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To Rule the Waves: Cable Telegraphy and the Making of “Maxwell’s Equations”

BRUCE HUNT, University of Texas

How and why did Maxwell’s theory of the electromagnetic field come to be cast into the now familiar form of four vector equations? In particular, how and why was this done not by James Clerk Maxwell himself, but by Oliver Heaviside in a series of articles published in a London electrical trade journal in 1885, several years after Maxwell’s death? The answer, I will argue, lies in the demands and opportunities presented by the global network of submarine telegraph cables, one of the characteristic technologies of the Victorian British Empire. Heaviside, himself a former telegrapher, was steeped in the problems confronting cable telegraphy, particularly the distortion or “retardation” that signals suffered in passing along a cable. It was Heaviside’s search for an effective tool with which to tackle such problems that led him to take up Maxwell’s theory and then to recast it into the four “Maxwell’s equations.”