

ambitious nature of the book—an exploration of the aural aesthetics for a medium that can now be accessed mainly through print material.

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**Portable Moving Images: A Media History of Storage Formats.**

By Ricardo Cedeño Montaña. Berlin: De Gruyter Press, 2017.

Pp. 294. Paperback \$80.99.

Although Ricardo Cedeño Montaña does not frame his project as such, *Portable Moving Images* is perhaps the most ambitious contribution yet to the “format theory” and “general history of compression” proposed by Jonathan Sterne in his *MP3: The Meaning of a Format* (Duke University Press, 2012). *Portable Moving Images* is an expansive but sometimes frustrating history of the successive “reductions” that transformed first film, then analog video, and finally digital video from complex technologies for professional media production to ubiquitous tools used by amateurs. In each process, Montaña argues, cameras and other equipment became not only smaller but also more automated; reduction in both mass and the complexity of operation facilitated widespread use of new formats. “Portable media,” he writes, “compress the media factory into takeaway apparatuses that are then poured into the streets” (p. 29).

Each of Montaña’s three historical chapters covers a long period. On film, he begins with eighteenth-century magic lanterns, which projected still images from painted glass slides and evolved from specialized apparatus for new kinds of scientific observation to portable entertainment operated by itinerant projectionists—a path later followed by the film projectors of the nineteenth century. In the twentieth century, making film portable involved not only narrowing its width, but also replacing flammable cellulose nitrate with nonflammable materials and simplifying processing so amateurs could produce their own prints. Film was thus a rapidly evolving technological system rather than a single monolithic medium.

Montaña’s account of analog video begins with speculations in the 1840s about transmitting images by telegraph. Its strongest portions, though, concern the geometries by which magnetic fields were, between the 1950s and the 1990s, squeezed ever more tightly onto the two-dimensional surface of a tape. It is an account of the triumphs of first recording across the tape rather than along it (transverse scanning), then recording in longer diagonal lines (helical scanning), then writing successive tracks close together without interference by angling them differently (azimuth recording), and of the miniaturization of the camera itself that followed.

Digital video represents for Montaña the culmination of a process of

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discrete representation: film broke motion into frames, analog video broke frames into rows, and digital video broke rows into pixels. To compress digital video, though, is to algorithmically detect patterns across time and space, imposing continuities. Montaña finds the roots of these compression techniques in the cybernetics and information theory of the mid-twentieth century, particularly the predictive coding of electrical engineer Peter Elias. He argues that the video frame has adopted an essentially new ontology as recent compression algorithms like H.264 and MPEG-4 Visual project picture elements forward and back in time in order to reconstruct each frame on playback.

Montaña illustrates his argument with three wonderful fold-out chronologies of formats, one for each medium, which use scale images to concretely show reduction in the scale of recordings themselves. 1.1 square meters of 1956 quadraplex videotape, he shows, held a single minute of video, whereas by 1984 the Video8 format packed 167 minutes into the same area. *Portable Moving Images* is part of a multimedia dissertation project, and appendices to the book include documentation of the software Montaña developed to produce these diagrams, as well as accounts of art he produced in each of the three media and photographs of apparatus he collected.

With better editing, Montaña's nearly encyclopedic ambition would have made *Portable Moving Images* a valuable reference on the history of moving image formats. As it stands, his narrative and technical passages sometimes demonstrate less originality and rigor than his conceptual framework. In Montaña's effort to document technical distinctions between formats, both people and institutions often disappear from his accounts. And although he writes that his "data gathered for the genealogy of portable storage formats comes primarily from . . . technical standards and reports" (p. 9), Montaña relies more often on secondary literatures which are themselves uneven and occasionally inaccurate. Ultimately, *Portable Moving Images* is a persuasive but flawed demonstration of the centrality of compression in media history, particularly as media technologies have found their way from professional to amateur use.

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