

## INTRODUCTION

In the British empire engineers were important agents, and this is a book about them. More specifically it is a study of the imperial diasporas, identities and networks that developed as the British engineering profession established connections on the African continent in the period 1875–1914. The book combines and integrates in new ways perspectives from the fields of imperial history and history of science and technology with the purpose of analysing the imperial connections of the engineers. The methodological approaches employed in the six chapters of the book are introduced in the opening sections of the individual chapters, while it is the purpose of this introduction to establish the overarching historiographical frame of the book and to explain what the main issues that it addresses are.

### The Empire at Home and its Connections

The last quarter of the nineteenth century was a period in which the boundaries of the British empire widened drastically, including in the African continent, which was divided in a scramble spurred by economic and strategic rivalries among the European powers.<sup>1</sup> Technologies in the form of medicine, improved military equipment and infrastructural systems such as harbours facilities, railways and telegraphs were important factors in this process.<sup>2</sup> These infrastructural technologies provided the muscle for conquest and were actively employed in strategies for formal empire-building. Moreover, they also served as a ‘main generator of those insidious partnerships of imperial, financial, and commercial interests that go into the making of “informal empires”’<sup>3</sup>

Hence, this was a period in which imperialism and engineering became closely intertwined. In the second half of the nineteenth century, as Robert Kubicek notes, ‘civil engineers abroad played a significant if insufficiently emphasized role in transferring infrastructure and disturbing the status quo.’<sup>4</sup> Indeed, over this period Britain’s industrial pre-eminence ultimately growing out of the Industrial Revolution ‘instigated a swarming of engineers to foreign and colonial adventures’, creating what Robert Angus Buchanan has labelled ‘The Diaspora of British engineering’: after the 1830s, British engineers moved in still wider geo-

graphical circles and in the process left an enduring stamp across the globe, in particular in the form of bridges, dams, harbours and railways. British engineers who '(1) recognised that they possessed an expertise that was in short supply elsewhere and (2) were prepared to travel abroad in large numbers in order to provide it' first expanded their operations to Continental Europe and North America, and after 1850 also began to work in Latin America, Australia and Asia. Eventually they made their way into Africa.<sup>5</sup> Between 1875 and 1914 British engineers designed harbours along the coast of Africa, scaled the Rift Valley with dozens of steel viaducts, dammed the Nile, and laid out railway tracks so that the length of British-built lines in Africa in 1907 had exceeded 10,000 miles, more than half of the total combined length of railways in Africa at the time.<sup>6</sup>

This part of the history is in many respects familiar. Its tangible legacy is still visible; the bridge across the Zambezi River by the Victoria Falls and the first and now smaller Aswan Dam, to mention two projects discussed in this book. The issues also, at first sight, fit comfortably within a familiar, slightly dated, perhaps eclipsed, historiography that has explored how big, masculine, industrial technologies were diffused from Europe and impacted on the rest of the world with little 'local' input – diffused either as a boon bestowed by advanced civilizations upon 'backward' societies or as oppressive tools of empire that enabled European penetration, conquest and consolidation across the globe.<sup>7</sup> Disagreements about causes and consequences are deep and important within this historiographical framework but it is based on the underlying assumption that what needs explaining is how 'Western', and in this case British, engineering impacted on the colonial world during 'the age of empire'.<sup>8</sup>

During the last decades historians have forcefully challenged and rightly dismissed 'diffusionist' approaches to the study of technology in the context of imperialism, emphasizing in particular the inability of the perspective to account for developments in the colonial world. This book also goes in different directions from the 'diffusionist' historiography. A first step is to reverse the question and examine not only how colonial regions were influenced by British engineering, but also how the civil engineering profession in Britain was influenced by experiences of imperialism in this period. The outward movement of British engineers impacted on developments throughout Britain's formal and informal empire but it had equally strong and often more enduring repercussions in Britain. Indeed, it is a central claim of this book that the outward movement of British civil engineering strongly influenced the profession and its place in British society and culture. It argues that key developments in the civil engineering profession need to be analysed against wider geographical and ideological contexts that in this period were closely tied to British imperialism. As will be demonstrated, 'imperial factors' were evident and of growing importance in the central institutions of the profession, in the business platforms that leading civil engineers operated from, in the public perception of civil engineers and in rela-

tion to more slippery notions concerning the identity of British civil engineers and the ideological outlook of the profession.

It is from the field of imperial history that this book adopts the insight that empire and imperialism were not only something ‘out there’ but also factors that strongly affected developments in British society. Scholars have long insisted on the importance of empire in relation to British society, culture and national identity and have from a range of perspectives, analysed its impact on Britain in politics, popular and elite culture, feminism, science and a range of other contexts.<sup>9</sup> This has sparked a prolonged debate about whether British society and culture were ‘saturated with empire’ or if other factors, notably class, were more important in Britain even in the high age of imperialism.<sup>10</sup> In a useful intervention Andrew Thompson has insisted that it is unfruitful to discuss the ‘amount’ of imperialism in Britain because this fails to capture what diverse and pluralistic entities both Britain and the empire were. He rightly asserts that

Whether they were explorers, traders, settlers, soldiers, missionaries or officials, the people of Britain became caught up in the process of overseas expansion not only in vastly different but unequal ways. There was never likely to be any single or monolithic ‘imperial culture’ in Britain, therefore.<sup>11</sup>

Thompson convincingly demonstrates that the empire ‘struck back’ into British society in unequal ways for different classes, genders, regions and indeed for different professional groups. This book follows this line of inquiry by exploring the ways in which empire ‘struck back’ at the engineering profession while knowing that it was more likely to do so in complex, unequal ways.

For this line of enquiry it is imperative to distinguish between different kinds of imperial influences that affected the profession. An important part of this influence came from the substantial groups of British engineers who were based in the colonial world but who retained strong connections with the engineering communities in their mother country. In 1902, 20.6 per cent of the 6,414 members of the Institution of Civil Engineers (ICE) in London were resident in British colonies (see Table 4.1 below). The ICE was the most prominent of the accredited institutions of the British engineering profession. The position of the large minority of ‘colonial’ members in the ICE is analysed in detail in Chapter 4 and the book more generally investigates to what extent, and through what channels, the influence of these large expatriate communities fed back into the British engineering profession.

Imperial impulses did not only originate from engineers in ‘colonial diasporas’. Indeed, the primary focus of this book is with London-based consulting engineers whose imperial platform was metropolitan rather than colonial. Operating from offices in Westminster, this powerful segment of the engineering profession based their income and professional status on planning and designing large infrastructural projects overseas and in particular in the regions of the world where Britain’s formal and informal imperial power was paramount.

The imperial influences often stemmed from, and even more frequently filtered through, this elite segment of the profession that occupied a position enabling it to affect the engineering profession far beyond their own closed ranks and tightly knit networks. Furthermore, between the expatriate communities in the colonies and the metropolitan consulting engineers, many British civil engineers spent their lives and careers moving back and forth between Britain and the engineering frontiers of the empire (or occasionally from one engineering frontier to the next) in search of fortune, fame or simply the next job opening. Such engineers and their complex imperial diasporas and careers are important because they enable us to flesh out connections between London and shifting regions overseas, connections that otherwise can be difficult to pinpoint.

In the British Isles there were large concentrations of engineers in locations apart from London. Glasgow is a notable case in point from where imperial connections also developed with Africa in this period.<sup>12</sup> The focus in this book is, however, on London, which during the period constituted a vital imperial engineering hub. By reconstructing and analysing the diverse engineering connections and impulses in London an image emerges of a dynamic metropolitan engineering centre; never self-contained, always connected and constantly reconfiguring connections with a wider imperial world. This view resonates with recent re-conceptualizations of the British empire as a zone bound together by 'colonial connections' and 'imperial networks' through which knowledge circulated, people travelled, and trust and authority were negotiated.<sup>13</sup>

Thus, the purpose of reversing the perspective to include Britain and to devote substantial attention to London-based engineers is not to argue in favour of a Eurocentric model in which the causes of a technologically driven globalization are seen as originating from 'the imperial centre' and from there diffused to more or less passive 'colonial peripheries'. Nor is it the purpose to engage in the debates on whether the forces of Britain's imperial expansion were primarily centrifugal and metropolitan or centripetal and peripheral.<sup>14</sup> Rather, the point is that it brings into focus the mutually constitutive connections between Britain and Africa during this period. It is such connections and in particular their reciprocal nature that this book is particularly concerned with. In order to explore these connections, analytical frames are required that are capable of encompassing Britain as well as colonial regions. To pursue this inquiry with respect to engineers, a useful concept is that of 'bridgeheads'. The term was introduced in the historiography by John Darwin, who defined the bridgehead as 'the hinge or "interface" between the metropole and a local periphery' and he emphasized the diversity of bridgeheads that might, for example, 'be a commercial, settler, missionary or pro-consular presence or a combination of all four' and might consist of 'a decaying factory on a torrid coast or, at its grandest, the "Company Bahadur"'.<sup>15</sup>

Thinking in terms of bridgeheads has great potential. As Alan Lester has rightly asserted, the concept recognizes the pluralism of British society and 'the

co-existence of different British interests, each with their own ways of connecting metropole and colony'.<sup>16</sup> It thereby draws attention to the fact that there were 'multiple, and often contestatory 'projects' of colonialism'.<sup>17</sup> Moreover, as Lester notes, 'conceiving of several "bridgeheads" connecting any one colony with Britain, Darwin was close to elaborating a networked or webbed conception of imperial space also characteristic of the "new" imperial history'.<sup>18</sup> These concerns are central to this book. The insistence on multiple points of contact is prerequisite for exploring the dynamics between members of the engineering profession and other groups with imperial interests in Britain and Africa. The chapters that follow also bring into focus contestatory imperial 'projects' among engineers as well as tensions with the 'projects' of other imperial groups. The book, moreover, reshuffles spatial categories in order to make sense of the multilayered engagements between the British engineering profession and forms of imperialism during this period. It demonstrates that whatever is left of the schism between 'traditional' and 'new' imperial history must be straddled in order to write a history of the engineers that takes into account the economic and political as well as the cultural and ideological dimensions of the imperial connections they developed.<sup>19</sup>

### Consulting Engineers and the Great George Street Clique

An important awareness that historians of the British empire can learn from historians of engineering is that the category 'engineer' was multifaceted, complex and subject to change over time.<sup>20</sup> In the British context an important distinction was that between Royal Engineers and civil engineers, the latter initially meaning that minority of engineers who were not in military service.<sup>21</sup> During the nineteenth century specialization and growth in the engineering profession, however, meant that terms such as mechanical engineer, marine engineer, mining engineer and later electrical engineer became common ways of distinguishing between different kinds of non-military engineers and that the term 'civil engineer' gradually came to mean a specific kind of non-military engineer that was engaged, in particular, in infrastructural engineering. However, among civil engineers and in particular in the ICE there was a strong adherence to the idea that the 'civil engineer' was more than a subcategory among other categories and that it retained at least part of its overarching meaning: civil engineering was the stem of the engineering tree from which the other forms had branched out and which therefore remained indebted to civil engineering. Naturally, engineers and professional institutions in fields such as mechanical or electrical engineering did not always share this point of view.<sup>22</sup>

A further complication in this period – and the one most important for this book – related to the category of the consulting engineer.<sup>23</sup> The term 'consulting engineer' was a contested and ambiguous category, an issue that contemporaries

also struggled with. In 1909 the London-based lawyer W. Valentine Ball published a book on *The Law Affecting Engineers* in which he noted:

We have the terms 'civil engineer'; 'mechanical engineer'; 'electrical engineer'; 'mining engineer'; 'marine engineer'; and 'railway engineer'. Last, but not least, we are accustomed to hear the phrase 'consulting engineer'. In what particular branch of the profession he holds himself out for consultation does not always appear. Nor is it necessary that he shall have any particular experience in the art of consulting or advising in consultation. Any man can assume this imposing title; and there is no disciplinary body to whom persons who consult him can complain if they find out that he has no qualification either as an engineer or as a consultant.<sup>24</sup>

Indeed, there was no institutional body specifically devoted to consulting engineers until the very end of the period studied in this book.<sup>25</sup> However, in spite of its judicial vagueness and lack of institutional back-up the term 'consulting engineer' was ubiquitous among engineers at the time and as Ball also pointed out 'among the leaders of the profession it would seem that the phrase "consulting engineer" has a well-defined meaning.'<sup>26</sup> This 'meaning' will become clearer in the course of the book but central elements can be summarized at the outset. The term was used, primarily, to denote independently practising engineers. In this period most engineers were employed by state or private companies for example in mining, manufacturing or railways, but the consulting engineers were the minority that could claim the elevated status of 'independent professionals'.<sup>27</sup> Consulting engineers were designers rather than builders. They were hired by promoters of engineering projects to carry out surveys, to estimate cost, prepare designs, draw up specifications, inspect purchased equipment and supervise construction processes. The consulting engineer to a project retained responsibility for the overall design of the works while contractors were responsible for recruiting and organizing labour, for supplying the workers with tools, for setting them to work and for paying their wages.<sup>28</sup> Moreover, the consultants received fees for their services and were not allowed to take on any contracts. The idea was that the consulting engineer should be independent of contractor and manufacturing interests so that the loyalty of the consultant would be undivided and directed only towards providing the best engineering solutions to the challenges of a project.<sup>29</sup> This ideal of 'independence' was crucial; the key value, essential character trait and defining marker in the professional and social identity of consulting engineers. It was an ideal, moreover, that was in accord with the gentlemanly aspirations of the top layer of consulting engineers. Indeed, the term 'consulting engineer' referred to certain professional functions but also to the status of an engineer in complex socio-professional hierarchies that existed among British civil engineers – hierarchies that by the last quarter of the nineteenth century consisted of pupils, clerks, resident, assistant and chief engineers, with the independent consulting engineers at the top.<sup>30</sup>

In the second half of the nineteenth century, the civil engineering consultancy business was dominated by a network of professionals based in central London. In an important article Dale Porter and Gloria Clifton referred to these consulting engineers as the 'Great George Street Clique', and this is very accurate.<sup>31</sup> Their offices in Westminster clustered around this street where the ICE was located also. The consulting engineers of the Great George Street Clique dominated the ICE as well as the market for engineering consulting to projects in the British empire. An immediate impression of these facts may be obtained from Table 3.1 below. They formed a diverse group but as a whole the Westminster consulting engineers were affluent, vocal, influential and self-confident. It was, furthermore, a group whose status and position was strengthened as the consultants became occupied increasingly with designing engineering projects throughout the empire.

From a privileged position in Westminster the men (and they were indeed all men) of the Great George Street Clique made connections with shifting regions in Britain's formal and informal empire and after 1875 also with those in Africa. This intermediary function was a seminal characteristic of the consulting engineers of the Great George Street Clique and they can be seen as paradigmatic examples of what John Darwin has referred to as the 'second bridgehead' located 'at the domestic end of the imperial axis' and consisting of enclaves of 'imperial-oriented interests in the metropole.'<sup>32</sup> Hence, focusing on the consulting engineers in Westminster provides an effective historiographical path for exploring the ways in which influences were negotiated at the metropolitan end of the imperial relationship and from there redirected onto the world that the British engineering profession constantly engaged with. Moreover, the consulting engineers in Westminster constituted a group in the engineering profession that developed particularly strong imperial identities and which exerted a strong influence on other segments of the British engineering profession. These are important reasons why they are the main subjects of this book.

Consulting engineers, however, also merit attention for other reasons. The late Victorian era was 'the age of the consulting engineer', as L. T. C. Rolt rightly asserted more than four decades ago.<sup>33</sup> Indeed, the consultants were the leading figures in the civil engineering profession at the time. Yet, compared with the early and mid-Victorian civil engineers, scholars have devoted much less attention to this later generation of leading figures in the civil engineering profession. More recently, however, there has been a growing willingness to move beyond and do away with the alleged watershed of 1860 marked by the simultaneous deaths of the 'railway triumvirate', Joseph Locke, I. K. Brunel and Robert Stephenson.<sup>34</sup> Among other things this has led to fruitful reinterpretations and revisions of the notion of 'Britain's industrial decline' and an insistence that 'men of technology' have occupied complex positions in British culture that are not captivated by discourses of decline and ascent.<sup>35</sup> This study of empire and

the engineers engages with and argues along the lines of these revisions. More specifically the book addresses issues relating to the role and status of engineers within British elite and popular culture,<sup>36</sup> to the 'gentrification' of engineers,<sup>37</sup> and to the reading cultures and communication circles that developed around the profession.<sup>38</sup> In relation to these issues the academic literature is especially patchy with regard to the closing decades of the long nineteenth century and the analyses therefore fill critical gaps in the scholarly literature.

### Africa and British Engineers

Africa during the decades of the scramble has been subject of substantial interest in particular from scholars concerned with the causes of European expansion during 'new imperialism' and with the lasting legacies of Europe's colonial empires. In the context of this book the case of Africa is important because it allows for the exploration of how an established engineering centre in Westminster developed connections with new areas of the world and how existing systems were geared to encompass projects in these regions. In Africa the regions were characterized by great diversities with respect to environmental, economic, cultural, social and political factors.<sup>39</sup> Of particular importance for the concerns of this book is the different ways in which the regions were or became part of the political structure of the British empire during this period. This decided with what other groups the engineers developed connections. In relation to projects dealt with in this book the client who hired engineers was the British government either through the Foreign Office, in the case of the Uganda Railway, or through the Colonial Office via a quasi-governmental system of Crown Agents in the case of railways and harbours in the West African Crown Colonies. For the railways in Rhodesia the engineers depended on connections with the British South Africa Company while for projects in the 'veiled protectorate' of Egypt and in the South African 'self-governing' colonies they were employed directly by colonial governments.<sup>40</sup> These differences affected profoundly the position of engineers and this fact allows this book to unravel and analyse a wide range of connections in the chapters that follow.

One critical aspect requires further introductory clarification before the analysis commences of the metropolitan connections between British imperialism and engineering. Imperialism may be defined as the attempt to impose one state's dominance over other societies by assimilating them to its political, economic and cultural systems, usually with the use of force and violence. Imperialism, moreover, concerns the ideologies, languages and vocabularies that people have used to organize and make sense of their political, social and cultural worlds – vocabularies that have served to establish and sustain hierarchies across cultures.<sup>41</sup> The engineering projects that are discussed in this book were car-

ried out in Africa at the time when the continent was partitioned by European imperial powers and during a period in which hierarchical, racist vocabularies and visions of human society proliferated and hardened up. The works that engineers were involved with were bound to be imperial also and this raises the question from what perspective we are to view the role that engineers played in the process. According to Angus Buchanan the diasporas of British engineers in Africa were imperial because in this region of the world 'trade tended to follow the flag, and trade generated the need for engineering works'.<sup>42</sup> This explanation is inadequate not only because it equates British imperialism too strongly with the formal boundaries of the British empire,<sup>43</sup> but also because the projects that engineers were involved with were not, as Buchanan suggests, merely aiming to facilitate existing trade after political control had been established. Headrick is more to the point when he notes, in conclusion to his extensive surveys of technology transfer in the context of European imperialism, that 'Trade did not so much follow the flag as come wrapped in it'.<sup>44</sup> A naval intelligence book from 1919 – tellingly the most detailed and rich contemporary source for factual information on railways and railway construction in Africa – sums up what was also involved in the engineering projects:

The aim of a colonial railway [in Africa] is the economic development of the country it serves. This covers the subjugation of unruly tribes and the military conquest and suppression of the region in question – all these strategic and political measures being mainly preparatory, and often indispensable, steps towards the government and economic development of the new country. Cecil Rhodes once stated that 'railways in the colonies are cheaper and more efficacious than guns', and it may be taken as an axiom that railways are in most cases a far better means of settling a country than wars and military enterprises.<sup>45</sup>

It is not the primary concern of this book to explore how the engineering projects influenced short- and long-term developments in different areas in Africa. Yet, it is important not to lose sight of the fact that the projects organized, planned and discussed in London often involved military conquest, political subjugation and violence. This insistence is not meant to infuse a moral dimension into the study but to direct attention to the fact that the organization of projects and the discussions of engineering, imperialism and Africa took place in a historical period where civil engineering projects affected profoundly the lives of people far away from Britain; people, moreover, whose voices were not heard in the debates. It is not least because of this uneven distribution of power and speech that it mattered what engineers in London thought and did. Indeed, the ideas and opinions of Britain's imperial engineers and how they saw their role in an imperial world are important issues, not least for this reason.

### Composition of the Book

Chapter 1 explores reading cultures and communication circles in the engineering profession to analyse the role of empire in particular in the engineering journals which in this period served to connect and integrate on multiple levels British engineers in Africa and the engineering profession in Britain. Chapter 2 combines perspectives from cultural and economic geography to provide a spatial analysis of the imperial engineering centre in Westminster, the district which housed the headquarters of the accredited institutions of the profession as well as substantial groups of engineers including the consulting engineers of the Great George Street Clique. The professional networks, imperial connections and colonial critics of the Great George Street Clique are the subject of Chapter 3. Chapter 4 analyses the role of empire in the ICE, the most important formal platform for the Great George Street Clique and the primary institutional body in Britain for substantial numbers of engineers in colonial diasporas. Chapter 5 examines the public dimension of imperial engineering and analyses the rise to fame of the 'explorer-engineer' and the role of consulting engineers as intermediaries between engineering projects in Africa and public spheres in Britain. Chapter 6 focuses on a controversy in the Nile Valley which sheds light on the position of engineers in elite society in Britain and which brings together a number of the agents and themes examined in the book. In the Conclusion the discussion concentrates on the nature and consequences of the imperial connections that were forged in the engineering world during this period.