SIR RICHARD DOLL CH OBE
28 October 1912 — 24 July 2005
In 1950 Richard Doll and Bradford Hill (later Sir Austin Bradford Hill; FRS 1954) showed that smoking was a cause, and an important cause, of the rapidly increasing epidemic of lung cancer in the UK. In 1951 they started the prospective study of smoking and mortality in British doctors that Doll continued for 50 years, showing that half of all smokers are eventually killed by their habit and that stopping smoking is remarkably effective. Between 1950 and 2005, overall UK death rates decreased by half in middle age; more than half of this decrease was due to the decrease in mortality from smoking.

Although best known for his work on tobacco, Doll did an extraordinary range of other medical research, quite apart from getting clinical medical education established in the University of Oxford (which now has a major medical school) and founding Green College in Oxford (now Green-Templeton College, with 500 graduate students).

Sixty years ago cancer was generally thought of as a natural consequence of old age, much like grey hair, wrinkled skin or conservative opinions. Doll showed that this was wrong, and that most cancers have avoidable causes. He was also a key figure in analysing and interpreting age-specific cancer rates and time trends in cancer rates, which again indicate that much cancer is, at least in principle, avoidable. He showed, more clearly than anyone, that each case of cancer arises from a combination of nature, nurture and luck (figure 1).

**EARLY INFLUENCES**

Richard Doll was born at Hampton Hill, Middlesex, on 28 October 1912. He was the elder son of Henry William Doll, a physician and surgeon, and his wife, Amy Kathleen, née Shaboe, concert pianist. He was educated at Westminster School, where he showed a flair for mathematics and considered studying it at university. Instead he studied medicine, and by chance...
became an epidemiologist—an ideal vocation for a numerate doctor with a social conscience, because it permitted him to apply his talents to major public health problems around the world.

Much of Doll’s upbringing at home was by his Victorian grandmother. When he left school in 1931 he was turning away from religion and towards pacifism and socialism, influenced by World War I and by the growing numbers of demoralized unemployed. As a medical student at St Thomas’ Hospital, London (1931–37), he delivered babies in the slums of Lambeth and was appalled by the living conditions, malnutrition and poverty. He became increasingly aware that much disease and premature death could be prevented by social change. He helped organize the St Thomas’s Socialist Society, joined the Communist Party, and visited Soviet Russia. He participated in the Jarrow march in 1936, a mass protest against unemployment, providing first aid to the marchers, and energetically helped raise funds for medical aid to the republicans in the Spanish Civil War. His early life is well described in the authorized biography by Conrad Keating (Keating 2009).

Soon after Doll qualified, World War II began. Before it started he had already predicted and accepted the necessity of war with Nazi Germany and had volunteered for the Royal Army Medical Corps, with which he served throughout the war. Three days after the outbreak of hostilities he went to France as medical officer to a regular battalion, the First Loyals. He treated and helped evacuate many wounded through the chaotic retreat to Dunkirk, despite sustained shelling and air attack, taking charge when other officers were lost, and leading men
to safety. (Forty years later, his vivid Dunkirk Diaries were serialized by the *British Medical Journal* (12)*.) In 1941 he was sent to Egypt, travelling via the Cape (with Archie Cochrane), and served as medical officer in a Cairo infectious disease ward and then on a hospital ship in the Mediterranean that was closely involved with the Salerno landings. He developed renal tuberculosis and was repatriated in 1944; the kidney was removed, and he recovered.

He met his future wife, Joan Mary Faulkner (1913–2001; see figure 2), who was at the time married to Hugh Charles Faulkner, at a meeting of communist doctors in the early 1930s. She was the formidably intelligent daughter of Charles Duncan Blatchford (a son in Blatchford and Sons, artificial limb manufacturers) and Susan Margherita, *née* Rota (a forceful Italian who had grown up in the Lambeth area, and eventually lived with Richard and Joan for many years). Like Richard, Joan was committed to political change, only partly to improve health, and both campaigned for the establishment of a national health service in Britain, in 1948 jointly writing a pamphlet entitled ‘Humanise our hospitals’. They remained communists (although increasingly uneasily so, after the 1948 Lysenko affair) for some 20 years, but after the Soviet invasion of Hungary in 1956 and Nikita Khrushchev’s secret speech describing some of the realities of the Stalin era they resigned and came to accept the impracticality and undesirability of centrally planned command economies.

Doll proposed marriage to Joan on 8 May 1945 (VE Day, when the war ended in Europe). She divorced, and they eventually married on 4 October 1949, at Kensington register office, Doll thereby becoming stepfather to her son, Tim. As Joan could not have further children, they wanted to adopt; however, the Dolls were atheists and at that time adoption agencies

* Numbers in this form refer to the bibliography at the end of the text.
required evidence of the Christian commitment of prospective adoptive parents. With advice from the British Humanist Association they set up the Agnostics’ Adoption Society. It was initially based in their home, and the Dolls used their own funds to help hire its first social worker. The society grew considerably, changing its name in 1964 to the Independent Adoption Society and expanding its remit. The Dolls themselves adopted two children, Nicholas in 1954 and Catherine in 1956.

At the suggestion of Joan, by then a rising administrative star at the Medical Research Council (MRC), Doll began his research at the Central Middlesex Hospital with the eminent gastroenterologist Francis Avery Jones, studying peptic ulcer, and conducting perhaps the first randomized clinical trial to use a factorial design. Although Doll soon moved elsewhere, he was considerably influenced by Avery Jones’s scientific temperament and continued to do some research and clinical work in gastroenterology at the Central Middlesex until moving to Oxford in 1969.

Concurrently Doll (and several other postwar doctors who wanted to help make a better world) began to study medical statistics in 1946 at the London School of Hygiene and Tropical Medicine under an extraordinarily influential epidemiologist and teacher, Austin (Tony) Bradford Hill, just as Hill was introducing the medical profession to randomization. In 1947 Hill was asked by the MRC to investigate the reasons for the rising mortality from lung cancer in the UK. Hill had observed the quality of Doll’s research with Avery Jones and offered him a research post, seeking new causes of lung cancer. Doll and Hill’s long collaboration discovered the main hazards of smoking, helped change the ways in which causes of chronic diseases such as cancer would be investigated and understood, and greatly strengthened the discipline of epidemiology.

SMOKING, LUNG CANCER AND OTHER DISEASES

The mortality attributed to lung cancer in the UK (among people of a given age) had been increasing rapidly for decades. It was known by 1947 that part of this increase was an artefact, caused by the increasing ability of doctors to recognize the disease. Such artefacts should, however, have affected men and women similarly, yet the proportional increase was far steeper in men. These lung cancer trends did not attract much attention until after World War II. Many then blamed increasing atmospheric pollution, perhaps from coal smoke, and Doll himself originally thought the increase might well be due chiefly to occupational factors, or to the tarring of roads, as there were known animal carcinogens in tar.

The results of Doll and Hill’s first study published in 1950 were, however, clear. The one consistent difference between lung cancer patients (cases) and other patients (controls) was that almost all of the lung cancer patients had smoked. Doll and Hill concluded that smoking was ‘a factor, and an important factor, in the production of carcinoma of the lung’ (1).

Four American studies also published in 1950, including one of comparable size by Ernst Wynder and Evarts Graham (Wynder & Graham 1950), independently found the same association, as had two smaller German studies (Müller 1939; Schairer & Schoniger 1943) that had been largely or wholly overlooked in England and America. Doll and Hill’s second report (2), published in 1952, cited all these American, German, and British studies as being mutually supportive (and Doll consistently cited all of them in his historical perspectives written in the 1980s (10) and 1990s (14)). Extraordinarily, even with such strong evidence so clearly
presented from case–control studies, most of the medical and scientific community in the early 1950s, many of whom themselves smoked, still did not accept that smoking could cause lung cancer, and argued that there must be other explanations for the association.

Doll and Hill understood, of course, that a few non-smokers would get lung cancer (so smoking was not a ‘necessary cause’ of the disease) and that many smokers would not get lung cancer (so smoking was not a ‘sufficient cause’ of the disease), but that among otherwise similar smokers, there was a substantial increase in the probability of developing the disease in the near future (so smoking was an important cause of the disease). Appropriate use of the term causality to describe increased probabilities rather than certainties is now widely accepted, but some found difficulty with it at first.

Although Doll and Hill understood that there was already proof beyond reasonable doubt that smoking was an important cause of lung cancer, they also understood that further research was needed, partly to help convince sceptics and partly to see whether smoking also caused other diseases. (Hill made the latter point clearly in his Cutter lecture (Hill 1953), before any results emerged.) In 1951 they enrolled 40 000 British doctors into a new type of study, asking them about their smoking habits and then following them prospectively over many years to see what the doctors died of. Some 50 years later, Doll wrote about the origin of the British Doctors Study and how it had continued to contribute to knowledge over five decades. (This was the last thing Doll wrote for publication, just one month before he died, and it was published posthumously by the charity, Cancer Research UK).

**Doll’s description of his 50-year prospective study of mortality in relation to smoking among British doctors**

In 1948, at the request of the Medical Research Council, Bradford Hill and I started a retrospective study to try to find out why the mortality from lung cancer had increased so enormously between the two world wars. To do this we obtained personal histories from a large number of patients with and without the disease and, within two years, were led inexorably to the conclusion that the principal reason was the smoking of cigarettes. Both of us were smokers and neither had expected this to be the result of our enquiry. We showed our findings to Harold Himsworth, then Secretary of the Council, and he agreed with our conclusion. ‘It will be a sensation’ he said ‘when you publish your findings.’ He could not have been more wrong, for when the findings were published, they were almost totally ignored.

The Department of Health’s Advisory Committee on Cancer advised the Department to do nothing about it, despite the fact that cancer of the lung had by then become the leading cause of death from cancer in men and that 80 per cent of men smoked. The Committee said that the statistical association between smoking and lung cancer did not prove causation and that it would only scare people to tell them that smoking might be dangerous. Clearly, some new type of evidence was going to be needed if such people were to be convinced.

A new approach quickly suggested itself. Get several tens of thousands of apparently healthy people to describe their smoking habits prospectively, follow them for some years, obtain the causes of death of those who died and see if knowledge of their smoking habits allowed prediction of the relative risks of dying from lung cancer, and from various other diseases. Doctors, it was thought, should provide a suitable population to study as they would be easy to follow, since they had to keep their names on a medical register if they wished to continue to practise, and they might, having had some scientific training, describe their smoking habits relatively accurately. The British Medical Association was willing to help and sent a letter from us to 60,000 British doctors. Useful replies were received from 34,000 men and 6,000 women and within three years our previous findings for lung cancer were almost exactly reproduced. The study had been planned to continue
for only five years, but after the first five years the findings suggested that smoking might also cause some non-malignant conditions, most notably myocardial infarction, and it was decided to continue for longer. Eventually, follow-up continued for 50 years.

Bradford Hill retired and withdrew from the study after we reported the 10-year findings. A few years later Richard Peto joined me, accompanied me to Oxford in 1969, and took a major part in analysing and interpreting the 20-year and, eventually, the 50-year findings. Information about changes in smoking habits was obtained periodically, and although some of the smokers continued, many stopped permanently, allowing us to study not only the hazards of smoking but also the benefits of stopping. The 50-year results showed that lifelong cigarette smokers lost about ten years of healthy life expectancy, but that stopping at ages 60, 50, 40 or 30 gained, respectively, three, six, nine or almost the full ten years.

One interesting, but unanticipated, finding was the progressive reduction in mortality among elderly non-smokers, presumably due in large part to advances in medical care. The probability that a 70-year-old would survive to 90 was only 12 per cent at our 1950s non-smoker death rates, but it was 33 per cent at our 1990s non-smoker death rates. Still, however, few would survive to 100.

Richard Doll, Oxford, June 2005

On 26 June 1954 the British Medical Journal published the first prospective results from the British Doctors Study, confirming that lung cancer rates were much higher in smokers, and increased with the amount smoked (3). In 1956 Doll and Hill reported that smokers also had higher death rates from heart disease, chronic lung disease, and many other conditions (4). In 1957 the British (because of Doll and Hill) and Dutch were the first governments to accept officially that smoking caused lung cancer; now, all governments do so.
Doll succeeded Hill as director of the MRC statistics unit in 1962, and their 10-year findings appeared in 1964 (6). By then, competent scientific doubt about smoking as a cause of lung cancer was past, and a consensus was emerging that smoking also killed even more people by other diseases than by lung cancer.

Doll continued for 50 years to follow meticulously every British doctor he had originally recruited in 1951 who still lived in Britain. Richard Peto, statistician and (eventually) epidemiologist, joined Doll in 1967 and collaborated closely on the prospective study of doctors, and much else, until Doll’s death in 2005 (figure 3).

Over these decades the epidemic of smoking-related deaths in Britain (and elsewhere) was evolving in complex ways. On 26 June 2004, exactly 50 years after the early follow-up was published (3), the British Medical Journal published the 50-year follow-up, showing that persistent cigarette smokers born in the first few decades of the twentieth century died, on average, 10 years earlier than otherwise similar non-smokers (figure 4) (15). Importantly, the study also showed that stopping smoking was remarkably effective at reducing the risk of dying prematurely (figure 5).
Doll lived long enough to see the situation in Britain transformed. By 2005 there was widespread cessation of smoking (figure 6), and the proportion of the male population killed by tobacco before the age of 70 years had fallen from 20% at 1970 death rates (half of all male mortality in middle age) to just 5% (figure 7). In 1970 British men had the worst rates in the world of premature death from tobacco, but over the next few decades they had the world’s greatest decrease in such deaths. Most of the decrease in cancer mortality in Britain the past few decades, especially among men, has been due to the decline in incidence of smoking-attributed cancers (figure 8).
Although best known for his work on smoking, Doll also showed, more clearly than anyone, that cancer arose, sometimes over a period of many decades, from a combination of nature, nurture and luck. During the 1960s he was a key figure in bringing together statistics from cancer registries around the world by the newly established World Health Organization International Agency for Research on Cancer (WHO IARC), in Lyon, France. In 1966 he co-edited the first volume of IARC’s *Cancer incidence in five continents* (7) describing and
Table 1. Future perfect: Doll and Peto’s 1981 tabulation of what was likely eventually to be known about the proportions of all cancer deaths (at 1978 US cancer death rates) attributable to various causes, or groups of causes. From (9).

<table>
<thead>
<tr>
<th>best estimate (%)</th>
<th>range of acceptable estimates (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>tobacco</td>
<td>30</td>
</tr>
<tr>
<td>alcohol</td>
<td>3</td>
</tr>
<tr>
<td>diet</td>
<td>35</td>
</tr>
<tr>
<td>food additives*</td>
<td>&lt;1</td>
</tr>
<tr>
<td>sexual behaviour</td>
<td>1</td>
</tr>
<tr>
<td>yet-to-be-discovered hormonal analogues of reproductive factors</td>
<td>−6</td>
</tr>
<tr>
<td>occupation</td>
<td>4</td>
</tr>
<tr>
<td>pollution</td>
<td>2</td>
</tr>
<tr>
<td>industrial products</td>
<td>&lt;1</td>
</tr>
<tr>
<td>medicines and medical procedures</td>
<td>1</td>
</tr>
<tr>
<td>geophysical factors (mostly natural background radiation and sunlight)</td>
<td>3</td>
</tr>
<tr>
<td>infective processes</td>
<td>10†</td>
</tr>
<tr>
<td>unknown</td>
<td>?†</td>
</tr>
</tbody>
</table>

| total: 200% or more† |

* The net effects of food additives may be protective, for example against stomach cancer.
† Since one cancer may have two or more causes, the grand total in such a table will probably, when more knowledge is available, greatly exceed 200%. (It is merely a coincidence that the suggested figures in the present table happen to add up to nearly 100%.)

comparing the age-specific incidence rates of many different types of cancer in many different populations. Since then a further eight volumes have been published, each with new data, and these IARC volumes are the main source of information for researchers and policy makers on the global incidence of cancer.

Doll’s influential Rock Carling lecture, published as a monograph in 1967 entitled *Prevention of cancer: pointers from epidemiology*, summarized the understanding that had by then developed of the avoidability of each major type of cancer (8). It was known (largely from studies in the USA) that cancer rates in migrants tended to be similar to those of their country of origin, but that within a generation or two incidence rates were similar to those of their adopted county, and that these rapid changes in cancer incidence could not be due to genetic factors. Using data from *Cancer incidence in five continents* Doll showed that each type of cancer that was common in one population was rare in another. He argued that because these differences were not chiefly genetic, wherever one type of cancer was common there were likely to be potentially avoidable causes.

In 1981 Doll and Peto set about quantifying the avoidable causes of cancer in countries such as the UK and the USA, presenting their findings in a report to the American Congressional Office of Technology Assessment that was then published in *Journal of the National Cancer Institute* (9) (table 1). They found that the number of cancer deaths caused by smoking was more than twice the sum of the numbers due to every other reliably known cause of cancer, and that man-made environmental pollutants played a relatively minor role (table 2) (11).
Richard Doll

Table 2. Present imperfect: reliably established (as of 1981) practicable* ways of avoiding the onset of life-threatening cancer. From (11).

<table>
<thead>
<tr>
<th>Avoidance</th>
<th>Percentage of all cancer deaths (at 1978 US cancer death rates) reliably known to be thus avoidable</th>
</tr>
</thead>
<tbody>
<tr>
<td>avoidance of tobacco smoke</td>
<td>30</td>
</tr>
<tr>
<td>avoidance of alcoholic drinks or mouthwashes</td>
<td>3</td>
</tr>
<tr>
<td>avoidance of obesity</td>
<td>2</td>
</tr>
<tr>
<td>regular cervical screening and genital hygiene</td>
<td>1</td>
</tr>
<tr>
<td>avoidance of inessential medical use of hormones or radiology</td>
<td>&lt;1</td>
</tr>
<tr>
<td>avoidance of unusual exposure to sunlight</td>
<td>&lt;1</td>
</tr>
<tr>
<td>avoidance of known effects of current levels of exposure to carcinogens (for which there is good epidemiological evidence of human hazard) in (i) occupational context</td>
<td>&lt;1</td>
</tr>
<tr>
<td></td>
<td>(ii) food, water or urban air</td>
</tr>
</tbody>
</table>

* Excluding ways such as prophylactic prostatectomy, mastectomy, hysterectomy, oophorectomy, artificial menopause or pregnancy.

Notes made in 2010: the estimate for smoking remains valid, that for obesity should have been a little higher, and there should have been a special entry for radon in houses.

STRENGTHENING EPIDEMIOLOGY AND IMPROVING PUBLIC HEALTH

Doll made an extraordinary range of other contributions to epidemiology and public health. Before the 1950s most epidemiological studies had been of various infectious diseases, often with a relatively fast-acting organism as a necessary cause. Different concepts were needed to study non-infectious causes of disease, some of which, such as smoking, took decades to have their full effect on risk. Moreover, the fact that many people could smoke yet not develop lung cancer and that a few with lung cancer were non-smokers troubled many with traditional views on how to attribute and understand causation.

Hill and Doll helped introduce new guidelines for assessing causality—based on, among other things, the presence of a dose–response relationship and the time sequence of events (Hill 1965) (5). By 1950 the leading causes of death in developed countries (heart disease, stroke and cancer) were no longer the infectious diseases, and subsequent investigations into their causes relied heavily on the criteria clearly articulated by Hill and Doll. Much of the proper understanding of the relative merits of different types of epidemiological study design can be traced to Hill and Doll’s careful discussion of the implications of their various studies.

In the late 1950s Doll embarked on a series of studies with Michael Court Brown of the long-term effects of medical exposures to moderate doses of X-rays (by following up people who had been treated with X-rays to alleviate spinal disease). Although heavy exposure to X-rays was already known to cause cancer, particularly of the skin, they demonstrated that moderate doses could also cause cancer, particularly leukaemia, establishing for the first time within one study a dose–response relationship between radiation and cancer. For the rest of his life, Doll collaborated extensively in several quantitative epidemiological studies of low-dose radiation of various types.
Doll also instigated successful studies of cancer in the coal gasification, nickel refining and asbestos industries. In 1955 he completed a study (in collaboration with the company) of the mortality of men who had worked at Turner Brothers Asbestos in Yorkshire. The striking results, with a tenfold increase in lung cancer in heavily exposed workers, led the company’s lawyers to attempt to suppress the research, claiming the military importance of asbestos, the irrelevance of long-past occupational exposures, and private ownership of the employment records. Despite legal threats, Doll and Hill promptly published their findings, after which the company agreed to continue indefinitely to provide Doll with current and past employment records for independent analysis, which were eventually used to demonstrate a significant continuing hazard.

Soon after the contraceptive pill became available in 1960, reports of adverse effects, particularly venous thrombosis, began to appear. Doll immediately realized that systematic epidemiological investigations were needed to obtain reliable evidence about the effects of the pill on health and helped others initiate and interpret them. He continued from then until 2005 to be closely involved in studies of the effects of the pill on cancer, participating actively in worldwide meta-analyses of all relevant epidemiological studies. These eventually showed that there was only a small and transient increase in the incidence of breast cancer; this and any increase in cervical cancer were outweighed by lifelong decreases in endometrial and ovarian cancer (16).

Doll made major contributions to epidemiological methodology and disease prevention for more than 50 years, and played a central role in strengthening public health institutions and supporting the careers and inspiring the work of later generations of epidemiologists and
medical statisticians. He tried to help whoever sought his advice, worked long hours and made a point of finding time to provide concise and constructive comments on their research plans and scientific reports.

EXPANDING MEDICAL EDUCATION AND RESEARCH IN OXFORD

Doll moved to Oxford in 1969 as Regius Professor of Medicine, the most senior medical post in the university. He quickly set about expanding the medical school and enhancing the quality of research. He made a series of new professorial appointments, broadened the scope of the medical curriculum, and helped his successors transform the faculty into one of the leading medical institutions in the world (figure 9).

While Regius Professor, Doll also managed to found Green College (since 2008 Green-Templeton College). This was a difficult and sometimes unpleasant task, requiring considerable diplomatic skills not only to raise money but also to get Oxford medical students and the university to agree to a new graduate college that would initially specialize in one main subject, medicine. Doll took early retirement to become the first warden of Green College. He and Joan (who had by then retired, having been the first woman with a senior MRC position) treated the students, staff and fellows as their extended family, from which, after the initial difficulties had been surmounted, they got much interest and pleasure.

The 25 years after Doll’s retirement in 1979 as Regius Professor were extraordinarily productive. He wrote, travelled, lectured, and collaborated with many others in new research on tobacco, alcohol, radiation, breast cancer and vascular disease. Half a century earlier he had helped Bradford Hill to establish randomized trials, and he was delighted to see the clarity with which large-scale randomized evidence could answer important questions.

Until weeks before his death, Doll continued working every day in the Cancer Epidemiology Unit (directed since 1989 by Valerie Beral) or the Clinical Trial Service Unit (co-directed since 1985 by Rory Collins and Richard Peto). In June 2005 both units moved into the newly built Richard Doll Building (figure 10), devoted to large-scale population studies of the causes, prevention and treatment of cancers, heart attacks, strokes and other major diseases. Doll worked
in the building only briefly before his death, admiring its spaciousness but still more the large research projects that it was already facilitating.

INTERNATIONAL INFLUENCE

The importance of Doll’s work was soon recognized throughout the world. He won many awards, including the United Nations Award for Cancer Research in 1962, and was the first recipient of the Mott Prize (a General Motors Cancer Research Award) in 1979. He was elected a Fellow of the Royal Society in 1966, was its vice-president in 1970, and received the Society’s Royal Medal in 1986. He was knighted in 1971 and made a Companion of Honour in 1996. He received numerous honorary doctorates and fellowships, both in the UK and elsewhere.

Doll’s integrity, courtesy, sharp mind and precise use of language made him an effective chairman of many committees and an impartial adviser to various government departments, court cases and industries. His strategic aims in such work were to ensure that the epidemiological evidence would be described accurately, distinguishing between established and unproven claims, and to ensure that employment records would be kept and analysed in ways that would ensure that any real hazards were discovered sooner rather than later, and that mistaken claims of hazard or safety would be minimized. He was open about his dealings with industry, received no retainers, and always gave away whatever consultancy fees or honoraria he received, usually to Green College. He also gave away some of the prizes he was awarded. He was regularly invited to deliver major lectures, and in the last year of his life he lectured in seven different countries on five different continents.

PERSONAL QUALITIES

Elegant and well-mannered, Doll thought, wrote and spoke clearly, choosing his words carefully; his publications, although concerned with factual matters, were often a pleasure to read. Having lived through the 1930s he understood how greatly medical science in general, and epidemiology in particular, could improve people’s lives. Thus motivated, he worked efficiently, and for long hours. He found good epidemiology beautiful and satisfying, considering himself to have been extraordinarily lucky professionally (figure 11).

Many found Doll’s apparent severity daunting, but behind the sometimes austere exterior was a mischievous interior that enjoyed nonconformity, and his wit could be delightful. He dressed immaculately and in later life wore vivid ties that he enjoyed people noticing. He and Joan loved and depended on each other, and had similar professional values. For two years after she died in 2001 grief predominated in private, but then in his last two years he had more internal peace, and retained his intellect and humour. He liked to say that old people should take risks, and in his ninety-third year he rode on a camel in the Arabian desert, flew in a glider, and climbed a jungle tree in Australia.

Doll had a remarkable ability to interpret, assimilate and remember population-based evidence and to put into perspective the major and minor avoidable causes of disease. This was not a theoretical exercise; he was conscious that his conclusions must not be wrong, because people’s lives and livelihoods were at stake. The more closely that people worked with Doll,
the more they respected him. His wide experience, careful judgement, integrity and rigour—all obvious to those who worked with him—meant that he was rarely wrong, and never stubbornly wrong. He was one of the most important medical scientists of the twentieth century. He died with dignity at the John Radcliffe Hospital, Oxford, on 24 July 2005, of heart failure, and was survived by his adopted children.

As a result of the twentieth-century epidemiological studies of smoking, of which Doll’s were among the most influential, many millions of premature deaths had already been prevented by the time he died; according to the World Health Organization, hundreds of millions of deaths from tobacco will be prevented during the twenty-first century. Doll’s own 1994 words (13) are engraved on his memorial stone in the Richard Doll Building:

**Death in old age is inevitable but death before old age is not.**

In previous centuries 70 years used to be regarded as humanity’s allotted span of life and only about one in five lived to such an age. Nowadays, however, for non-smokers in Western countries, the situation is reversed; only about one in five will die before 70 and the non-smoker death rates are still decreasing, offering the promise, at least in developed countries, of a world where death before 70 is uncommon. But, for this promise to be properly realised, ways must be found to limit the vast damage now being done by tobacco and to bring home, to not only the many millions of people in developed countries but also the far larger populations elsewhere, the extent to which those who continue to smoke are shortening their expectation of life by so doing.

Richard Doll, 1994
Honours and Awards

Honorary degrees

1969  DSc, Newcastle
1972  DSc, Belfast
1973  DSc, Reading
      DSc, Newfoundland
1975  DM, Tasmania
1988  DSc, Stony Brook
      DSc, Harvard
      DSc, London
1989  DSc, Oxford
1994  DSc, Oxford Brookes
      MD, Birmingham
1996  DSc, Kingston
      MD, Bergen
2003  DSc, Aberdeen
      MD, University of Illinois at Chicago
2005  MD, Karolinska Institute

Professional awards

1957  FRCP London
1966  FRS
1974  FFPHM
1978  Hon. FRCGP
1987  Hon. FFOM
1988  Senior Member, Institute of Medicine
1990  Emeritus Fellow Academia Europaea
1992  Hon. FRCOG
1993  Hon. FRCR
1998  Hon. FRCS
2001  Foreign Associate, US National Academy of Sciences

Richard Doll was also an honorary member of the Academy of Medical Sciences of Catalunya and the Balearic Islands, the American Academy of Arts and Sciences, the American Association for Cancer Research, the American Epidemiological Society, the American Gastroenterological Association, the International Association of Cancer Registries, the International Epidemiological Association, the Italian Oncological Society, the Norwegian Academy of Sciences, and the Royal Academy of Medicine in Ireland; and an honorary fellow of the Society for Radiological Protection, the Royal Statistical Society, the American College of Epidemiology, the New York Academy of Medicine, the Institute of Engineering and Physics in Medicine, and the Institute of Actuaries.

Honours

1956  Order of the British Empire
1971  Knight Bachelor
1996  Companion of Honour
Richard Doll

Awards

1955  William Julius Mickle Fellow, University of London
1958  David Anderson Berry Prize, Royal Society of Edinburgh (jointly)
1962  Bisset Hawkins Medal, Royal College of Physicians
United Nations Award for Cancer Research
1970  Gairdner Award, Toronto
1972  Buchanan Medal of the Royal Society
1973  Nuffield Medal, Royal Society of Medicine
1974  Presidential Award, New York Academy of Sciences
1975  Prix Griffuel, Paris
1976  John Snow Award, Epidemiology Section, American Public Health Association
1977  Gold Medal, Royal Institute of Public Health
1979  Charles S. Mott Prize for Cancer Research, New York
1983  Gold Medal, British Medical Association
1984  Wilhelm Conrad Röntgen Prize, Accademia dei Lincei, Rome
1985  Johann-Georg-Zimmermann Preise, Hannover
1986  Founders’ Award, Chemical Industry Institute of Toxicology
Royal Medal, The Royal Society
1988  Alton Ochsner Award (jointly)
1990  Ettore Majorana Erice Science for Peace Prize
1991  Helmut Horten Foundation Award (jointly)
1992  Prince Mahidol Award
1995  Erkki Saxén Medal, Cancer Society of Finland
1997  Gold Medal, Royal Society of Medicine
1998  British Thoracic Society Medal
1999  Stampar Medal, Association of Schools of Public Health European Region
Hewitt Award, Royal Society of Medicine
2000  Gold Medal of the European Cancer Society
C-E. A. Winslow Medal, Yale University
2001  Dr Nathan Davis International Award, American Medical Association
2002  King Olav V Award for Cancer Research (jointly)
2003  Tyler Prize (jointly)
2004  Shaw Prize in Life Sciences and Medicine
2005  King Faisal International Prize for Medicine (jointly)

Other appointments

1973–77  Chairman, Medical Research Council’s Cancer Coordinating Committee
1970–77  Chairman, Adverse Reactions Sub-Committee of the Committee on Safety of
          Medicines
1978–87  Chairman, Management Committee, Institute of Cancer Research
1985–88  Chairman, Medical Research Council’s Committee on Epidemiology of AIDS
1991–2004  Chairman, Management Committee, UK Childhood Cancer Study
          Protection Board
Richard Doll was also at various times a member of the Royal Commission on Environmental Pollution, the Commission on Energy and the Environment, the Council of the Royal Society, the Medical Research Council, the Council of the Royal College of Physicians, the Scientific Council of the International Agency for Research on Cancer, the Council of the International Union against Cancer, the World Health Organization Advisory Committee on Medical Research, and the World Health Organization Committee on Health and the Environment.

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