War, Wireless, and Empire: Marconi and the British Warfare State, 1896–1903

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Radio . . . was born into a world of jittery jingoism and started life as a weapon in the commercial and military rivalries of the great powers. Thus do humans unfairly project their own virtues and vices upon the machines they create.

— **Daniel Headrick**[1]

The technology for wireless communication was invented in 1896, but radio did not evolve into a medium for mass communication until after World War I. Historians of early radio have noted but not explained the strange fact that public broadcasting, the application with which the technology is today most readily associated, was not part of the thinking about the technology in the moment of its invention.[2] Ironically, in an era that saw the emergence of a range of other mass media, from cheap newspapers to the cinema, no one seems to have been interested in developing radio into a mass medium. Indeed, scientists and the press bemoaned its ability to transmit to multiple receivers, as we shall see.

Of course, technological change is rarely a story of efficient improve-

1. Daniel Headrick, *The Invisible Weapon: Telecommunications and International Politics, 1851–1945* (New York, 1991), 116.
2. Susan Douglas, *Inventing American Broadcasting: 1899–1922* (1987; repr., Baltimore, 1989), 33–34; Hugh G. J. Aitken, *Syntony and Spark: The Origins of Radio* (New York, 1976), 306–7.

ment along some retrospectively discernible optimal path; paths are messy, contingent, and notoriously sticky. There were, for instance, important technical difficulties in the way of wirelessly transmitting anything other than dots and dashes—although the first feeble transmissions of speech and music occurred in 1906. But this is more than a case of technology evolving haltingly in-step with scientific knowledge: what is curious in the case of radio is that none of the key inventors was particularly trying to overcome technical barriers to mass communication.[3]

Instead, they thrust wireless technology into an application—long-distance, point-to-point communication—for which it was even less technically suited at the time.[4] Indeed, the technical barriers in the way of long-distance communication were even greater than those prohibiting broadcast transmission; it only became reliably practicable thirty years later, through rather different techniques than turn-of-the-century scientists had developed. Nor was radio economically suited to this application, which immediately positioned it as a rival to wired telegraphy; it was hardly in a sufficient state of development to displace a cable oligopoly that easily fought back with price-cutting for three decades. The move is even odder given that early inventors had originally conceived radio as a maritime technology, suitable to those ship-to-ship and ship-to-shore communication situations in which regular telegraphy could not work—thus a complement rather than a rival.[5]

So why was so much effort so quickly invested in making radio an instrument of long-distance communication? Hugh Aitken's classic work argues that "without a demonstrated ability to communicate over stipulated distances, there was no market." To break into his intended market of lighthouse-to-lightship communication, Guglielmo Marconi, the Bolognese tinkerer who arrived in London in 1896, had to demonstrate that his device could cover the distance involved.[6] But if coastal communication was the goal, we are left with a mystery about the dizzying lengths to which Marconi went to prove his point. None of the usual explanatory factors—contingency, path-dependency, technical barriers—seems able to illuminate the mystery. As Ken Alder explains, technical limits and social demands might set the outer limits of the technologically possible, but they cannot answer the all-important *historical* question: "Why are particular technologies designed and used in particular ways and particular times?"[7]

One explanation is that Marconi was so beset by rival claims to the invention that he clung desperately to the antennae that distinguished his

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3. For a critique of the traditional conception of technology as a direct translation of scientific knowledge, see Ken Alder, *Engineering the Revolution: Arms and Enlightenment in France, 1763–1815* (Princeton, N.J., 1997), 87.

4. Douglas, 33–34; Aitken, 306–7.

5. Aitken, 240–42; W. J. Baker, *A History of the Marconi Company* (London, 1970), 28.

6. Aitken, 230.

7. Alder, 87.

apparatus and controlled distance of transmission.[8] But this technical explanation begs further questions: Why was Marconi's position so embattled? And why did distance—measured in continents rather than miles—turn out to be such a marketable dimension in which to demonstrate progress? Aitken cites the publicity motives behind transatlantic transmission, but why did it suddenly become a gamble worth taking in 1901?

Clearly, some wider context shaped the path of radio's development. Radio was born at a critical moment in the development of the British warfare state, when colonial and industrial rivalries kept a diplomatically isolated Britain at the brink of conflict. Events like the Fashoda Incident of 1898 fed a sense of imminent European war, as did the Great Game with Russia. In the shadow of a global arms race and a growing conviction that new technologies conferred military and imperial advantages to whoever was first in the field,[9] the turn-of-the-century British state invested more deeply in scientific research, and scientists, in turn, relied increasingly on state support.[10] In this time of science and technology for and by the nation, Marconi was an interloper; despite his mother's British ancestry, he was a foreigner and, worse, a tinkerer.[11] Transmitting across the imperial map enabled him to prove his bona fides as a servant of the British state and style himself nostalgically as a "tinkerer-explorer" of the dark continent of space.

But the warfare state's influence did not stop at compelling the Italian to prove himself a true son of the empire. We cannot simply take it for granted that Marconi's well-known exploitation of the imperial map would have resonated so powerfully at any moment in this period: it was not merely empire as a set of cultural touchstones, but empire as an active

8. On the rival claims to priority, see Gleason Archer, *History of Radio to 1926* (New York, 1938); Sungook Hong, *Wireless: From Marconi's Black-Box to the Audion* (Cambridge, Mass., 2001); Jill Hills, *The Struggle for Control of Global Communication* (Urbana, Ill., 2002), 93–124; Anna Guagnini, "Patent Agents, Legal Advisers and Guglielmo Marconi's Breakthrough in Wireless Telegraphy," *History of Technology* 24 (2002): 171–202; Aitken (n. 2 above); Rowland F. Pocock, *The Early British Radio Industry* (Manchester, UK, 1988); and Gavin Weightman, *Signor Marconi's Magic Box: How an Amateur Inventor Defied Scientists and Began the Radio Revolution* (London, 2003).

9. Alfred T. Mahan's 1890 *The Influence of Sea Power upon History, 1660–1783* made precisely this point. The book was highly influential in Britain, as well as in the United States and Germany.

10. David Edgerton, *Warfare State: Britain, 1920–1970* (Cambridge, 2006); David Edgerton and John V. Pickstone, "Science, Technology and Medicine in the United Kingdom, 1750–2000," in *Cambridge History of Science*, vol. 8: *Modern Science in National and International Context*, ed. Ron Numbers (forthcoming). See also William McNeill, *The Pursuit of Power: Technology, Armed Force, and Society since A.D. 1000* (Chicago, 1984), chap. 8.

11. Newspapers almost tauntingly called him "Signor Marconi." When he had had enough, J. Henniker Heaton wrote to the *Times*: "Mr. Marconi will hardly blush to be reminded that he is a countryman of Signor Galvani and Signor Volta. As a matter of fact, Marconi's mother is an Irishwoman" (14 July 1902). Marconi's mother, Annie Jameson, was the daughter of a Scotch-Irish family of brewers and distillers.

political-economic and military pursuit in a time of war that made conti-nental distances the measure of progress.[12]

The long-anticipated war came in October 1899, in the unexpected form of a massive, long, costly, and controversial conflict in South Africa. For an imperial state at odds with everyone from Russia to France and rap-idly losing face before a guerrilla opposition, radio promised a useful tech-nical edge; indeed, at first, military exigency seemed likely to utterly dictate its early development. The Royal Navy had been quietly searching for a wireless system of communication, and, when war began, radio's absorp-tion into military work seemed preordained but for its fatal tendency to broadcast signals when security was at a premium, as the new genre of the spy novel and the Dreyfus affair across the Channel urgently reminded.[13]

If military needs had nevertheless remained the primary factor shaping early radio, we would have expected secrecy and directionality of transmis-sion to become Marconi's primary preoccupations. Indeed, without im-provements in those areas, even civilian ship-to-shore communication on a useful scale would prove impracticable, as stations along the coast would inevitably interfere with one another. Still, Marconi focused on distance. How, then, did the fear of war and the outbreak of war matter? For a way out of this explanatory impasse, we must turn to cultural history.

As the popularity of spy novels attests, the British warfare state gener-ated a rhetorical, as much as a military, need for security. And it is in the discursive context produced by the anticipation of and engagement in war that we can trace the evolving sense of the technology's ideal use. British militarism, David Edgerton argues, was grounded in the language of polit-ical economy for scientists and engineers, as much as for the general pub-lic.[14] Thus the principal defender of the war, Colonial Secretary Joseph Chamberlain, famously and unsuccessfully proposed an imperial tariff fed-eration to protect Britain's preeminence from the growing power of the United States and Germany and to strengthen the emotional and political bonds of empire. Imperial security had multiple wartime connotations: protection from the threat of force, from the economic "interference" of foreign imports, and from emotional estrangement during the conflict.

12. Susan Douglas has examined the "social construction" of radio in the United States, the way inventors, institutions, the press, and the public spun a "fabric of mean-ings" around the technology; see *Inventing American Broadcasting* (n. 2 above), xvii. But she does not tell us how that social construction affected radio's development. Her American focus precludes her attending to the wartime and imperial context in which Marconi operated. Instead, she argues that Marconi pursued long-distance transmissions simply because of his "grand" and "singular" vision (pp. 16 and 53).

13. See, for instance, "Wireless Missives: Handwriting Flashed Through Air," *Daily Telegraph*, 10 April 1899. On the fascination with espionage in the early twentieth cen-tury, see Priya Satia, *Spies in Arabia: The Great War and the Cultural Foundations of Britain's Covert Empire in the Middle East* (New York, 2008), chaps. 1–4.

14. Edgerton, esp. 11–12.

The effort to make radio an instrument of long-distance communication was contingent on Britain's military failures in South Africa, and on Marconi's subsequent efforts to engage the turn-of-the-century concern with security by presenting his technology as something that could bind an empire that was being pulled apart by the cable companies' punishing prices—a rending that was particularly disconcerting during a time of war. Marconi's ultimately successful efforts to attract customers for long-distance maritime communication among Britain's merchant marine and Lloyd's, the marine insurance giant, depended on this elision between notions of military and political-economic security. Had Britain not been in a war mood, he might have prioritized his original notion of shorter-distance coastal communication with ships approaching the British Isles. While he remained unable to reliably tune his apparatus, the war let him keep it in the public eye as an instrument of powerfully reassuring point-to-point communication. Radio became entangled with the task of securing the ocean for imperial commerce and bridging the continental distances of an empire in the throes of long-distance warfare. Even after Marconi lost his institutional affiliation with the state, wireless remained tied to the notion of imperial security, albeit in the more allegorical form of an empire more closely knit, its constituents less autarkic, its form less fanciful.

I am not making a claim here for the Boer War's practical impact on Marconi's technical work, but for its rhetorical influence on visions of the technology's ideal development. Ironically, the British state's anticipation of war and its South African military engagement shaped the technology ever more in the direction of long-distance, point-to-point communication. I am less interested here in Marconi's technical decisions—whether and how he addressed the problem of syntony to reinstate himself with military customers—than in his use of the public conversation about security as he sought alternative clientele and standing in the civilian world even before he had improved his technology. It was that discursive *association*, the structuring of the public imagination, that, I argue, made the idea of mass, local broadcast transmission—the most automatic association with the word "radio" today—appear such a backward application of the technology to the scientists and public of his time.

This is, then, a question about public rhetoric, one best answered by consulting press reports and Marconi's public speeches and presentations. Through the press, we can trace the powerful validation that the technology's spotty military heritage nevertheless lent to claims for its political-economic uses in promoting imperial security. Indeed, the press is a natural place to look for contemporary understandings of radio: Marconi deliberately took his case to the press—his rivals following in an endless stream of letters to editors—counting on the press's interest in his defiance of the cable companies that so closely governed the business of news reporting. In other words, the press was an important constituency to win over, as well as

a critical intermediary between himself and the larger constituency of the British public during his global peregrinations. It mediated public knowledge of wireless telegraphy; key events in the technology's evolution were newsworthy precisely because they transpired in remote locations. While the press cannot divulge exactly what ordinary Britons thought about radio, it does disclose the scientific opinion and public information they drew on to form their ideas during this period. Radio came to them entangled with the imperial happenings that were then the staple of news reporting.

My analysis draws on both technical and popular press coverage of wireless. The early priority disputes were carried out primarily in the technical press (the *Electrician*, *Electrical Review*, and *Nature*)—that supposedly disinterested segment of the public sphere where scientific findings were announced, validated, and contested. But when Marconi found himself cornered by skeptics and critics, he took the debate to another venue—the popular press, where he traded on the shifting valences of the concern with security and the press's resentment of dependence on expensively cabled news. To trace the discursive construction of radio in this press, I have drawn on a diverse range of publications: the conservative gentleman's *Pall Mall Gazette*; the liberal provincial tradesman's *Manchester Guardian*; the paper of record, the *Times*; the fashionable *Illustrated London News*; the liberal local *Westminster Gazette*; the cheap, mass, conservative *Daily Telegraph*; and the conservative, highbrow *Spectator* magazine. Across these publications, we can trace the close entanglement of radio technology with security in the public imagination, and Marconi's deliberate cultivation of that association.

In this cultural history, agency is thus a multifaceted phenomenon. Marconi's wit and business acumen are on flagrant display, but so are the more subtle workings of a collectively produced discourse, whose origins are more difficult to trace. We might simply call them the rhetorical conventions of an imperial state geared for long-distance war. In this familiar story of Marconi's canny grasp of publicity in imperial Britain, we can discern the surprising ways in which war can influence technological change. It is well-known that warfare states can produce a host of technologies with important peacetime uses, from the airplane to GPS,[15] but not that their discursive power can also shape technologies that have no immediate military usefulness. Conventional wisdom tells us that war is often the fount of technological revolution—radio finally came into its own after the Great War, after all—but this story suggests that war can also profoundly distort the process of technological change. And cultural history provides us tools for discerning its more subtle forms of influence. Alongside real technical limits to radio's development into a mass medium were the constraints on the imagination produced by the priorities of the British warfare state.

15. For the general principle, see Alder (n. 3 above), 348.

In what follows, I first describe how the state's growing interest in science gave Marconi his first platform in Britain and linked wireless technology to the business of the imperial state. The next section shows how Marconi's experiments with long-distance communication traded on the notion of imperial security as he searched for customers beyond the state. Finally, I describe how the notion of imperial security underwrote Marconi's monopolistic ambitions and their consequences for radio's further development.

How Radio Failed the State

When Marconi arrived in Britain in 1896, the Post Office had just acquired a monopoly over all electric communication within the country and three miles beyond its coastline. It was also under pressure by the Admiralty to develop techniques for communications with ships at sea, and its chief engineer, William Preece, a leading "practician," was in bitter dispute with academic scientists working on electromagnetic questions, particularly the distinguished professor Oliver Lodge.[16] This was a moment in which the cosmopolitan "tinkerers" of an older era were engaged in a rearguard action against "theoreticians," who disparaged them as mercenary relics oblivious to notions of intellectual property and national propriety.[17] In Marconi, Preece found a kindred spirit, a fellow practician who knew little of Maxwell's equations and had developed his black box through diligent trial and error.[18] He promised Marconi unsparing Post Office support, thus infuriating the theoreticians, who were just then negotiating with the government for a national physical laboratory (they succeeded in 1900). Radio's early years were thus shaped by the state's interest in science at a moment of palpable international tensions and the resulting cleavages within the British science community.

The state's patronage gave Marconi prime access to those he had identified as his likeliest consumers. His initial demonstrations before the Post Office, Admiralty, and War Office took place on Salisbury Plain, the training ground to which troops preparing for the Boer War would soon be sent. His early trials during naval maneuvers were much noted.[19] He talked of

16. See Hong, *Wireless* (n. 8 above), 36–38.
17. Frank M. Turner, "Public Science in Britain, 1880–1919," *Isis* 71 (1980): 589–609; Roy MacLeod, ed., *Public Science and Public Policy in Victorian England* (Aldershot, UK, 1996); Roy MacLeod and Peter Collins, eds., *The Parliament of Science: The British Association for the Advancement of Science: 1831–1981* (Middlesex, UK, 1981); Edgerton and Pickstone (n. 10 above).
18. He also thought Marconi's apparatus relied on a new kind of radiation that would help him challenge the scientific establishment's electromagnetic fixations; see Aitken (n. 2 above), 117 and 214, and Pocock (n. 8 above), 101–21.
19. See H. J. W. Dam, "The New Telegraphy: An Interview with Signor Marconi,"

exploding gunpowder by wireless; visions of torpedoes steered by ether waves and other innovations followed.[20] Thus, working within the institutional spaces of the state, he and others began to think of the technology as an instrument of imperial defense. A successful trial across the Bristol Channel in the summer of 1897 convinced Preece to permanently associate Marconi with the Post Office—belatedly, for by then Marconi had tired of its bureaucratic pace and style and accepted his cousin Jameson Davis's offer to set up the Wireless Telegraph and Signal Company, securing a stable salary as company director.[21]

Despite striking out on his own, Marconi continued to cultivate state authorities as the most likely source of a sustaining contract. Obliged to move his transmissions outside the Post Office monopoly, he found through the navy a convenient experimental space at sea.[22] He also leveraged the example of Germany's Arco-Slaby wireless firm to call for continued government support of his own endeavors.[23] Most notably, on the declaration of war in October 1899, he immediately contacted the War Office to suggest that they use radio to control the flow of men and material into South African ports and to communicate "across tracts of country where it would not be possible or prudent to carry ordinary telegraph wires."[24] Indeed, the war secured him his first contract. Within a month, he had dispatched a team of engineers and five wireless sets to the war zone, but they functioned so poorly that they cast fresh doubt on his claims about his system's immunity from "tapping" or disruption by the enemy.[25] Marconi publicly defended his device, blaming the technical problems on the military authorities. The director of Army Telegraphs retaliated by withdrawing the sets from service. By then, however, the navy was sufficiently impressed by the performance of his device in maneuvers that it snapped up the rejected apparatuses for the naval blockade in Delagoa Bay, where they functioned well enough to prompt the purchase of some thirty sets in July 1900.[26]

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Strand Magazine 13 (1897): 278–79; "Telegraphy without Wires," *Times*, 11 June 1897; and "Signor Marconi's Electric Telegraph," *Illustrated London News*, 31 July 1897, 152.

20. "Torpedo Steering by Ether Waves," *Electrician*, 19 May 1899, 112; "Pay and Status of Engineers: Experiments with Wireless Telegraphy in the Mediterranean," *Electrical Review*, 9 August 1901, 214.

21. On Marconi's use of his British relatives, see Guagnini (n. 8 above), 178–79.

22. As remarked in "Wireless Telegraphy," *Nature*, 15 February 1900, 378.

23. See managing director, quoted in "Notes," *Electrician*, 2 March 1900, 647. The *Illustrated London News* offered a full-page illustration on 20 September 1902 of "The German Army Manoeuvres: A Communication from Headquarters to the Divisional Commanders by Means of Wireless Telegraphy" (p. 416).

24. "Wireless Telegraphy," *Times*, 16 November 1899, 11. When it was discovered that the Boers also possessed wireless instruments, Marconi assured that they were German-made and not workable; see "Notes," *Electrician*, 5 January 1900, 351.

25. "A Correspondent from South Africa," *Electrical Review*, 1 November 1901, 698.

26. Duncan C. Baker, "Wireless Telegraphy in South Africa at the Turn of the Twentieth Century," in *History of Wireless*, ed. Tapan K. Sarkar et al. (Hoboken, N.J., 2006),

Although these military contracts had immense publicity value, they did not generate further sales to the state, partly because the navy began building its own sets[27] and partly because Marconi's commercial efforts foundered on the early failure in South Africa, which gave rise to insistent calls for more secure transmission. The *Times* warned that "[t]o shoot a signal into the vague or to sweep it round a large arc of the compass would in many contingencies be far more compromising in time of war than a similar indiscriminate use of the search-light."[28] The scientific community pressed Marconi for proof of syntony—the state arising when a transmitter and receiver are adjusted, or "tuned," to a particular wavelength. Tuning, of course, is what makes simultaneous radio broadcasts possible today, but a century ago, when the objective was to prohibit broadcasting altogether, syntony was critical to exclusive transmission.

The prioritization of syntony, which together with directionality would allow private transmission, was conditioned by the military context. Lodge had early conceded that "there were occasions when one wanted to 'shout to the world'—as in distributing political speeches to the Press," but the *Electrician* scoffed that "nothing is to be generally gained by using ether waves radiating in all directions." The technology's prodigality was an embarrassment: "Messages scattered broadcast not only waste energy by travelling with futile persistence towards celestial space; they do positive mischief by interrupting the everyday business of irrelevant stations in the vicinity."[29] The diffuse nature of wireless transmission was not only psychologically disturbing,[30] it was discomfortingly uneconomical at a time when tight husbanding of imperial resources was a pressing concern. Even an encrypted message sent by broadcast might advertise a ship's location to the wrong people, as in the scenario projected by the *Times*.

Scattered signals seemed to render any communication impossible;

444–48; W. J. Baker (n. 5 above), 50–51. The contract was announced publicly by the Marconi Company's managing director, Major Flood Page, in a letter to the editor of the *Times* on 18 July 1900.

27. On this, see R. F. Pocock and G. R. M. Garratt, *The Origins of Maritime Radio: The Story of the Introduction of Wireless Telegraphy in the Royal Navy between 1896 and 1900* (London, 1972). Nationalist rivalries also held the Continental powers back from purchasing his equipment; see Headrick (n. 1 above), 116–20.

28. Lead editorial, *Times*, 18 August 1899.

29. Oliver Lodge, quoted in "Hertzian Telegraphy at the Physical Society," *Electrician*, 28 January 1898, 453; see also "Wireless Telegraphy," *Electrician*, 14 October 1898, 815, and "Notes," *Electrician*, 7 April 1899, 819. To be sure, directionality was not really possible until the advent of shortwave transmissions in the 1920s (I thank my anonymous referee for pointing this out), but the important point for my purposes is that turn-of-the-century scientists and engineers pursued directionality as part of their search for more secure wireless transmission—at the expense of technical improvements that would enhance broadcast transmission.

30. See Julie English Early, "Technology, Modernity, and 'The Little Man,'" *Victorian Studies* 39 (1996), 328–29.

indeed, by 1900, interference between Marconi's own stations was becoming a serious problem. He began to develop a syntonic system but in the meantime extended the distance of transmission. In 1896, he had transmitted four miles across Salisbury Plain; in 1897, fourteen miles across the Bristol Channel; in 1899, eighteen miles across the English Channel. Then, at the turn of the century, to the bafflement of his critics, came a transatlantic transmission between Cornwall and Newfoundland. In 1902, Marconi announced that he would "succeed shortly in telegraphing around the world."[31] But distance was "secondary," harped *Nature*; Marconi had "made it clear enough that, given sufficient power, almost any range can be attained." Instead, the magazine demanded "[t]rustworthiness, clearness, the design of circuits and apparatus, and . . . successful syntonisation."[32] The disputes over whether syntony was necessary, whether Marconi's system was syntonized, and what sorts of delinquencies syntony could realistically prevent culminated in the "scientific hooliganism" of June 1903, when Nevil Maskelyne—magician, inventor, and sometime detractor of Marconi—sent insulting messages from a transmitter at the Egyptian Theatre in London to interfere with a demonstration of Marconi's system at the nearby Royal Institution, thus disproving its syntonization.[33] The question is: Why did Marconi continually demonstrate improvements in distance when he was being asked for proof of syntony?

How Radio Secured the Empire

As it turns out, imperial defense and secure communication were not the only conversations about security in which wireless was entangled; even the early hopes for ship-to-shore communication were about multiple kinds of security. A Briton in German seas complained in the *Times* that it was "degrading" to have to tell the German lifeboat authorities that Britain had made "no progress" with wireless maritime communication.[34] At the

31. "Wireless Telegraphy," *Times*, 17 July 1902; see also "Wireless Telegraphy," *Times*, 28 May 1900, and "From Cornwall to Kronstadt," *Westminster Gazette*, 16 July 1902.

32. "The Lodge-Muirhead System of Wireless Telegraphy," *Nature*, 16 July 1903, 247. The article considered the relative merits of the new Lodge-Muirhead system, which did not have a very large range.

33. Sungook Hong, "Syntony and Credibility: John Ambrose Fleming, Guglielmo Marconi, and the Maskelyne Affair," in *Archimedes: Scientific Credibility and Technical Standards in 19th- and 20th-Century Germany and Britain*, ed. Jed Z. Buchwald (Dordrecht, 1996), 157; Hong, *Wireless* (n. 8 above), chap. 4. Maskelyne sent out "dirty," broad frequency waves that no tuned system at the time could have been protected against. The American Wireless Company had tried something similar in 1901; see Douglas (n. 2 above), 56–57.

34. Letter to the editor, *Times*, 3 July 1900; see also letter to the editor, *Times*, 7 April 1899, and "Foreign News," *Manchester Guardian*, 29 April 1899. The Dover Chamber of Commerce pushed unsuccessfully for fitting out lightships with wireless telegraphy

height of the naval arms race, wireless promised, but did not deliver, physical security at sea *and* the geopolitical security of a restored reputation as masters of the sea. With his pursuit of distance, Marconi played on a related set of security concerns that were more political-economic in nature: Britain's diplomatic isolation at a time of long-distance military conflict intensified calls for strengthening imperial ties, particularly among the "white" colonies of settlement, leading to Chamberlain's postwar calls for a tariff federation. While critics harped on the security weaknesses of his device for military use, Marconi traded on the multiple valences of the security concern as he explored other avenues for sustaining his commercial venture. Having failed to find contracts among state departments, he redirected his energies toward the creation of a wireless network that would capture the communication market of the empire itself. A sympathetic press continued to couch this application of the technology in terms of imperial security, as we shall see below.

To maintain shareholders' confidence in a company without customers in a time notorious for shady schemes, Marconi had to demonstrate constant progress, despite having reached a dead end in the most obvious avenues for applying the technology. Ironically, the scientific establishment's antagonism toward him lit the way forward. The scientists were incensed not only by Marconi's status as tinkerer and foreigner, but also by his claim to an invention that Lodge purported to have demonstrated in 1894.[35] On its front page in July 1897, the *Electrician* threw down the gauntlet: if Marconi could prove that his apparatus was far superior to all other combinations, he might defend a patent for a "novel combination of 'old instrumentalities,'" but his device would have to "transcend all others in range, reliability and ease of manipulation."[36] As this challenge suggests and other scholars have noted, Marconi might have chosen among several dimensions to defend his claim, but he chose distance over syntony—for as he understood it, there was a trade-off between syntony and range.[37]

He did so partly because the vertical wires that distinguished his device were also the innovation that permitted him to transmit over long distances. He had made only casual reference to the wires in his initial patent specifications, but the attacks on his claim to priority made him emphasize them as the source of his success.[38] Soon after the *Electrician*'s challenge,

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installations; see "Wireless Telegraphy," *Times*, 4 June 1900, and "Wireless Telegraphy," *Times*, 16 November 1899.

35. See Lodge, letter to the editor of the *Times*, 22 June 1897; see also Sungook Hong, "Marconi and the Maxwellians: The Origins of Wireless Telegraphy Revisited," *Technology and Culture* 35 (1994): 717–49, and Hong, *Wireless*, chap. 2.

36. "Notes," *Electrician*, 30 July 1897, 431.

37. Distance was the result of highly damped broad frequency waves in Marconi's apparatus; see Hong, *Wireless*, 91–96.

38. See Marconi's lecture at the Institution of Electrical Engineers, reported in "Sig-

Marconi reported that "I can only tell you this, that until the date of my experiments no mention was made in the scientific papers . . . of the possibility of long-distance signals." The *Electrician* countered by citing back issues in which Sir William Crookes had written of people a mile apart corresponding via "vibrations."[39] Marconi would have to deliver on a more spectacular scale than a few miles to make his case. And so, in April 1899, months before the war, he announced his ambition to create a cheap replacement for regular telegraphy.[40]

This move stoked the technical press's animosity. As beneficiaries of cable companies' subscriptions and advertisements, engineering journals scoffed at the notion of an "imminent revolution in methods telegraphic" and cautioned readers against reckless divestment from cable companies.[41] But with his gambit, Marconi had designated a new audience to adjudicate his claim to priority. The technical press's implacable skepticism drove him into the arms of the lay press, where he strove to secure an alternative source of legitimacy as a businessman and scientist. In shifting the scene of the contest, he endeavored not only to evade the biases of the scientific press, but to exploit those of the lay press, which was seeking escape from the cable companies' stranglehold on its ability to fulfill growing demands for up-to-date news.[42] Announcing his feats of transmission by dispatching news reports wirelessly from ever-more-distant locales, Marconi let the medium become the message.[43]

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nor Marconi on Wireless Telegraphy," *Times*, 3 March 1899; "Wireless Telegraphy," *Electrician*, 10 March 1899, 692; and "Wireless Telegraphy," *Electrician*, 17 March 1899, 727. Even his supporters forgot the catholic claims he had made in his patent specifications of 1896, citing a "popular delusion that Mr. Marconi claims to be the inventor of wireless telegraphy" and clarifying that he was rather the first "to take height into consideration in transmitting the electric waves"; see "Occasional Notes: Wireless Telegraphy," *Pall Mall Gazette*, 19 December 1901. Curiously, this statement was made after the transatlantic signal that, if anything, disproved Marconi's "rule of thumb" relating distance to the height of the vertical wire; see also Captain J. N. C. Kennedy, letter to the editor, *Electrician*, 29 October 1897, 22–23.

39. Daily Chronicle, quoted in "Notes," *Electrician*, 24 September 1897, 699; Sir William Crookes, 1892, quoted in "Notes," *Electrician*, 1 October 1897, 736.

40. Major Flood Page, letter to the editor, *Times*, 3 April 1899.

41. "Wireless Telegraphy," *Electrician*, 13 May 1898, 83; "Notes," *Electrician*, 21 April 1899, 885; see also J. H. Carson, manager of Anglo-American Telegraph Company, letter to the editor, *Westminster Gazette*, 18 December 1901.

42. Simon J. Potter, "Webs, Networks, and Systems: Globalization and the Mass Media in the Nineteenth- and Twentieth-Century British Empire," *Journal of British Studies* 46 (2007): 631; see also Douglas (n. 2 above), 25.

43. When the *Times* received the first transatlantic wireless-telegraphic news dispatch from New York in April 1903, it ran articles reporting on the transmission. Other papers ran articles about the *Times*'s self-referential articles; in fact, they applauded its sophistication in making ideal use of the new technology: "Transatlantic wireless telegraphy may now be considered on a practical commercial footing," announced *Nature* ("Notes," 2 April 1903, 517). Such articles were, in turn, summarized in the *Times*; thus its article headlined "Wireless Telegraphy and 'The *Times*'" reported the coverage given by the *New York Sun* and *New York Times* to its own reception of a news article via wire-

The *Times* praised him for setting "a new record in the work of enterprising journalism."[44]

Before this new jury, Marconi traded the rule of reason that supposedly governed the technical press's adjudication of scientific progress[45] for the whimsical notions of an inexpert press fascinated by the idea of invisible transmission.[46] With public opinion in mind, he designed open-air experiments conducted in increasingly wider spaces, in *public*, calculating that the lay press would be impressed by rather different notions of "progress" than the scientific establishment—even if the increases in distance transmitted involved only the addition of more power.[47] He continually tantalized the public with the prospect of enormous distances soon to be bridged, thereby evoking a mixture of doubt and excitement even in the technical press.[48] But it was not merely distance in an abstract sense that was so electrifying: it was what those distances symbolized to an empire involved in a long-distance war. The timing was everything.

As we have seen, radio found a starring role at the start of the war, and that early activity helped associate the technology with imperial defense in the popular press as much as in Marconi's mind. Through letters and news reports, the newspapers reported the adventures of Marconi's personnel, immersing the peripatetic invention in a procession of South African place-names: Delagoa Bay, Cape Town, Natal, Transvaal, Kimberley, Orange River, De Aar, Modder River, Enslin, Belmont.[49] Battle reports provided

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less telegraphy (31 March 1903), and another reported what New York newspapers had said about the impact the *Times*'s relationship with the Marconi Company would have on cable companies ("Wireless Telegraphy," *Times*, 1 April 1903). See also "First Press Message Across the Channel," *Times*, 29 March 1899; "Wireless Telegraphy between France and England," *Nature*, 30 March 1899, 514; "A Triumph of Wireless Telegraphy," *Westminster Gazette*, 29 March 1899; "The Wonders of Wireless Telegraphy," *Pall Mall Gazette*, 29 March 1899; and "Telegraph and Telephone Notes: Wireless Telegraphy," *Electrical Review*, 26 December 1902, 1076. Reliable daily transatlantic service was only successful beginning in 1907.

44. "Wireless Telegraphy," *Times*, 16 November 1899.

45. David Zaret, "Religion, Science, and Printing in the Public Spheres in Seventeenth-Century England," and Craig Calhoun, "Introduction: Habermas and the Public Sphere," both in *Habermas and the Public Sphere*, ed. Craig Calhoun (Cambridge, Mass., 1992), 36, 228.

46. On this fascination, see Douglas, 17–19.

47. See especially J. A. Fleming, letter to the editor, *Times*, 3 April 1899, reprinted as "Professor Fleming on Wireless Telegraphy," *Manchester Guardian*, 4 April 1899. (Fleming, who had worked with Maxwell and taught electrical engineering at University College, London, joined Marconi's company in 1900, bringing the company greater academic prestige and legitimacy; see Douglas, 35–36.) Douglas explains American sympathy for Marconi as a product of an American emphasis on practical success over the technicalities of priority issues (p. 22), but, in fact, Britons were just as impressed with practice.

48. See, for instance, "Notes," *Electrician*, 14 April 1899, 852; "Marconi's Experiments," *Daily Telegraph*, 30 March 1899.

49. See, for example, letter to the editor, *Times*, 18 July 1900; "Wireless Telegraphy," *Nature*, 15 February 1900, 380; Marconi, lecture at the Royal Institution, reported in

templates for this coverage, as did the narrative conventions of explorers' accounts for reports of Marconi's own movements.

These press reports styled Marconi as an imperial hero battling on the frontier of time and space itself. He filled the increasingly apparent iconographic void created by the Livingstones, Rhodes, and Cooks of the past, as the press hailed his "conquest of the air" and taming of the "trackless expanse of the Atlantic Ocean."[50] The Conservative Member of Parliament, journalist, and postal reformer J. Henniker Heaton reminded *Times* readers that "[Marconi] has devoted his youth to working for England. Every one of his 130 patents benefits the Empire."[51] The transatlantic transmission's sensational disproof of Marconi's own theory, that the square of the antenna's height predicted transmission distance, enforced the image of a brave explorer at the precipice of the unknown; even the scientific establishment, until then certain that the curvature of the earth would prevent transmission beyond the horizon, expressed a qualified admiration.[52] The magical quality of electrical science in an age of occult fascinations, together with Marconi's exotic origins and personal reserve, created an aura of the mystical genius conjuring knowledge from the void.[53]

"Notes," *Nature*, 8 February 1900, 350–51; and "Mr. Marconi on Wireless Telegraphy," *Times*, 5 February 1900.

50. "Signor Marconi's Conquest of the Air Continues," *Pall Mall Gazette*, 22 December 1901; see also Dam (n. 19 above), 280. Douglas (n. 2 above, p. xxiv) types Marconi as an "inventor-hero," but in Britain, heroism had specific imperial and military resonances—indeed, even in the United States, Marconi was compared to Admiral Dewey of the Spanish-American War (pp. 4–8 and 20). Marconi's experiments were primarily directed to the British public—the American branch was "an afterthought" (pp. 73 and 77).

51. J. Henniker Heaton, letter to the editor, *Times*, 14 July 1902. That Marconi was a specifically British agent was never absolutely certain. Frustrated with the Post Office's refusal to grant him a license in 1903, he threatened to return to Italy. *Nature* protested: "This is a little sweeping, for all England has not been so backward in supporting Mr. Marconi's enterprise as the officials of the Post Office"; see "Mr. Marconi and the Post Office," *Nature*, 19 February 1903, 371.

52. Guglielmo Marconi, "Recent Progress in Wireless Telegraphy," *Electrician*, 9 February 1900, 555; Central News interviews with Professor Ramsay, Sir Thomas Brunton, Professor Silvanus P. Thompson, and Professor Dewar of the Royal Institution, quoted in "The Marconi Experiments," *Manchester Guardian*, 19 December 1901, as well as in the *Times* and *Westminster Gazette* of the same date. Marconi was also quoted in "Further Developments in Wireless Telegraphy," *Nature*, 6 March 1902, 417; "Transatlantic Wireless Telegraphy: Marconi's Successful Experiment," *Illustrated London News*, 11 January 1902, 54; "Mr. Marconi on His Wireless Telegraph System," *Manchester Guardian*, 21 February 1902; Major Flood Page, letter to the editor, *Times*, 21 December 1901. Scientists thought that electromagnetic waves traveled in straight lines and would not be able to follow the earth's curvature to a terminus over the horizon. Marconi's 1899 signal from Wimereux to Chelmsford (eighty-four miles) had already made him doubt the validity of this theory. In 1902, some scientists posited an ionosphere that could refract certain frequencies back to earth, but this notion remained speculative until 1925. On the transatlantic transmission, see Anthony Constable, "Marconi's Transatlantic Wireless Message, 1901," *Transactions of the Newcomen Society* 73 (2002): 53–70.

53. See "Wireless Telegraphy," *Daily Telegraph*, 29 March 1899; "Notes of the Day,"

Numerous articles about Marconi merely recorded where he was going. Coverage of his search for new sites for stations invested his movements with the purpose and proprietary air of an explorer looking to plant the imperial flag or erect an imperial monument:

> Signor Marconi has arrived here [Halifax] from Newfoundland and spent to-day in examining a proposed site at Cape Breton for the erection of a Transatlantic wireless telegraphy station. Tomorrow he will examine another site at Louisburg. He says that a permanent station will certainly be erected at Cape Breton for the Canadian service. From here Signor Marconi will go to Ottawa on Saturday to meet the members of the Dominion Parliament, and . . . Massachusetts, where a station is to be established at Cape Cod. Signor Marconi will then leave for England. He says that the power of the station in Cornwall is to be doubled.[54]

Halifax and Louisburg were colonial cities drenched in military-historical significance. The early South African adventure only intensified radio's cachet as a technology at the frontier of knowledge and the imperial map. The association with Africa remained especially close as reports emerged of the technology's superior functioning in tropical climates, and the African colonies provided Marconi with long-distance land laboratories after his break with the Post Office.[55] The marvels of wireless telegraphy, its ability to penetrate even the most imposing of natural barriers—rocks and mountains alike—were also said to be displayed to best advantage in the diverse topographies of Africa.[56]

This imperial cartography underwrote Marconi's investments in distance. As the war fed demands for tighter imperial bonds, his technology promised to put far-off places in instantaneous touch with "home." Those calling for imperial federation were often also those condemning cable companies as obstacles to greater imperial intimacy.[57] Audiences at the Royal Institution cheered Marconi's announcement that radio would tran-

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Westminster Gazette, 16 December 1901; "Wireless Telegraphy," *Times*, 3 April 1899; "Occasional Notes," *Pall Mall Gazette*, 10 November 1900; Dam, 279; "Wireless Telegraphy," *Manchester Guardian*, 29 March 1899; "Wireless Telegraphy," *Illustrated London News*, 26 August 1899, 296; "Notes," *Nature*, 19 December 1901, 158; and Douglas, xxv. On occultism, see Alex Owen, *The Place of Enchantment: British Occultism and the Culture of the Modern* (Chicago, 2004). On Marconi as magician, see L. F. Austin, "Our Notebook," *Illustrated London News*, 20 June 1903, 932, and "Notes," *Electrician*, 11 June 1897, 207. Lodge was a leader in the spiritualist revival of the turn of the century.

54. "Transatlantic Wireless Telegraphy," *Times*, 28 December 1901; see also "Wireless Telegraphy," *Times*, 21 August 1899.

55. "Transatlantic Wireless 'Wires,'" *Westminster Gazette*, 22 December 1902.

56. H. Cuthbert Hall, managing director of the Marconi Company, quoted in ibid.; Hall, letter to the editor, *Times*, 25 April 1903; "Telegraph and Telephone Notes: Wireless Telegraphy," *Electrical Review*, 22 August 1902, 315.

57. Potter (n. 42 above), 636.

scend "such great distances as divided Great Britain from her colonies and America."[58] Marconi leaned on the wartime sense of vulnerability when he billed his transatlantic transmission as an event that reconnected a sundered people, "colonial cousins" whom punishing cable rates had long kept apart and whose cabled contact was susceptible to attack during war.[59] A zealously converted scientist christened this new hope, of "bridging the enormous distance from the Old World to the New," a "historic occasion."[60] Marconi promised to end colonial isolation. At the Royal Institution, he proposed that "[a]ny of those who have lived in the colonies will easily appreciate what a hardship it is to have to wait, perhaps, four or five weeks before receiving an answer to a letter sent home. The cable rates are . . . prohibitive to a vast majority of people. May it not, perhaps, be for wireless telegraphy to supply the want?"[61] Even those en route between imperial outposts would no longer have to sacrifice involvement in metropolitan life.[62]

Besides strengthening the sentimental bonds of empire, wireless could also provide a more practical administrative security. The press promoted its uses in integrating neglected islands and transforming a fragmented geography into coherent units; viceroys and governors could consolidate control at the margins of their territories by signaling to outlying islands. In December 1899, the Marconi Company entertained a proposal to link up dozens of islands in the Bay of Bengal, thereby creating "an independent telegraph connection between India and the rest of the world."[63] South Africa loomed large in such conversations: wireless promised to fulfill that

58. Reported in "Wireless Telegraphy," *Manchester Guardian*, 14 June 1902.

59. See, for instance, "Occasional Notes: The Letter 'S,'" *Pall Mall Gazette*, 17 December 1901.

60. Maurice Solomon, "Transatlantic Wireless Telegraphy," *Nature*, 1 January 1903, 206. See also lead editorial, *Times*, 26 January 1903, 9; "Occasional Notes: The Letter 'S,'" *Pall Mall Gazette*, 17 December 1901, 2; "Occasional Notes: Signor Marconi's Triumph," *Pall Mall Gazette*, 16 December 1901; and Richard Cartwright, acting premier, Ottawa, wireless telegram sent via Cornwall to the *Times*, quoted in "Wireless Transatlantic Telegraphy," *Times*, 23 December 1902.

61. Guglielmo Marconi, "The Progress of Electric Space Telegraphy," *Electrical Review,* 18 July 1902, 127.

62. Marconi, quoted in "Wireless Telegraphy," *Times*, 7 May 1902; "Wireless Telegraphy and the Lucania," *Times*, 17 June 1901; "News of the Week," *Spectator*, 24 January 1903, 115.

63. Colonel Temple, quoted in "Notes," *Electrician*, 22 December 1899, 286; "Wireless Telegraphy," *Times*, 15 December 1899. Also see "Wireless Telegraphy," *Nature*, 27 April 1899, 606. The British West Indies, the United States, the Dutch East Indies, and other territories also announced plans to establish wireless telegraphic communication with and between island territories (although at least two of these important contracts ultimately went to the Lodge-Muirhead Syndicate). See "Telegraph and Telephone Notes: Wireless Telegraphy," *Electrical Review*, 26 July 1901, 154; "Wireless Telegraphy: Latest," *Westminster Gazette*, 19 June 1899; "Wireless Telegraphy," *Times*, 16 November 1899; "Telegraph and Telephone Notes: Wireless Telegraphy," *Electrical Review*, 8 November 1901, 770; and "Wireless Telegraphy," *Times*, 10 January 1902.

old dream of a British Cape-to-Cairo corridor when it was most desperately needed.[64] Wireless telegraphy would not merely carry information between distant places but transcend distance itself. It would lash the entire sprawling empire into a coherent unit invisibly and more efficiently than could regular telegraphy or the collective imagination. It offered the wartime security of an imagined imperial community made real.

The initial military application thus gave way to other kinds of security applications—sentimental, political, and commercial. This last was a vision of an empire engaged with renewed confidence in its traditional mercantile pursuits in an increasingly jealous world. Marconi's managing director offered as "striking practical proof" of the technology's "indisputable commercial value" to Britain the fact that "out of the 26,000,000 tonnage of the ships of the entire world[,] the United Kingdom and our colonies own more than half. Steamers, ships, lighthouses, lightships, with land stations along all coast lines will not only help commerce, but will add most materially to the security of ocean travel. . . . [M]illions of pounds and thousands of lives will be saved."[65] The day was nigh, Marconi announced, when ships headed for the colonies would be in constant communication with the hub of "this country."[66] Press reports evoked a vision of austerely futuristic stations at all the capes and bays of the empire—a modernist echo of that era's imperial monumentalism.[67] Radio would provide the infrastructure of the political-economic security that the turn-of-the-century warfare state sought.

Thus when Marconi's opponents demanded to know "[w]hat on earth has distance to do with the matter," his supporters patiently explained the obvious: "While we are separated from our fellows by thousands of miles, distance has a good deal to do with the matter. Lodge's installation might serve a college or a monastery; Marconi's supplies the needs of an Empire."[68] Marconi's spectacular experimentation muffled the syntony issue and resolved the question of the precise nature of radio's service to national interests by associating it tightly with the symbolic security of a close-knit

64. "Signor Marconi's Experiments," *Westminster Gazette*, 1 January 1902; *Daily Mail* story reported in "Notes," *Nature*, 22 January 1903, 276.

65. Letter to the editor, *Times*, 18 November 1899.

66. "Wireless Telegraphy and the Lucania," *Times*, 17 June 1901; Marconi, quoted in "Wireless Telegraphy," *Times*, 7 May 1902.

67. See "Notes," *Electrician*, 7 April 1899, 820; "The South Foreland Wireless Telegraph Station," *Electrician*, 28 April 1899, 6; "British Association Meeting at Dover," *Electrician*, 22 September 1899, 762; "Marconi's Wireless Telegraphic Station at Cornwall, Wrecked by a Gale on Sept. 17," *Illustrated London News*, 28 September 1901, 446, and 11 January 1902, 54; "Further Developments in Wireless Telegraphy," *Nature*, 6 March 1902, 416; "Notes," *Nature*, 11 September 1902, 485; and "Royal Interest in the Advance of Science," *Illustrated London News*, 25 July 1903, 126.

68. Silvanus Thompson, letter to the editor, *Times*, 15 July 1902; J. Henniker Heaton, letter to the editor, *Times*, 19 July 1902.

empire.[69] Early on, some commentators had remarked that in civilian, as opposed to naval, transmissions, wireless's "catholicity of appeal would be no serious drawback."[70] The sensation of the 1902 transatlantic signal strengthened the view that wireless's lack of security would not impede its fulfillment of political and commercial security needs that would endure after the war:

> This fear [of sabotage] is . . . somewhat imaginary, as it is doubtful whether such an enterprise would be commercially successful, and it is inconceivable that anyone should devote his energies to its real-isation purely out of malicious rivalry. Even in war time, we think, it would hardly repay the labour, and, moreover, Marconi's system now promises to be of more use in peace than in war.[71]

As the war drew to a close, a concern with imperial protection and pro-tectionism was launched in various different realms at once; the tight artic-ulation of the political-economic with the militaristic allowed radio's uses in war to morph from actual military communication to a loftier, if more comfortably careless, kind of communication. Continuing to draw on a military idiom even as the technology migrated to the civilian realm, the *Times* urged "those responsible for national interests . . . to watch and antic-ipate the bearing upon various strategical problems of [wireless telegraphy] which . . . annihilates space and time."[72] Radio may still have been impor-tant to the navy, but in the meantime, the popular imagination gave it a romantic, pacific, cosmopolitan, and altogether grander security role.

In press accounts of Marconi's relationship with royalty in particular, we can trace his packaging of radio as a technology that could provide imperial security without itself being secure. The war, the queen's death in 1901, and the coronation of King Edward VII fueled the prodigious turn-of-the-century fascination with the monarchy. By courting royalty, Mar-coni burnished his image as an agent of empire and illustrated his technol-ogy's fitness for use by the imperial state even as he was locked out of substantive military contracts. From the outset, Marconi shrewdly con-ducted his experiments in the presence of eminent personages, including ambassadors, military dignitaries, and illustrious scientists—an impressive roster of believers whose presence often proved more newsworthy than the experimental results themselves.[73] In 1898, he landed the top customer of

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69. See, for instance, "Wireless Telegraphy," *Times*, 20 April 1898, and letters to the editor, *Times*, 3 April 1899, 21 December 1901, 4 March 1902, 4 October 1900, and 21 December 1901.

70. Editorial, *Manchester Guardian*, 21 April 1898.

71. Maurice Solomon, quoted in "Further Developments in Wireless Telegraphy," *Nature*, 6 March 1902, 417.

72. Lead editorial, *Times*, 30 March 1903.

73. See, for instance, "Wireless Telegraphy," *Times*, 17 July 1902.

the empire, Queen Victoria, who had him erect a station at Osborne House to connect with the yacht of the convalescing Prince of Wales.[74] In Marconi's press announcements, he reproduced the telegrams sent by the queen and the prince—polite comments on their health and the weather. Later, he would often cite these experiments to illustrate technical points that others would have elucidated equally well.[75]

Thus commenced a series of encounters with heads of state from Italy, Belgium, Russia, the United States, and elsewhere.[76] Every approval by a foreign sovereign was duly reported in the newspapers, as if to warn the British government against taking Marconi's loyalties for granted. His association with royalty provided Marconi with untarnished legitimacy. As the professor and physicist Silvanus Thompson astutely observed: "When Emperors and Kings express their high approval, who will not also approve?"[77] The *Spectator*'s affirmation of a popular desire for imperial intimacy is evident in its excitement at the response of the republican (but increasingly imperialistic) United States to its first wireless communication with Britain: "The President's 'Marconigram' contained a noteworthy sign of the growth of the recognition of the Imperial idea in the fact that he congratulated 'the people of the British Empire,' and not merely . . . the British people, on this new and ethereal link between the two branches of the race."[78] The press's coverage of such incidents enveloped the technology in the grand rhetoric of state correspondence and cast it as a technology not for the quotidian demands of local existence, but for the communal expressions of an empire—a useful image given the technical and institutional obstacles to using the system more democratically and locally. In the public mind, at least as it was represented in the press, such elite expressions of mass sentiment *were* the "public" use of wireless telegraphy, a polite and performative role in which syntony mattered little.

In short, although Marconi's continuing failure to achieve privacy of transmission prevented his technology from fulfilling actual military needs, the state's habitual recourse to an elastic political-economic language of imperial security created other, technically forgiving uses for it. As his long-distance strategy played out on the imperial map, radio became discursively

74. Reported in the "Wireless Telegraphy and Signal Company," *Times*, 8 October 1898; "News in Brief," *Times*, 3 August 1898.

75. See, for instance, Marconi's lecture to the Society of Electrical Engineers, reported in "Our London Correspondence," *Manchester Guardian*, 3 March 1899, and Guglielmo Marconi, "Wireless Telegraphy," *Electrician*, 10 March 1899, 692.

76. See, for instance, reports in "Notes," *Electrician*, 16 March 1900, 730; "Wireless Telegraphy," *Times*, 17 July 1902; and "Wireless Telegraphy at Sea: The Italian Warship 'Carlo Alberto' Fitted for Communication with the Station at Poldhu, Cornwall," *Illustrated London News*, 6 December 1902, 866.

77. Silvanus Thompson, letter to the editor, *Times*, 21 July 1902.

78. "News of the Week," *Spectator*, 24 January 1903, 115. These messages were reproduced in the press; see, for instance, "Notes," *Nature*, 22 January 1903, 275.

associated with the quest to bridge the distances between imperial publics through point-to-point communication, its symbolic value putting paid to concerns about syntony.

The Security of Monopoly

By 1903, even *Nature* was persuaded that the technical problems of wireless telegraphy were no longer cause for concern, "for we know that they are in the hands of one who has shown himself fully competent to deal with them."[79] Marconi's new image as a conscientious scientist pursuing truth contrasted strikingly with the brazen image initially pushed by Lodge.[80] But more importantly, the security hard sell positioned him to implement a new business strategy, with crucial results for the future history of the technology. From 1901, his company ceased selling equipment and instead began leasing the right to use company-owned and -operated stations and receivers. This strategy depended on a policy of "noninter-communication" that prohibited Marconi operators from communicating with non-Marconi operators except in emergencies.[81] Marconi created a tight-knit monopoly of his own in which "security" had a new significance.

The *Electrician* continued to insist that "it is far more important that we should possess an effective ship-to-ship and ship-to-shore telegraphic system than that the Marconi Company should be able to establish telegraphic communication across the Atlantic."[82] Marconi's nascent empire enabled him to fulfill this demand at least for commercial, if not naval, vessels by elevating it also to a suitably imperial level in which syntony did not matter (even though popular wisdom had already indulged him on the relative unimportance of syntony to civilian communication). To meet the demand for greater safety at sea, Marconi simply replaced the small scale of national coastlines with the more technically forgiving map of empire.

Putting all British commercial vessels in communication along "all coast lines" was well beyond the capacity of Marconi's untuned technology. But in the shadow of war, the company pushed as more fitting to imperial needs a network of a few large stations at key points on the globe, substantially what it already had and could manipulate without full syntonization. The company's chairman argued at a general meeting that "[h]alf the ships that sail the sea are English, but they go off to the teeming populations of the East. If you will take a map, you will see that the important places we have got to deal with . . . are Ushant, Finisterre, and Gibraltar. If this system is pressed into its largest possible use, it will enable every person on his way

79. "Transatlantic Wireless Telegraphy," *Nature*, 1 January 1903, 206.

80. See, for instance, J. A. Fleming, letter to the editor, *Times*, 14 April 1903.

81. For more on this strategy and its bearing on the Post Office monopoly on electrical communication, see Aitken (n. 2 above), 233–35.

82. *Electrician*, 7 November 1902, quoted in Hong, *Wireless* (n. 8 above), 104.

to India and China to communicate with the shore day by day."[83] Certainly, communication with far-off ships was important and lucrative in its own right, but it was also much more technically convenient for Marconi than creating the coastal communications that he, coastal communities, and the Post Office had initially envisioned. Only in a moment in which the imperial map was so continually invoked could the company have made a case for the greater importance of protecting ships traveling to the farthest reaches of the globe over those returning to port in Britain.[84]

This vision justified the company's insistence on maintaining its own international organization, its own empire. When, in 1903, the short-lived Lodge-Muirhead Syndicate tried to break into the ship-to-shore market by installing its relatively well-tuned apparatuses more densely along England's southern coast, the Post Office denied it permission on the grounds of interference with the existing Marconi stations.[85] Through his emphasis on distance, Marconi had succeeded in changing the conversation about wireless and security: imperial security at sea now rested on the security of his own monopolistic empire. After he landed a contract with Lloyd's far-flung network in 1901, the nonintercommunication policy helped usher in a considerable clientele among shippers insured by Lloyd's.[86]

The company pressed the coincidence of its interests and the public's by projecting wireless telegraphy as a service for the imperial public, albeit exercised for the moment only by the few. As Aitken observes: "Marconi's system . . . was a practical system of wireless telegraphy only as long as there was very little wireless telegraphy."[87] That it succeeded in portraying the forces ranged against the company as enemies of the people is perhaps most clear from the 1903 press campaign against the Post Office, which had refused to grant the company a license to transmit over the two miles separating the Poldhu station on the Cornish coast from the terminus of the postal wires in a nearby village, thus preventing general access to the transatlantic wireless telegraphic system. Drawing on a military analogy with a discursive rather than factual foundation, Heaton was incensed that "the postal authorities obstinately refuse to sanction, for commercial and social purposes, a system which is good enough for the defence of the Empire— a system which enables an Admiral to consult and direct his captains in all the complicated developments of a naval battle as if they sat round a table in his state cabin." A Post Office partisan countered that "it would be much

83. "Companies' Meetings and Reports: Wireless Telegraph and Signal Co. (Ltd.)," *Electrician*, 2 March 1900, 680–81.

84. In this moment lies the germ of the Marconi Imperial Wireless Scheme. Marconi obtained government approval of this scheme in 1911 after a hard sell lasting five years— trumping government concern for the cable companies; see Hills (n. 8 above), 117–21, and Douglas (n. 2 above), 67.

85. Aitken, 161.

86. Douglas, 69–70.

87. Aitken (n. 2 above), 210.

more satisfactory if the Marconi Company would demonstrate incontestably to an impartial scientific jury what they can do across the Atlantic, instead of indulging in sensational statements."[88]

The Post Office's position was that radio had for too long been tried in an unreliable popular court. But this line of argument failed to address the thrust of the public's argument. As *Nature* put it: "Whether Transatlantic wireless telegraphy will prove of commercial value or not time will show. . . . But none of these questions, commercial or technical, seems to us to be the concern of the Post Office, which should only desire to facilitate a new means of communication in which, rightly or wrongly, a large portion of the general public have considerable confidence." The *Times* considered it "a complete reversal of the objects and purposes of the Government that it should be vexatiously impeded by the action of a public department."[89] The press, speaking in the name of the public, supported Marconi's monopolistic ambitions as a means of securing a universal good. Marconi may have seen the invisible, ubiquitous, and seemingly communal ether as a territory he could "preempt and privatize,"[90] but the British public, accustomed to the idea of paternalistic private mastery over communal spaces like the oceans, also found this assumption compelling—at least in the press's (paternalistic) representation of its opinion. The British imperial idea had long been articulated through the lens of the general (communal, national) good.

With the Marconi map firmly superimposed on the imperial one, Britain's interests came to clash sharply with those expressed at the 1903 Berlin Wireless Telegraph Conference, where the German Arco-Slaby Company, archrival of the Marconi Company, strove to initiate international regulation of radio and enable all stations to communicate with all ships. This smacked of freeloading to the Marconi Company, which had the largest network of stations. Appealing to the public through the *Times*, the company's manager, H. Cuthbert Hall, argued that "wireless telegraphy has not yet reached such a stage of development as to be ripe for the imposition of special rules and regulations for its working applicable to all systems . . . if rules and regulations are now laid down, with which the majority of persons working wireless telegraph systems can comply, the utility of the most advanced system will be enormously reduced." He ended with a plea not "to deprive a British company of the advantages it has fairly secured in open competition."[91]

At London's Savage Club, Marconi framed the situation as a matter of imperial protection, invoking first "the great encouragement [of] King Ed-

88. J. Henniker Heaton, letter to the editor, *Times*, 5 February 1903; Sir John Wolfe Barry, letter to the editor, *Times*, 7 February 1903.

89. "Mr. Marconi and the Post Office," *Nature*, 19 February 1903, 370–71; lead editorial, *Times*, 26 January 1903.

90. Douglas (n. 2 above), 101.

91. H. Cuthbert Hall, letter to the editor, *Times*, 1 August 1903.

ward" since Osborne House: "As half a Britisher himself—(cheers)—he [Marconi] should be sorry if the result of [government] policy was that every Continental nation should reap the advantages of this system of wireless communication before England." In a presentation that echoed Chamberlain's drumbeat, protecting the Marconi empire became synonymous with protecting the British empire, and international regulation was configured as an illegitimate attempt to access British markets and infrastructure.[92] In the end, both their obligations to the Marconi Company ensured that neither Britain nor Italy accepted the conference resolutions. From that point, protection of British preeminence in radio led to a jealous guarding of patent rights against foreign sale, a tactic inevitably resented and reciprocated.[93]

Conclusion

This chapter in the history of radio ends in the summer of 1903, when the conference and the Maskelyne Affair together signified that radio had outgrown a developmental process guided primarily by Marconi's personal charisma. After being publicly discredited by Maskelyne, Marconi could no longer resort to spectacular experimentation to assert his authority. His increasing secretiveness during the following months bespoke the escalating rivalry and the rising importance of syntony as yet another military conflict loomed.[94]

By then, however, the myriad insecurities of the turn-of-the-century warfare state had set their seal upon the future directions of radio's development. While distance so preoccupied Marconi that he did not even pursue voice transmission, the scientific establishment (including Lodge) poured *its* energies into developing syntony and directionality as the most pliable chinks in Marconi's armor.[95] In this context, any move away from

92. "Signor Marconi on Wireless Telegraphy," *Manchester Guardian*, 23 February 1903; see also Hall, letter to the editor, *Times*, 1 August 1903.

93. See Hills (n. 8 above), 101–3, on the Marconi Company's eventual accommodation to regulation and the Post Office. The British government ratified the 1906 international convention on wireless telegraphy, ending the era of nonintercommunication and launching a series of predatory mergers: Marconi and his biggest European rival Telefunken created a joint company to handle the wireless business of the German mercantile marine during 1910–11. He began filing a series of patent suits against companies using his tuning technology. He won an important case against British Radio-Telegraph and Telephone in 1911 and absorbed the Lodge-Muirhead Syndicate, making Lodge an associate scientific adviser. Marconi next went after the American company United Wireless, which, along with Lee De Forest's company, was convicted of fraud. Marconi merged with United in 1912. See Douglas, 181–84, and W. J. Baker (n. 5 above), 133–34.

94. See Hong, "Syntony and Credibility" (n. 33 above), 173.

95. Hong, *Wireless* (n. 8 above), 191; Douglas, 178–79, 241–55. Even Reginald Fessenden, who on Christmas Eve 1906 first broadcast music from Brant Rock, Massachusetts, proposed that wireless be used not for broadcasting, but for telephony, as did AT&T

precise, point-to-point communication appeared misplaced. Meanwhile, support for Marconi's monopolistic empire of wireless stations impeded international cooperation on research and patents, slowing technological improvements more generally.[96] Virtually every key invention for the development of mass radio failed commercially until the Great War radically transformed the institutional, cultural, and political landscape.[97]

Still, it was, after all, the political-economic conversation about security that allowed wireless technology to step out of the cloistered spaces of the military establishment and into the limelight of civilian use. But its long association with state security remained, and the idea of using wireless technology for truly mass communication found little support. It was not that people did not know that the technology enabled them to "shout to the world," but that they had imagined very specifically what constituted advanced and tractable uses of wireless in their particular cultural context. Certainly, it required an upheaval in cultural practice for the public to conceive of radio as a source of mass entertainment, but the early imbrication of radio with the wartime vocabulary of imperial security also had a lasting influence on popular imaginings about future developments and shaped the direction of subsequent research.

The invention of radio was guided by the discursive context of an empire anticipating and then embroiled in military conflict. Even though, in its inchoate state, radio failed to fulfill the needs of military agencies, the wartime preoccupation with security furnished a rhetorically elastic principle for other, more sensational uses. Marconi focused on using it for the

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when it first transmitted the human voice across the Atlantic. (AT&T bought Fessenden's patents and forced him out of the telephony business.) The broadcast field was left open for amateurs, for whom the number of stations they could "tap" became a measure of success and the strength of monopoly an inspiration for a fraternity of illicit listening and broadcasting. Still, the press remained unenthusiastic, finding the notion of a "Babel of voices" in the air "terrifying" and a threat to privacy. During World War I, many amateurs were drafted into military wireless operations, and the term "broadcast" gained currency as a means of sending messages to a number of naval vessels at once. See also Archer (n. 8 above), 88–93, and Hills, 111–21.

96. As Douglas points out (n. 2 above, pp. 12–14), the dramatic progress in the technology between 1888 and 1894 had been made possible by intensive cooperation within the European physics community, which suffered as the technology became bound up in national security concerns.

97. For instance, the Dunwoody crystal detector of 1907, which was cheap enough for mass production and had a profound effect on the development of wireless telegraphy after the development of broadcasting, was received indifferently by the public. The De Forest audion, which nearly perfected voice transmission and formed the basis of Lee De Forest's Radio Telephone Company in 1907, flopped miserably (as did the company). Fessenden's heterodyne receiving system, which provided the means of receiving and "decoding" the high-frequency impulses of voice transmission, was made before he had suitable equipment with which to test it; his 1905 patent was more or less theoretical in nature. Not until De Forest's audion was freed up from litigation and made available for the general public did the heterodyne assume its true importance.

long-distance, point-to-point communication that promised to bridge the emotional, political, and commercial distances of empire, and he created his own technological empire in the process. This preoccupation was an important factor in the technology's inability to evolve into a local, mass medium until after the Great War.

I offer this essay to help open up the question of just how the shadow of a warfare state can shape the technologies of everyday life.[98] The story of radio's birth as a broadcast technology during World War I has obscured its more complex relationship to the history of war. Its earlier history reveals the extent to which a warfare state can shape technologies (and the businesses that market them) in counterintuitive ways as its priorities are interpreted by a wider polity; it can even discursively undercut its blunter efforts to patronize technological innovation. That war can accelerate the development of technologies with civilian uses is a commonplace; in this story, we find evidence of the inefficiencies it can introduce—an echo of the criticisms articulated by J. D. Bernal and other scientists of the Left during the 1960s and 1970s. They pointed to the example of nuclear power to argue that military involvement delayed and distorted the development of civilian technology, but they might just as easily have pointed to the development of radio seventy years earlier—or to the development of environmental technologies during today's war on terror.[99] With cultural-historical methods, we can begin to discern the full complexity of war's influence on technology.

98. See Caren Kaplan, "Precision Targets: GPS and the Militarization of U.S. Consumer Identity," *American Quarterly* 58 (2006): 693–713.

99. Edgerton (n. 10 above), 224. For instance, the press release about a massive Defense Department grant to Stanford University for developing more "highly mobile, deployable, lethal" war capacity touts its possible civilian spin-offs: "lightweight materials developed for armored vehicles might find their way into cars and trucks, making them much more fuel efficient"; see David Orenstein, "$105 Million Goes to Computing Center," *Stanford Report*, 25 April 2007, http://news-service.stanford.edu/news/2007/april25/super-042507.html (accessed 13 May 2010), and "Troubling Defense Grant May Have Strings," *Stanford Daily*, 1 June 2007, http://www.stanforddaily.com/2007/06/01/op-ed-troubling-defense-grant-may-have-strings (accessed 13 May 2010).