
THE TOOLS OF EMPIRE

Technology and
European Imperialism
in the Nineteenth Century

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INTRODUCTION

Technology, Imperialism, and History

Among the many important events of the nineteenth century, two were of momentous consequence for the entire world. One was the progress and power of industrial technology; the other was the domination and exploitation of Africa and much of Asia by Europeans. Historians have carefully described and analyzed these two phenomena, but separately, as though they had little bearing on each other. It is the aim of this book to trace the connections between these great events.

The European imperialism of the nineteenth century—sometimes called the “new” imperialism—differed from its precursors in two respects: its extent and its legacy. In the year 1800 Europeans occupied or controlled thirty-five percent of the land surface of the world; by 1878 this figure had risen to sixty-seven percent, and by 1914 over eighty-four percent of the world’s land area was European-dominated.¹ The British Empire alone, already formidable in 1800 with a land area of 1.5 million square miles and a population of twenty million, increased its land area sevenfold and its population twentyfold in the following hundred years.²

Its legacy is harder to quantify. In today’s Asia and Africa,

European political and religious ideals barely survive as tenuous mementos of a defunct imperial age—modern equivalents of the Mosque of Cordoba or Hadrian's Wall. The real triumph of European civilization has been that of vaccines and napalm, of ships and aircraft, of electricity and radio, of plastics and printing presses; in short, it has been a triumph of technology, not ideology. Western industrial technology has transformed the world more than any leader, religion, revolution, or war. Nowadays only a handful of people in the most remote corners of the earth survive with their lives unaltered by industrial products. The conquest of the non-Western world by Western industrial technology still proceeds unabated.

This conquest began in the nineteenth century and was woven into the expansion of European empires. The connections between technology and imperialism must be approached from both sides: from the history of technology as well as from that of imperialism. The history of technology ranks as one of the more popular forms of literature. Bookstores with only a handful of biographies and national histories will offer whole shelves of books on the history of guns, antique furniture, vintage cars, old-time locomotives, and Nazi warplanes. Most of these are hardware histories, compilations of pictures and facts about objects divorced from the context of their time. The social history of technology, in contrast, aims at understanding the causes, the development, and the consequences of technological phenomena. Social historians of technology generally begin with a given technology and examine it in this light. Examples abound: What was the impact of the cotton industry on British labor during the Industrial Revolution? How did firearms change warfare during the late Middle Ages? How did railroads contribute to the winning of the American West? Reversing the question, however, can also shed light on the historical process. Given a particular historical phenomenon—for example, the new imperialism—how did technological forces shape its development? This is the question that his-

torians of imperialism have neglected to answer, and that we must now confront.

The search for the causes of nineteenth-century imperialism has spawned one of the liveliest debates in modern history. Historians have offered a wealth of explanations for this dramatic expansion of European power. Some have emphasized such political motives as international rivalries, naval strategy, the instability of imperial frontiers, the diversion of popular attention from domestic problems, or the influence of pressure groups on political decision makers. Others, following in the footsteps of the English economist J. A. Hobson, have stressed economic motives: the need for raw materials, secure markets, or investment opportunities.³

At first sight, these points of view seem to differ markedly. Yet, we are struck by a common underlying element. Participants in the debate agree that the crucial factor in the new imperialism was the motivation of the imperialists. What made nineteenth-century politicians, explorers, traders, missionaries, and soldiers want to extend the influence of Europe to hitherto untouched lands? Behind this question lies the tacit assumption that once Europeans wanted to spread their influence, they could readily do so, for they had the means close at hand.

Rather than analyze in detail the debate on the new imperialism, let us consider a few recent and important contributions. These can be divided into three broad categories: those that ignore the role of technology, those that disparage it, and those that gloss over it lightly. In the first category is *Africa and the Victorians* by Ronald Robinson and John Gallagher. The authors consider the conquest of Africa in the last decades of the nineteenth century:

Why, after centuries of neglect, the British and other European governments should have scrambled to appropriate nine tenths of the African continent within sixteen years, is an old problem,

still awaiting an answer. . . . What were the causes and incentives? Which of them were merely contributory and which decisive? . . . A first task in analyzing the late-Victorians' share in the partition is to understand the motives of the ministers who directed it. . . .⁴

Having asked these questions, the authors find that indeed the scramble for Africa can be explained by the intentions and hesitations of the statesmen, the "official mind" of the European powers.

A similar perspective pervades Henri Brunschwig's *French Colonialism 1871–1914, Myths and Realities*.⁵ In this book the author argues that France acquired an empire mainly for psychological reasons: wounded pride following the Franco-Prussian War, and the desire to regain status and prestige among the great powers. A less Eurocentric theory is advanced by D. K. Fieldhouse in *Economics and Empire 1830–1914*. Imperialism, defined as military and political conquest, was the consequence of instability generated on the frontiers of empire by advancing parties of traders, missionaries, and other Europeans coming into conflict with indigenous societies: ". . . imperialism may be seen as a classic case of the metropolitan dog being wagged by its colonial tail," he declares, or again, ". . . Europe was pulled into imperialism by the magnetic force of the periphery."⁶ After presenting myriad instances of this phenomenon, however, Fieldhouse is left with the tantalizing question:

Is 'imperialism' merely shorthand for an agglomeration of causally unrelated events which happened to occur at largely the same time in different parts of the world? If so, why did the critical period of imperialism happen to occur in these thirty years after 1880?

These multiple crises and their timing were merely symptoms of a profound change in the pathology of international relationships. The world crisis was real and a solution had to be found. By about 1880 there was a profound disequilibrium between Europe and most parts of the less-developed world. Never had

one continent possessed so immense a power advantage over the others or been in such close contact with them.⁷

Imperialism, then, was the sum of many little imperialisms tied together by their timing. And their timing was the product of "a profound change in the pathology of international relationships," "a profound disequilibrium," "a power advantage." Here, on the very brink of offering a concrete explanation for the new imperialism as a unified movement, Fieldhouse backs off, leaving us with hazy, mysterious forces.

In the works cited above, the authors disregard the technological factor in imperialism. Others mention it, but only to reject it. This is the position taken by both Hans-Ulrich Wehler and Rondo Cameron.

In his book *Imperialismus*, Wehler asserts:

. . . technological progress as such did not cause imperialistic expansion directly, let alone automatically, but contributed as the impetus in other areas. Imperialism resulted, in a way, from the socio-political inability, within the political framework, to cope with the economic results of permanent technological innovations and their social consequences.⁸

In a later work, Wehler is even more categorical:

If one points to technological progress as the main factor of expansion, thereby defining imperialism as a sort of unavoidable "natural" consequence of technological innovations, one is led astray too. There is no direct causal relationship between these innovations and imperialism.⁹

Rondo Cameron reached a similar conclusion in an article entitled "Imperialism and Technology," which appeared in a general history of technology:

It is sometimes asserted that the rapid progress of Western technology in the 19th century was a major determinant of the imperialist drive. . . . Western superiority in ships, navigational techniques, and firearms was a fact of long standing, however. It

INTRODUCTION

cannot be used to explain the burst of expansion at the end of the 19th century, after almost a century during which Europeans showed little interest in overseas expansion.¹⁰

The rejection of the technological factor by Wehler and Cameron, and its disregard by Robinson, Gallagher, Brunschwig, and Fieldhouse are not representative of the literature as a whole. The majority of current works on imperialism concede the importance of the technological factor, paying it lip-service before hurrying on to something else. An excellent example is the recent *African History* by Philip Curtin and others. The authors recognize that, as a result of advances in medicine and pharmacology, iron and steel, and firearms, "conquest in Africa was not only far cheaper than it had ever been in the past; it was also far cheaper in lives and money than equivalent operations would ever be again." Yet to these "technological factors," they devote only three pages.¹¹

The conclusion is inescapable; at the present stage of the debate, historians give technological factors very low priority among the causes of the new imperialism. Such a curt dismissal of the role of technology in nineteenth-century imperialism stands in striking contrast to the central role assigned to technological change—better known as the Industrial Revolution—in the histories of European societies and economies of the very same period. It contrasts even more with the careful attention that historians of the early modern period have devoted to the technological aspects of the oceanic discoveries and of the exploration and conquest of the Americas.¹²

One reason for the disregard of technological factors lies in the leading-sectors model of the Industrial Revolution. This widely accepted explanation concentrates on the role of the most innovative and fastest-expanding industries—textiles, railroads, mining, and metallurgy—which exerted strong multiplier effects on the rest of the economy. It is quite reasonable for someone to consider these leading sectors and conclude that they became important in the non-Western world only

TECHNOLOGY, IMPERIALISM, AND HISTORY

late in the colonial period, and not in the earlier periods of penetration and conquest.

If the more dramatic aspects of the Industrial Revolution had only a marginal impact on imperial expansion, it does not follow that technology in general was inconsequential. In order to discover which inventions were important on the frontiers of empire, we must look at Africa and Asia as well as Europe, and at indigenous technologies and natural obstacles as well as at the technologies of the imperialists.

A more fundamental reason for misunderstanding the role played by technology lies in the very concept of causality used by historians. Almost all historians nowadays view imperialism as the result of many causes; their interpretations differ in the weights they attach to each cause. The problem with this way of thinking is that any attempt to emphasize the role of one cause automatically reduces the importance of the others, thereby coming into conflict with other interpretations. The debate on the new imperialism is essentially the result of conflicts in the ordering of causes. To defend the importance of a new factor is therefore to run head-on into other interpretations. And to advance the claims of technology—which many still associate with the concept of matter over mind—seems at first to defy an axiom of Western historiography: that history results from the interactions of human decisions.

This dilemma is much relieved if we divide causes into motives and means. A complex process like imperialism results from both appropriate motives and adequate means. If the motives are too weak—as they were in the case of the Chinese expeditions to the Indian Ocean in the 1430s—or if the means are inadequate—as in the Italian invasion of Ethiopia in the 1890s—then the imperialist venture aborts. Both types of causes are equally important, and by focusing on one we in no way discredit the other.

A model of causality in which the technical means are separate from the motives does not imply that the two are unre-

lated. On the contrary, the appearance of a new technology can trigger or reinforce a motive by making the desired end possible or acceptably inexpensive. For example, quinine prophylaxis allowed Europeans to survive in tropical Africa. Conversely, a motive can occasion a search for appropriate means, as when the American occupation of Cuba brought about the investigation of the causes of yellow fever. The many instances in which we will encounter both types of relationships will serve as reminders that we must steer between two dangerous determinisms: the technological—"what can be done will be done"—and the psychological—"where there's a will there's a way."

If we accept the equal necessity of both motives and means, then the new imperialism could have resulted from any of three possible scenarios: Adequate means were available, but new motives triggered the event; sufficient motives existed, but new means came into play, thus leading to the event; or, finally, both the motives and the means changed, and both caused the event.

The first scenario—which Cameron sums up with the words "Western superiority . . . was a fact of long standing"—has formed the basis of the débate up until recently. Yet Western superiority, insofar as it existed, does not suffice to explain European conquests in Asia and Africa. The new imperialism was not the result of mere superiority, but of the unleashing of overwhelming force at minimal costs. Technological changes affected the timing and location of the European conquests. They determined the economic relations of colonialism. And they paved the way for the astonishing reversal of the world balance that we are currently witnessing.

If the first scenario overemphasizes motivations, the second one gives more credit to technological factors than the evidence warrants. Europeans were not always equally interested in Asia and Africa, and historians have rightly stressed the growing demand for colonies in the late nineteenth century.

It is the third of our scenarios, in which both means and motivations changed and interacted, that best reflects the realities of the European conquest and colonization of the eastern hemisphere during the nineteenth century. It is the purpose of this book to argue this third scenario, by analyzing the technological changes that made imperialism happen, both as they enabled motives to produce events, and as they enhanced the motives themselves.

The goal and result of imperialism—one which was in fact achieved in most territories before decolonization—was the creation of colonies politically submissive and economically profitable to their European metropoles. The economic networks that were established, and the technologies that entered into the development and exploitation of colonial plantations, farms, mines, and forests, are a complex subject that we must leave for another time.

This book concentrates on an earlier period, that of imperial expansion. The imperialism of Europe in Asia and Africa involved a number of stages before the goal of pacified colonies eventually was reached. Though these occurred at different times and in different ways depending on the region, we can classify these stages roughly as follows. The initial stage was that of penetration and exploration by the first European travelers. Then came the conquest of the indigenous people and the imposition of European rule on them. Finally, before the colony could become valuable as an adjunct to a European economy, a communications and transportation network had to be forged.

From the technological point of view, each of these stages involved hundreds of diverse products and processes, from pith-helmets to battleships. In this book I will concentrate on those that played the most crucial role, either by making imperialism possible where it was otherwise unlikely, or by making it suitably cost-effective in the eyes of budget-minded

governments. In the penetration phase, steamers and the prophylactic use of quinine were the key technologies. The second phase—that of conquest—depended heavily on rapid-firing rifles and machine guns. In the phase of consolidation, the links that tied the colonies to Europe and promoted their economic exploitation included steamship lines, the Suez Canal, the submarine telegraph cables, and the colonial railroads. These technological factors are the subject of this work.

The effects of technological change were experienced almost everywhere in the nineteenth century, but they were felt much more strongly in some parts of the world than in others. In particular, areas such as India and Africa, which were conquered and colonized by Europeans, were more deeply affected than areas like Persia or China, over which European influence was exercised indirectly through indigenous rulers.¹³ Thus we shall award to each region a share of our attention proportional to that which it received from nineteenth-century imperialists.

This book makes no claim, then, to destroy other interpretations of nineteenth-century imperialism. Rather it aims to open new vistas and to provoke fresh thinking on this subject, by adding the technological dimension to the list of factors other historians have already explored.

NOTES

1. D. K. Fieldhouse, *Economics and Empire 1830-1914* (Ithaca, N.Y., 1973), p. 3.

2. F. J. C. Hearnshaw, *Sea-Power and Empire* (London, 1940), p. 179.

3. J. A. Hobson, *Imperialism: A Study* (London, 1902). The debate has grown to the point of generating its own anthologies and historiographies. See, for example, Harrison M. Wright, ed., *The "New Imperialism": Analysis of Late Nineteenth Century Expansion*, 2nd ed. (Lexington, Mass., 1976); George H. Nadel and Perry Curtis,

eds., *Imperialism and Colonialism* (New York, 1964); and Ralph Austen, ed., *Modern Imperialism: Western Overseas Expansion and its Aftermath, 1776-1965* (Lexington, Mass., 1969). More analytical studies of the debate will be found in E. M. Winslow, *The Pattern of Imperialism* (London, 1948); George Lichtheim, *Imperialism* (New York and Washington, D.C., 1971); Roger Owen and Bob Sutcliffe, *Studies in the Theory of Imperialism* (London, 1972); and Benjamin Cohen, *The Question of Imperialism: The Political Economy of Dominance and Dependence* (New York, 1973). A detailed bibliography of imperialism will be found in John P. Halstead and Serafino Porcari, *Modern European Imperialism: A Bibliography*, 2 vols. (Boston, 1974); on the historiography of imperialism, see 1:32-37.

4. Ronald Robinson and John Gallagher with Alice Denny, *Africa and the Victorians: The Climax of Imperialism* (Garden City, N.Y., 1968), pp. 17-19.

5. Henri Brunschwig, *French Colonialism 1871-1914: Myths and Realities*, trans. William Glanville Brown (London, 1966).

6. Fieldhouse, pp. 81 and 463.

7. Fieldhouse, pp. 460-61.

8. Hans-Ulrich Wehler, *Imperialismus* (Berlin and Cologne, 1970), p. 13.

9. Hans-Ulrich Wehler, "Industrial Growth and Early German Imperialism," in Owen and Sutcliffe, pp. 72-73.

10. Rondo Cameron, "Imperialism and Technology," in Melvin Kranzberg and Carroll W. Pursell, Jr., eds., *Technology in Western Civilization*, 2 vols. (New York, 1967), 1:693.

11. Philip Curtin, Steven Feierman, Leonard Thompson, and Jan Vansina, *African History* (Boston, 1978), p. 448. See also David Landes, "The Nature of Economic Imperialism," *The Journal of Economic History* 21(1961):511 for a similar approach; the author recognizes the importance of technological factors, but does not explain or elaborate. In addition to these examples taken from the general literature, the technological factor appears in specialized writings on particular aspects of imperialism; see, for example, Philip Curtin, "'The White Man's Grave': Image and Reality, 1780-1850," *Journal of British Studies* 1(1961):94-110 and *The Image of Africa: British Ideas and Actions 1780-1850* (Madison, Wis., 1964); Michael Gelfand, *Rivers of Death in Africa* (London, 1964); a series of articles on firearms in *The Journal of African History* 12(1971) and 13(1972); Michael Crowder, ed., *West African Resistance: The Military Response to Colonial Occupation* (London, 1971); and Henri

INTRODUCTION

Brunschwig, "Note sur les technocrates de l'impérialisme français en Afrique noire," in *Revue française d'histoire d'outre-mer* 54(1967): 171–87. Such specialized works, however, are rare and the authors make no attempt to generalize about the role of technology in imperialism.

12. See, for example, Samuel Eliot Morison, *The European Discovery of America: The Northern Voyages* (New York, 1971), ch. 5: "English Ships and Seamen 1490–1600"; Joseph R. Levenson, ed., *European Expansion and the Counter-Example of Asia, 1300–1600* (Englewood Cliffs, N.J., 1967), ch. 1: "Technology"; Eugene F. Rice, *The Foundations of Early Modern Europe, 1460–1559* (New York, 1970), ch. 1: "Science, Technology and Discovery"; J. M. Parry, *The Establishment of the European Hegemony: 1415–1715: Trade and Exploration in the Age of the Renaissance* (New York, 1961), ch. 1: "The Tools of the Explorers: (i) Charts (ii) Ships (iii) Guns"; and Carlo Cipolla, *Guns and Sails in the Early Phase of European Expansion 1400–1700* (London and New York, 1965).

13. As for Latin America, its history in the nineteenth century, that is, in its post-independence or neo-colonial phase, is entangled with that of American expansion and resembles that of Africa and Asia since World War Two. To do it justice would require another book.