Sungook Hong, **Wireless: From Marconi's Black-Box to the Audion,** MIT Press, 2010, 272 pp., $22.00 (paperback).

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In this 2010 paperback reprint of his 2001 book *Wireless: From Marconi's Black-Box to the Audion*, Sungook Hong pens a comprehensive history of wireless communication technologies, from the invention of wireless telegraphy in the mid-1890s to that of the audion, a device which opened a new era of radio broadcasting in 1906. Hong's purpose is to "probe the substance and context of scientific and engineering practice in the early years of wireless," and to explore both the "borderland between science and technology" and the process of "transformation of scientific effects into technological artifacts."

Hong's essay reads on two levels, as it is both a history of wireless communication technology and a historiographic reflection on communication technology, social change, and the process of innovation.

Each of the six chapters is a richly illustrated, freestanding account of a specific episode in the short history of wireless technology upon which Hong focuses. The histories he crafts will delight electrical engineers. His use of previously uncovered private letters and notebooks strengthens the contribution of this essay to electrical engineering history. These vignettes begin with a discussion of the origins of wireless telegraphy and of Marconi's devotion to perfecting the homology between wired and wireless telegraphy. They continue with examinations of the dispute between Marconi and British inventor Oliver Lodge regarding the paternity of this technology, and of feuds between Marconi and his advisor John Ambrose Fleming on one hand, and with Nevile Maskelyne on the other, in which the engineers battled for credibility and recognition. Hong concludes with detailed accounts of Fleming's development of the thermionic valve and the later invention by Lee de Forest of the audion, a device that caused a shift from wireless telegraphy to radio.

Readers concerned with the history of communication technologies in relation with social change will find each of these free-standing mini-histories to form a revisionist history that puts petty personal relations, ulterior motives, and commercial context back at the center of historical analysis. In this sense, it is an analysis both of how technology history gets written, and of how context constrains technological change. Even though the unifying theme is only briefly mentioned, the book is a lens shining an analytical light on constraints that hinder technological advances and innovation.

The detailed historical accounts suggest that technologies are not simply constrained by scientific advances, but by the extent to which individuals are able to create analogies, as well as by social space, national interests, personal motives, individual styles, and the ongoing struggles between pure scientists

and practitioners. This approach throws into question official histories of technology, and it raises issues of path dependence.   Did today's technology evolve as it did because of inescapable physical and engineering necessities, as the product of natural evolution, or is it the accidental product of the specific contexts in which scientific inventions were turned into technological artifacts? Hong strongly argues in favor of the second view in an essay that reads like a modern-day Shakespeare play filled with conspiracies, backstabbing moves between scientists and "practicians," petty jealousies, fights for paternity and general recognition, corporate politics, breaches of trust, and sabotage. All of these dramas are laid out over a background of nationalism and greed.

Finally, Hong presents a detailed comparative case study of the engineering styles of Marconi, an intuitive, field-experiment-driven "practician," and that of his advisor Fleming, a scientist focused on his laboratory experiments and driven by scientific purity and mathematical correctness. He characterizes Marconi's character as an organizer and clever businessman and once again shows how context ultimately constrained the development of transatlantic wireless communications. Hong opens a window on thinking about and understanding the nature of innovation in ways that are reminiscent of the writings of Brian Arthur.