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Vincent Mosco, **To the Cloud: Big Data in a Turbulent World**, Boulder, CO: Paradigm Publishers, 2014, 284 pp., $26.95 (paperback).

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In the 1980 science fiction film *The Empire Strikes Back*, commander Han Solo and a small band of rebels attempt to escape the clutches of the Empire by taking refuge in Bespin, a city that is literally suspended in the clouds. While they assume that this frontier, libertarian-minded community will conceal their efforts, they are stunned when the city's leader (and their fellow co-conspirator) divulges their whereabouts to the evil Darth Vader in exchange for legal immunity for harboring fugitives from the state. This sequence from popular culture is a rather apt metaphor for the privacy pitfalls that surround today's earthbound cloud computing industry.

Cloud computing "involves the storage, processing, and distribution of data, applications, and services for individuals and organizations" (Mosco, 2014, p. 17). Popular Internet services like Twitter, Facebook, and Flickr, just to name a few, all utilize the cloud as a means to store and share customer data. Given the rising importance of the cloud for the future of networked computing, it is difficult to imagine a more propitious time to spark a critical discussion about its role in our society. A spate of recent events such as the Edward Snowden disclosures about NSA domestic electronic surveillance and the FCC's reconsideration of net neutrality rules, among others, has directed public attention on the future of computing and the dangers of our reliance on an increasingly centralized corporate computing infrastructure. As more and more personal data are stored, shared, and transported via cloud-based services, the need to understand and critically evaluate these interconnected systems has become acute.

Vincent Mosco's latest book, ***To the Cloud***, offers a much needed and insightful window into this brave new computing world. As in his earlier work, Mosco adopts a political economic approach to new information technologies. His recent effort, along with his previous book *The Digital Sublime* (Mosco, 2004), looks critically at the legal, economic, and discursive structures surrounding new technologies. While there has been a good deal of recent attention paid to the scientific and democratic possibilities of networked computing (see, for example Benkler, 2006; Mayer-Schönberger & Cukier, 2013; Shirky, 2008), these efforts often serve to reinforce the hyperbolic marketing claims of big technology corporations. Mosco's orientation to technology is more in line with scholars such as McChesney (2013), Suarez-Villa (2012), Andrejevic (2007), Hindman (2009), and Schiller (2007), all of whom have explored the deleterious effects of the steady encroachment of capitalism into the online sphere. By focusing his attention specifically on the technology and business of cloud computing, Mosco is breaking some new ground.

With any emerging technology, the first step in grasping its significance is to clearly delineate what it is and what it does. While popular conceptions of cloud computing revolve around the networked storage of consumer data via services such as Google Drive, Dropbox, and Amazon Web Services, Mosco notes that there are, in fact, three different types of cloud computing models: *infrastructure as a Service (IaaS)*, wherein customers purchase cloud space and deploy their own software and applications; *platform as a Service (PaaS)*, wherein the cloud provider deploys applications that the customer has created or acquired; and *software as a Service (SaaS)*, wherein cloud companies offer their own applications for customers to utilize within the cloud infrastructure, typically via a software interface. For example, Microsoft's Office 360—an online version of their desktop suite of productivity applications—is a good example of SaaS.

Mosco traces the genesis of the term "cloud computing" in industry parlance to a speech by Google CEO Eric Schmidt in August 2006, but the origins of the concept go back much further, he argues. To flesh out that rich history, the second chapter of the book is devoted to a brief, though fascinating, tour of cloud computing attempts in the 20th century, beginning with the dawn of the computer age in the post–World War II years. The history of cloud computing tracks closely to the history of computing itself, of course, and Mosco provides a concise and readable overview of the most crucial developments, from the Cold War fascination with cybernetics and economic planning to the development of networked computing under the auspices of DARPA, the Defense Advanced Research Projects Agency. Even in the earliest implementations of mainframe computing within large institutions like the federal government and armed forces, argues Mosco, we can see the potential and the logic of "the cloud" in action. His touchstones for thinking about the cloud are from the 1960s, when IT expert John McCarthy first imagined the "computer as a public utility," a theme that emerged powerfully in Douglas Parkhill's (1966) book, *The Challenge of the Computer Utility*. The fascination with computer technology in the 1950s and 1960s emerged from a unique confluence of historical factors: concern in scholarly circles with the rise in the information economy, development of a precloud computer system infrastructure called videotex, and fears within the Kennedy administration that the Soviet Union was actively pursuing cybernetics as a potent new weapon in its ideological struggle with the West.

In spite of early government-sponsored dalliances with centralized data storage and processing, however, industry fascination with cloud computing began to mushroom during the mid-2000s thanks to increased broadband access speeds and expanded Internet adoption. In a fashion reminiscent of his previous book, Mosco next traces the development of industry rhetoric surrounding cloud computing in this century. He critically analyzes print and television advertising, industry blogs, private think tank white papers, and industry conferences in order to highlight the rhetoric of the technological sublime. The notion of the technological sublime, or the profound sense of awe and grand possibility that often accompanies the arrival of a new technology, was explored extensively by historian David Nye (1994). Mosco finds ample evidence of this type of breathless rhetoric in our contemporary moment, noting that "cloud computing currently resides in this magical sublime phase where transcendent visions of ending space, time, and social divisions tend to dilute our appreciation of the more grounded, long-term, but banal consequences of implementing cloud systems" (p. 32).

Mosco meticulously outlines and analyzes some of those "banal" consequences of cloud computing, which represents one of the strongest parts of the book. For example, even though "the cloud" connotes ideas of weightlessness, magic, and the myth of boundless space, Mosco argues that the physical requirements of cloud computing are real and potentially dangerous. For instance, the energy required to power vast server farms in sometimes remote areas results in serious environmental consequences. This was the case in Quincy, Washington, when Microsoft located a giant server farm on the outskirts of this small town, only to begin significantly polluting the air when it ran its 10-foot-tall diesel-powered backup generators for more than 3,000 hours in 2010.

The dramatic rise in "e-pollution" is not the only tangible negative side effect of a cloud computing infrastructure. *To the Cloud* also tackles the inherent privacy and security pitfalls that accompany our race to the cloud. Cloud computing raises numerous privacy concerns because "it entails moving all data from relatively well-known settings where the home computer hard drive is under personal control or the computer at work stores data behind an employee's firewall at an on-site data center" (p. 141). The storage of vast quantities of personal data on off-site servers makes them ripe for attacks by malicious hackers or vulnerable to failure due to the complexity of the systems created to manage and protect all the data. These issues aside, the central privacy threat posed by cloud computing arises from the revenue streams that flow from users' own personal data, argues Mosco. Services like Google Maps, Facebook's "likes," and Amazon's purchase history database are all heavily utilized by corporations to target advertising to consumers, generating billions in revenue in the process. Finally, Mosco illuminates another "dark cloud" by noting the shifts in IT labor thanks to cloud computing. The cloud essentially "deepens and extends opportunities to eliminate jobs and restructure the workforce" (p. 166). Specifically, in-house tech support jobs are being increasingly outsourced to cloud computing companies as a cost-saving measure, leaving important IT-infrastructure decisions in the hands of a dwindling number of corporate cloud providers. Even more alarmingly, the federal government has also begun outsourcing its data storage needs to the corporate cloud. Perhaps the most startling example of this trend occurred in 2013, when several online sources discovered that the CIA had awarded a $600 million contract to Amazon Web Services (AWS) to build a cloud infrastructure for its sensitive data (Konkel, 2013).

In the final chapter, Mosco departs from his analysis of the cloud computing industry to address the *cultural* consequences of the shift toward cloud computing. Not only does cloud computing entail changes in our use of data, he argues, it promotes a specific "culture of knowing" that has "significant implications across social life" (p. 176). He first tackles the concept of "big data," the "movement to analyze the increasingly vast amounts of information stored in multiple locations, but mainly online and primarily in the cloud" (p. 177). The analysis of these enormous data sets using sophisticated computer algorithms has helped solve real-life problems, such as tracking and containing the outbreaks of certain diseases, but it has also enabled the widespread, indiscriminate surveillance of the public by the NSA, CIA, and other government agencies. Here Mosco applies his framework of the digital sublime to critique Mayer-Schönberger and Cukier's 2013 book *Big Data: A Revolution That Will Transform How We Live, Work, and Think.* Despite the mythical rhetoric about the "the end of theory" (Anderson, 2008) thanks to the relative ease of finding even the smallest correlations among vast seas of quantitative data, Mosco

cautions that these analyses often simplify complex realities to the point of absurdity, while tossing context and history aside in the temptation to make grandiose claims.

Mosco next stretches his analysis even further into the cultural realm by considering the evocative nature of clouds and their appearance in Western literature as a problematic metaphor for wisdom and transcendence. Here he unearths historical references to the cloud from some extremely disparate texts: Aristophanes' 2,500 year-old play, *The Cloud*; a 14th-century anonymous monk's religious treatise, *The Cloud of Unknowing*; and David Mitchell's 2004 book, *Cloud Atlas*. Although each of these texts point to the limits of the day-to-day ephemera that potentially impedes the search for enlightenment and knowledge, the connection between these cultural artifacts and cloud computing seems forced. This adventurous foray into historical cultural criticism, appearing so late in the book, comes across more as an afterthought in a work ostensibly devoted to computing technology.

Nevertheless, Mosco's book provides an excellent, highly readable overview of cloud computing, and his critical analysis of its implementation is a much-needed counterbalance to inflated industry rhetoric about the benefits of "the cloud" for our collective computing future. Given the clarity of the writing style and minimal theoretical foregrounding, *To the Cloud* is appropriate for a wide audience, including undergraduates and the general public.

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