiding my career.

Rex no doubt quietly guided the careers of many of his students and younger colleagues. I was one of those students, and recall that in 1973 I was looking after the magnets in Rex’s lab over the Christmas period. I was using the time to attempt to improve the field homogeneity, which had been proving problematic. I inadvertently forgot to switch off one of the superconducting field correction coils and returned the following morning to find ice around the magnet, which had quenched (dissipated its energy) because the helium had run out. This is potentially very damaging to the magnet and I was utterly devastated. Rex came in, took the magnet apart, discovered a broken wire (nothing to do with the quench, which had thankfully caused no damage), fixed it and re-energized the magnet. The field homogeneity was better than it had been for a long time, and within a couple of months the first groundbreaking $^{31}$P NMR studies of intact tissue were carried out. Not only that, Rex and his family were also extremely hospitable hosts to me over Christmas!

**Childhood influences**

Rex spoke very fondly of his childhood in Devon, including his father’s enthusiasm for building things. It is surely no coincidence that a central theme of Rex’s research, one that stands out above all else, is his interest in the design and building of novel apparatus, starting with near infrared spectrographs and then moving on to NMR spectrometers of ever higher sensitivity and spectral resolution. In his own words ‘it all went back to my father’s day ... I felt that ... if we had an idea ... I could make it’ (Oxford Brookes University 2011a). It is clear that his father’s very high standards of craftsmanship, as well as his interests in electronic gadgetry, left a deep impression on Rex. So too did the administrative skills and strength of character of his mother, traits that Rex displayed so admirably. Moreover, Rex’s relatively modest background was, it seems, an influential factor when it came to making career decisions. According to Keith McLauchlan, Rex once mentioned that he had come to the view that if a new opportunity or challenge became available to him, especially one that he could never have dreamed of back in his days in Colyton, he should take it with open arms. And with each of the opportunities that he embraced he was hugely successful.

No doubt, too, Rex’s happy Devon childhood contributed to the decisions that he and his wife eventually made, and their daughters’ families also, to return to live in the West Country following their days in Oxford.

**Concluding remarks**

In concluding this memoir, what could be better than to provide another quote from Ray Freeman? ‘It is hard to adequately set out the enormous contribution that Rex made to science and education during his charismatic career. The first person in Britain to have the vision that NMR would revolutionize chemistry, and then build his own NMR spectrometers from scratch in a department largely dedicated to wet chemistry. A superlative undergraduate tutor, research supervisor, and an outstanding mentor.’
Sir Rex Edward Richards

HONOURS AND AWARDS

1954 Corday–Morgan Prize, Royal Society of Chemistry
1959 Fellow, the Royal Society
1970 Fellow, the Royal Society of Chemistry
1976 Davy Medal, the Royal Society
1977 Knight Bachelor
1986 Royal Medal, the Royal Society
1987 Honorary Fellow, the Royal College of Physicians
1990 Honorary Fellow, the British Academy
1990–1992 President, the Royal Society of Chemistry
1991 Honorary Fellow, the Royal Academy of Music
1995 Associé étranger de l’Académie des sciences, Institut de France

Rex received honorary degrees from more than 10 universities and was chancellor of the University of Exeter from 1982 to 1998.

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AUTHOR PROFILE

David Gadian

David Gadian’s research career has focused on the development and application of magnetic resonance techniques. He read physics as an undergraduate at Merton College, Oxford, and then moved to the Biochemistry Department in Oxford for his doctoral and postdoctoral research, where he worked in Rex Richards’ laboratory in close collaboration with George Radda’s group. During this time (1971–1982), he contributed to the development of $^{31}$P NMR spectroscopy as a non-invasive method of studying metabolism in vivo. He then moved to the Royal College of Surgeons of England to establish the new Department of Physics in relation to Surgery. In the early 1990s, he relocated with his group to the Institute of Child Health, which later became part of UCL. Together with colleagues in radiology, neurology and cognitive neuroscience, he and his group built up a magnetic resonance research programme combining experimental studies with investigations of brain damage and its functional consequences in children. He was elected fellow of the Academy of Medical Sciences in 1999.
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