

chapter one

## **Introduction**

This book has been written to mark the centenary of the Imperial College charter. It is intended for a wide readership, including historians of higher education, historians of science, engineering, and medicine, and historians with interests in the more general culture of twentieth-century Britain. While scholarly, the book has been written also for the interest and enjoyment of Imperial College students and alumni, and for past and present members of the staff. The 2007 centenary is a time both to look back at what has been achieved, and a time to look forward. With this in mind, I hope that the book will also be an aid to those working at Imperial, both in thinking about the college and its many disciplines, and in planning for its future. I was fortunate in being invited to write the college history by Lord Oxburgh, and doubly fortunate in that he gave no special directives and allowed me access to most of the college records and archives.<sup>1</sup> The Victorian records are fairly well known to scholars, but the little-used twentieth-century records, and the rich collection of personal papers, could support many more books. I hope that what I have written will encourage others to explore them further.

This book tells the story of a new kind of institution that came into being with the federation of three older colleges.<sup>2</sup> As will be shown, these colleges had well-formed identities already by 1907, identities that were to influence the future history of Imperial College in many ways. Why they federated, and how the resulting structure and governance of the new college contributed to its longer-term success, is a major theme of this book. Imperial College was founded by the government as an insti-

tution for advanced university-level training in science and technology, and for the promotion of research in support of industry throughout the British Empire. True to its name, the college soon built imperial links and was an outward looking institution from the start. It early laid the foundations that were to make it an international success and its connections to the larger world, to industry, and to the British state, have been major factors in its historical development. Local geography, too, has been important. The situation of the college in South Kensington, a bus ride from Westminster, close to major museums, the Royal College of Art, the Royal College of Music, the Royal Albert Hall, Chelsea and the River Thames, Hyde Park and Kensington Gardens, has been intrinsic to its development. Locality has mediated the technological spirit of the college in interesting ways.

That Imperial College was given a utilitarian mandate led to its having a distinct identity within the British university system and set it apart from other universities with more outwardly liberal aims.<sup>3</sup> In this, the college resembled some European and North American technological institutions which the government had in mind when creating the college. For example, the 1861 charter of the Massachusetts Institute of Technology (MIT) states that it should support, ‘the advancement, development, and practical application of science in connection with arts, agriculture, manufactures and commerce’. The adoption of similar goals at Imperial spelled problems for the college in its relationship with the University of London, and for an academic staff seeking success within the wider, liberal, academic culture. How staff, with an eye to advancement in both learned societies and professional bodies, navigated their way in a college dedicated not simply to teaching and the pursuit of knowledge, but also to serving the needs of industry, is a major theme of this book. By the late twentieth century business and entrepreneurial ideals had become more widely accepted in the larger culture, something reflected in Imperial College’s increased status in recent years. The college has never been wealthy and has therefore had to respond quickly and effectively to outside forces, whether cultural, intellectual, economic or political. Indeed, as will be discussed, its success relative to the far better endowed ancient universities, and to the largely better endowed civic universities, can partly be explained in terms of the way it responded to these forces.

One way of thinking about an educational institution is in terms of its alumni. Imperial College graduates have made many important contributions to science and engineering, and to public life around the world. More recently some of its graduates have contributed also to medicine. Many books could be written on their various contributions, and some have already been written. But this book focuses primarily on work carried out by people while directly associated with the college. Even then, full justice cannot be done to the many interesting men and women who have passed through the college, and to the varied and important work they carried out. This great flux of talent has been a major factor in Imperial's success. Despite being relatively poorly funded the college has always attracted good people. This was already the case in the older colleges before they federated in 1907. In part the attraction was that the colleges provided new kinds of opportunity for social advancement, something that has remained true of Imperial College to this day.

In its approach to the history of institution building, this book makes a contribution also to twentieth-century intellectual and socio-cultural history. Issues of class, gender, generation, race, ethnicity and locality intersect with the wide range of topics raised in the various chapters. The book has a large cast of characters. The many, often parallel, stories collectively tell both a human and an institutional story. Written from within the humanistic tradition, the book relates, and attempts to explain, how people came together in a new kind of venture, how they exchanged ideas and made their way in the world, and how the college to which they were attached evolved over a century. It shows how competing interests were negotiated, how social exchanges worked to generate new ideas, and how work in science and technology mediated between the natural and cultural worlds.

While writing this book I read a number of other college and university histories. Perhaps in a class of its own is the multi-volume history of the University of Oxford. In the volume covering Oxford in the twentieth century the different chapters are thematically, rather than chronologically, organized.<sup>4</sup> They were written by different authors, many of whom are specialists who were able to cover their topics in great depth. While a single author cannot display the same range of expertise, there is some advantage to presenting a cohesive personal account. I have followed the Oxford example in several of the following chapters and have used a thematic approach. Two other types of chapter have also been

written. One type covers college governance in light of external cultural, economic, and political forces, and the other covers the history of departments and subject areas. The chapters are organized so that reading them consecutively allows for a coherent and roughly chronological history of Imperial College. However, the thematic chapters overlap with the others chronologically, and can be read as independent essays. Even the non-thematic chapters are relatively free-standing and can be read as such by those who simply wish to know more about Imperial College in a particular period. Because of this structure there may be a small amount of repetition but it has been kept to a minimum. The histories of the various medical schools that joined Imperial in the late twentieth century are not covered, but the creation of the Imperial College School of Medicine (now Faculty of Medicine) is discussed, as are some of the consequences of having a medical school at the college.

The second chapter gives a brief history of the colleges that federated to form Imperial College in 1907. While the college was founded in the Edwardian period its strong Victorian roots have influenced its history to this day. The older colleges remained strong within the federation well into the 1970s. The third chapter tells of the founding of Imperial College. In some ways this is a pivotal chapter, since how the college emerged proved important to its later development. It was created by the state, given a powerful governing body, and had a strong mandate. In 1907 Imperial College was independent of the University of London. It joined reluctantly in 1929 — and then only after much debate. The often uneasy relationship with the University is an ongoing theme in the book. It is perhaps fitting that having reached its centenary the college is to become independent once again, this time as a full degree-giving body.

Chapter four focuses on the early governance of the college and how its future was envisaged. Its initial success owes much to some very good professorial appointments, and to some active members of the governing body. The many contributions made by college staff to the war effort (1914–18) also made clear to the government that the college was a national asset, worthy of greater support. The Governing Body and the staff very much wanted the college to count in the outside world and were politically astute in moving forward. The first new subject areas to be introduced were chemical technology and aeronautics, both in response to larger political anxieties, related to Britain's industrial competitiveness

and military preparedness respectively.<sup>5</sup> Technical optics was the next to be added, the result of concerns over Britain's optical needs at the beginning of the war. The Rector and governors also moved quickly to find the money for a student union and the provision of communal social facilities, thinking this the best way to bring together people from the three older colleges.

Chapter five is the first of the thematic chapters. It covers Imperial College during the First World War and, as with the other thematic chapters, can be read as an independent essay. Chapter seven, 'Imperial Science at Imperial College' is also thematic and shows how, in the first half of the twentieth century, the college served the needs of empire. The other thematic chapters are numbers eight, eleven and fourteen. Chapter eight covers the college during the Second World War. Chapter eleven examines corporate and social life, and is important to an understanding of the nature of the college as it evolved over the twentieth century. It is also a micro-historical and socio-cultural account of student life in London. Chapter fourteen shows how the college encouraged students to broaden their outlook, and how the curriculum began to diversify in the face of cultural and political pressures after the Second World War. It covers the history of the diversifying curriculum into the early twenty-first century. Chapters nine, twelve, and fifteen cover college governance since the Second World War and include material on the larger political and socio-cultural contexts in which the expansion and restructuring of the college occurred. Chapters six, ten, thirteen, and sixteen cover the more academic history of the college, focusing on the histories of departments — on teaching, research, and the contributions of individuals. Readers who are simply interested in the development of particular disciplines can read the relevant sections that follow chronologically within these chapters. I have looked at the departments dispassionately, focusing as much on the rough periods as on the smooth. While the overall story is one of great success, this has been achieved only by overcoming serious problems as they have arisen.

Each chapter has many, and sometimes long, endnotes. The reasons for this are threefold, the first being to include as much personal detail as possible. The many people who have worked at the college have made it what it is today and I strongly believe they should be remembered. The inclusion of much personal information in the main narrative would have disturbed the flow, and so it has been largely confined to endnotes.

Readers who seek information on a particular individual should use the index to find the appropriate endnote, in addition to any references in the main text. Second, endnotes are used in the normal scholarly way to cite reference sources where appropriate. Third, I have used endnotes for a number of scholarly asides so as to enlarge the commentary in ways that I believe will be of interest to the various readers I had in mind. While the book covers the period to 2001 in a comprehensive way, some of the chapters include commentary on the more recent period where important for reasons of clarity and continuity. The names of places and countries are given as used historically in Britain. For example, the name Ceylon is used for the period before 1972, and the name Sri Lanka for the period after.<sup>6</sup> There is some inconsistency in the use of people's names. In some cases I use just initials and in others I use the first name, along with surname. I have relied somewhat on my ear, and have adopted what appear to be common modes of reference in the college.

By necessity in a work of this kind I have focused more on the Rectors and professorial staff than on others. Professors are at the centres of associational groups, and earn their position by the demonstration of certain skills. But it is worth remembering that the associational group, while largely anonymous, is essential to the overall success of both the professor and the college. As mentioned, one aim of this book is to provide an understanding of the college's success. What is it that has made Imperial College the major institution it has become? Perhaps an institutional history is not ideal for this purpose, and a more anthropological look at departments, or at groups associated with successful professors would be better suited. Nonetheless, the concluding chapter adds to commentary on individual successes made in the earlier chapters by including also some abstract speculation on the overall success of the college.

Chapters two to seven cover the college history up until the Second World War. This period saw the establishment of a corporate culture, aspects of which are still recognizable today. The end of the Second World War brought many changes both within the college and in the country at large. As was the case elsewhere, people looked towards the United States for direction and were impressed by the scale of scientific and technological research being carried out in American universities. One consequence was a major increase in postgraduate and research work after the war, especially in the physical sciences, as well as in some of

the engineering fields. Given their importance in 1907, it is interesting to see how little valued the biological sciences were by the late 1940s and early 1950s — before the uncovering of the structure of DNA — and how close they came to being shut down. In light of later developments this is a lesson in the importance of longer-term thinking and in how quickly old fields can be reinvigorated by new discoveries, and become of great importance.

The post-war boom saw a major expansion in the economy, and the college soon more than doubled in size. The first expansionary period is covered in chapters nine and ten. Two wartime successes, computers and nuclear technology, came to the fore. Computers, especially, were to have a major long-term influence. Indeed, during the recession that followed the boom, from the late 1960s to the early 1980s, increasingly cheap computation resulted in a major shift towards more theoretical work. It was simply cheaper than experiment, though not always rationalized that way by those claiming their theoretical approaches to be superior. Clever new uses of computers helped people through this difficult period. Computer modeling continues to be of central importance in research today and, most notably, has changed the face of engineering. The early 1970s saw also the start of major restructuring at the college, described in chapters twelve and thirteen. This restructuring is discussed in the wider political and economic context, including the student movements of the period. A further major theme of the mid to late twentieth century is the increase in interdisciplinary work. This was a response to outside funding priorities which continue to drive the trend in the founding of new interdisciplinary centres and institutes. What has further transformed the college in recent years is the addition of a School (now Faculty) of Medicine. This major expansion and some of its consequences are discussed in chapters fifteen and sixteen.<sup>7</sup>

Since the 1970s there has been ongoing debate in the United Kingdom over a new social contract for universities. While taxpayers are willing to support universities, they want some tangible social gain in return. The same can be said of industrial, commercial, and other investment in higher education. As yet there is no consensus of the kind that existed before the Second World War when the university sector was small. Debate over what is appropriate support for higher education, and what universities need to do in return, is ongoing. Some of the chapters covering the post-war period give an account of the social-contract debate

as it has evolved to date. Keeping up with the political mood has been essential for an institution as poorly endowed as Imperial. Indeed the history of the college in the second half of the twentieth century can be seen as a series of reactions to government initiatives in higher education. As a consequence the college has been in almost permanent transition. Today, research is largely focused in the areas of medical genetics, molecular medicine, biotechnology, the environment, energy resources and conservation, information technology, nanotechnology, and new materials, but it is continually in flux. As is discussed in later chapters, the move to more interdisciplinary research has entailed some problems for traditional disciplines and for the maintenance of sensible and good undergraduate programmes.

The chapters on the earlier history of the college were easier to write than those covering the more recent period. Indeed, chapters fifteen and sixteen were the most difficult. There are several reasons for this. Greater distance allows for a clearer picture. What comes later can be used to evaluate earlier events. Further, the very helpful obituary and memoir literature is far greater for the earlier period. It is also the case that written records are usually more reliable than oral ones. For the recent period, many written records are not yet available and I have relied more heavily on interviews and direct queries in writing about it.<sup>8</sup> I am very grateful to all those who helped me in this way, and I very much enjoyed meeting people working at the college, as well as some who have recently retired. But the old saw about witnesses is true — they do not always agree. Memory is not always reliable. It is also uneven, sometimes vague and, at other times, enhanced. Thus, while this work has been much aided by what I have learned from talking with people it is based largely on the archival records which include the minutes of the Governing Body (now Council) and its committees, other committee minutes, annual reports, departmental and other correspondence, memoranda, and the large number of position papers generated over the years. Also of much value, and of very great interest, are the many boxes of personal papers left by people who have been associated with the college. No doubt there will be readers who disagree with some of my interpretations of this material. But the duty of the historian is to gather information as reliably as possible, tell interesting stories that give meaning to the whole, provide some interpretation of events and behaviours, and give some general analysis. The stories and

analysis should be consistent with the evidence. But, as scientists know, consistency and truth are not necessarily the same. Truth is more elusive but, in being consistent with the evidence, we at least have a chance of capturing some of the truth.

One area of the college history that is not fully pursued in the following chapters is the history of the estate — though it is not entirely neglected. At the time of the Great Exhibition of 1851, the area to the southwest of the exhibition site was largely rural, much of it under cultivation by market gardeners. About eighty-seven acres of this land was purchased by the Royal Commission for the Exhibition of 1851 with profits from the exhibition. The land extended (with some interruptions) from Kensington Gore in Westminster to Harrington Road in Kensington, and from the eastern boundary of what is now the Victoria and Albert Museum to Queen's Gate in the west, with one small section extending as far as Gloucester Road.<sup>9</sup> The surrounding land was largely privately owned, much of it by two aristocratic families who began to speculate in building projects soon after the Exhibition closed. The Commissioners, too, speculated. Interestingly many of the houses they built were designed by architects associated with the 'domestic revival' movement. One of them, designed by Norman Shaw, is now home to the Rector of Imperial College.<sup>10</sup> Much of the Commission land, south of Cromwell Road and west of Queen's Gate, was gradually sold to raise money for important projects on the site. The main roads through the estate were built in 1854–6 under the supervision of Thomas Cubitt and, following Prince Albert's wish, some were originally planted with Linden trees since he thought Plane trees too commonplace. It was also Prince Albert who suggested that the area be called South Kensington.<sup>11</sup>

An early idea was to build the National Gallery on Commission land, but this was rejected already in 1856. Much of the land to the north of what became a major exhibition site (where the Natural History Museum now stands), and between Queen's Gate and Exhibition Road, was leased to the Royal Horticultural Society for a public garden that opened in 1861. It was an Italianate garden, with arcades and much statuary, but it never paid its way and soon fell into disrepair. By 1880 the Society relinquished its lease and the land became free for redevelopment. People who came to visit the 1862 Exhibition and the various other exhibitions mostly came on foot since the fare from central London, on the then horse-drawn bus, was an expensive six pence. This changed

when the railway station at South Kensington was opened in 1868. Major construction on the Commission land began in the 1860s and, as discussed in chapter three, included a building on Exhibition Road intended as a college of naval architecture and general science. Instead it was to house the Royal School of Mines and the Royal College of Science<sup>12</sup> and became known as the Science Schools Building (renamed for T. H. Huxley in 1932). The South Kensington Museum (later extended and renamed the Victoria and Albert Museum), the Royal Albert Hall and the Albert Memorial were all built at roughly the same time in the late 1860s and early 1870s. The City and Guilds of London Institute built its college on Exhibition Road in the early 1880s. The Imperial Institute, which occupied much of the land later taken over by Imperial College, was constructed in the late 1880s and early 1890s. So, too, was the Royal School of Needlework on Exhibition Road.<sup>13</sup> A portion of this building was sublet to the City and Guilds College and, later still, the whole building (renamed for W. C. Unwin) became part of Imperial College. The Royal College of Science building, located around the corner from the Needlework School on a portion of land that the government had intended be shared with the Tate Gallery, was completed in 1906. The government had paid £70,000 for the freehold of the eight-acre site which was valued at £200,000. It changed its mind on the location of the Tate in 1899 after much lobbying by Fellows of the Royal Society, notably by Lord Kelvin and Lord Rayleigh, who wanted the entire site to be given over to science instruction. The neighbouring Post Office was rebuilt so as to house the Meteorological Office on its upper floors. Holy Trinity Church on Prince Consort Road was built in 1901–3, when the Commissioners asked the City of Westminster to take control of the road, something agreed to only on condition that the Commission first pave it with wood, which was done.

Given the later history of Imperial College it is interesting that in 1907 the Commissioners were asked to lease land to the north of the City and Guilds College for a proposed Institute of Medical Science, an idea soon abandoned. This allowed construction of the Royal School of Mines building to begin in 1909. The later history of this, and other buildings associated with the college, is discussed in other chapters. It is worth remembering, however, that in the mid-Victorian period land in much of South Kensington was rural and cheap. By investing in it, the Royal Commissioners showed great foresight. While the Commissioners

worked in the public interest, at first they had few clear plans. However, they were committed to certain kinds of projects and the development of the site is important to an understanding of Victorian Britain's response to the needs of empire, industry, and advanced education in the arts and sciences.<sup>14</sup> The early history of the site is complex but, fortunately for the development of Imperial College, the government purchased and leased land for the expansion of the Royal College of Science and Royal School of Mines respectively; and the Commission gave the City and Guilds of London Institute a peppercorn lease for land on which to construct its college. That Imperial was later able to expand into other areas of the site has much to do with the foresight of its Rectors; notably Henry Tizard who lobbied for the takeover of the Imperial Institute (or its land base), and Patrick Linstead, who negotiated both the demolition of the Institute, and the exchange of the old Science Schools (Huxley) building for increased space in Prince's Gardens.<sup>15</sup>

Imperial College now sits on some of the most expensive land in the country making further expansion in the immediate neighbourhood difficult. But the purchase of Silwood Park after the Second World War, and the more recent mergers with the medical schools, and with Wye College, have led to new growth, and will allow for expansion in the future. The college is well positioned as it moves into its second century. In writing this book, and as a former student of the college, I wish it well.

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1. Unless otherwise stated, archival sources cited in this book are held in the Imperial College Archives (ICA).
2. This is not the first history to be written of the college. A very readable short history by A. Rupert Hall, was published internally in 1982. There are a number of typescript departmental histories written by insiders (most of them ending in the 1960s) and an internal history of the City and Guilds College written for its centenary in 1985. A. Rupert Hall, *Science for Industry: A Short History of the Imperial College of Science and Technology and Its Antecedents* (London, 1982); Adrian Whitworth (ed.), *A Centenary History: A History of the City and Guilds College, 1885–1985* (London, 1985). I am indebted to the published and unpublished works.
3. Some British universities founded in the Victorian period make reference to the needs of industry in their charters; for example, the University of

Birmingham. But Birmingham, while emphasizing science and engineering, also made provision for the arts, social sciences and humanities.

4. Brian Harrison (ed.), *The History of the University of Oxford* (vol. viii); *The Twentieth Century* (Oxford, 1995). I also much enjoyed Ralf Dahrendorf's history of the London School of Economics. The LSE is smaller than Imperial and, for much of the twentieth century, its staff had many intellectual interests in common, and students were encouraged to attend lectures across the departments. This pattern allowed Dahrendorf to write what is almost a family history of the LSE. Such an approach would have been impossible for Imperial which, from the start, had very independent departments. But the two colleges have in common their modernity. Both developed new kinds of courses at the university level, and attracted new kinds of students who saw opportunities for advancement. Another successful university history is that of the University of Toronto. While different in approach to what I am attempting here, Friedland constructed his history around a number of interesting stories and episodes, organized in short chapters. My history, too, while organized in relatively long chapters, is based on an accumulation of stories arranged so as to give meaning to the whole. Ralf Dahrendorf, *LSE: A History of the London School of Economics and Political Science, 1895–1995* (Oxford, 1995); Martin L. Friedland, *The University of Toronto: A History* (Toronto, 2002).
5. Aeronautics was taught in the mechanical engineering department from 1909. The Department of Aeronautics was founded in 1920.
6. Ceylon gained independence in 1948; while the name Sri Lanka was in common use it was used officially only from 1972.
7. While medicine and medical research appear as though they will become the strongest areas of the college in this century, they came to the college only late in the twentieth century and therefore are not featured heavily in this book. The merger with St. Mary's, the subsequent mergers with other schools, and the formation of the Imperial College School of Medicine, are discussed in chapters 15 and 16. As will be seen, much medically-related work was done in the college even before the medical school mergers.
8. With electronic mail it is unclear how many written records will survive. The historian of the twenty-first century may have a more difficult task than I have had.
9. See F. H. W. Sheppard (ed.), *Survey of London* (vol. xxxviii): *The Museums Area of South Kensington and Westminster* (London, 1975). Of the original 87 acres purchased, about 18 have been taken up by roads and 17 sold for private development; 52 have been dedicated to public purposes. See also

the Reports of the Royal Commission for the Exhibition of 1851; especially the 7th Report (1889) and 8th Report (1911).

10. The house at 170 Queen's Gate, built in 1889, was originally designed for cement manufacturer, Frederick White. It included fittings, notably fire-places, taken from older houses that had been demolished on Millbank. See Hermione Hobhouse, *The Crystal Palace and the Great Exhibition: Art, Science and Productive Industry: A History of the Royal Commission for the Exhibition of 1851* (London, 2002), p. 177.
11. This was preferred over North Brompton, to avoid association with what was then considered a swampy, low-lying, unhealthy village. After Albert's death Plane trees were planted in preference to Lindens.
12. The name Royal College of Science was used from 1890 on; before that the college was known as the Normal School of Science.
13. The Royal School of Needlework had occupied a temporary building on the site since its foundation in 1874.
14. This response can be read also in the iconography of the Albert Memorial with its representation of the arts, sciences, industry and empire.
15. In some records this is called Princes Gardens, Indeed, even today the names on signs around the Gardens are inconsistent, with both versions in use. Princes Gardens is the name to be found in the *Survey of London, op. cit.* (9), but Prince's Gardens is used in the 1961 ordnance survey map. I use Prince's Gardens since it makes both historical and grammatical sense.