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By Francesca Musiani (Associate Research Professor, Center for Internet and Society of CNRS, France)

In the Internet's "backstage" – its lower strata, invisible to the user, from software and protocols to the actual physical infrastructure of plumbing and wiring – a number of things happen that are vital to how power is distributed, enacted, controlled, impeded and denied on and by means of the network of networks. The question of the material and logical "control points" of the Internet – how they are born and they evolve, what they do and how – has become in recent years an increasingly central preoccupation of scholars at the crossroads of media/communication studies, science and technology studies, and Internet governance research. With *Internet Daemons*, Fenwick McKelvey adds an important brick to this body of work by examining the extent to which digital communications are "possessed" by daemons – an evocative metaphor that broadens the usual basic meaning of the word in computer science, that of a program that runs as a background process instead of being under the direct control of an interactive user, to refer to the software programs that control, *possess* data flows across the Internet's infrastructures.

Instead of focusing on who controls these daemons, McKelvey questions "how these daemons control the Internet" (p. 4). His work aiming at developing what he calls "daemoniac media studies" is informed by the work of Oliver Selfridge, Wendy Chun and Jane Bennett, who draw from what are indeed "classical" literary references such as John Milton's *Paradise Lost* to account for what happens in the lower layers of the Internet, and draws from concepts such as Michel Foucault and Gilles Deleuze's "diagram" – a "map of power" on which Alexander Galloway subsequently worked in relation to the Internet. McKelvey's aim is to contribute to media studies and STS-informed analyses of Internet infrastructure as an arrangement of power. And while the reference he chooses in the introduction to illustrate this objective is that of Christian Sandvig's "new materialism", others could easily come to mind, and are indeed to be found throughout the book, most notably the work of Laura DeNardis or Tarleton Gillespie.

Over the course of seven chapters in addition to the introduction, McKelvey engagingly builds his case for the need of elaborating a science of "daemoniac media studies," drawing from the mix of history, philosophy and computer science which gave rise to "cyborg sciences," and from a number of case studies.

The first chapter, mostly historical in nature, explores how the early stages of digital communications were influenced by a thought experiment called "Maxwell's demon", which eventually gave rise to a new theory of information in which a number of breakdowns were identified and analyzed, in particular those between humans and machines, and between the physical and the non-physical (p. 23). This chapter examines how the experiment inspired two notable developments that gave rise to the Internet daemon in today's meaning: first, a "materialization" of information and communication theory in concrete computing infrastructures; second, an intuition by developers that particular versions of

program-demons could be produced to manage the routine, background tasks of the operating systems that were seeing the light (p. 43). Ultimately, while the initial “core issue” of digital communication seemed to be looking for ways to connect humans and machines, research turned to the different ways in which different computing systems could be connected to each other, hereby creating a “network of networks”.

The second chapter also draws from Internet history, in particular the early developments of ARPANET as a key point of convergence for research and researchers addressing packet-switching technology. It explains how, as early as 1966, National Physical Laboratory researcher Donald Davies had proposed building a networking infrastructure that would use programs to accommodate multiple networks – and their interactions – within a single communication system, a vision which foresaw the functioning of packet switching and the existence of a “network of networks” (pp. 46-47). The chapter explores how daemons were crucial in establishing the Internet as such, as they are the devices that control flows so that multiple networks can exist simultaneously. This flow control, which the author defines as the “purposive modulation of transmission that influences the temporalities of networks simultaneously sharing a common infrastructure” (p. 67), has a fundamental impact on the Internet’s functioning, inasmuch as it decides the conditions of transmission for specific types of packets or in specific types of networks. Thus, daemons are the devices that can decide to prioritize some types of traffic or relegate others to the backstage, or define what are successful and unsuccessful networks, creating “power imbalances and inequalities” in the process (p. 68).

In the third chapter of the book, the author examines how the shifting arrangements of space and power from ARPANET to the early Internet contributed to the ascension of daemons, by giving them an increasing variety of tasks to accomplish, and eventually brought together a variety of networked systems into one global infrastructure. The chapter retraces how the rise of daemons coincided with a period of steadfast innovation in the design of computer networking(s), that went beyond the military-industrial complex to create “hobbyist, pirate and academic networks (that) popularized digital computing” (p. 72). While several of these histories have been told elsewhere, this chapter’s original contribution is to show how the particular transmission requirements of these different networks created a “heterarchy” of network demands to be solved by daemon optimization. However, there is a lack of a clear way to define what is the optimal and optimized, and this definition becomes an ongoing controversy in today’s Internet because of “competing values and priorities” (p. 91).

Perhaps nowhere in the history of the Internet has the flow control operated by daemons been more “in the spotlight” than in the turn-of-the-century decision by several Internet Service Providers (ISPs) to ensure that peer-to-peer traffic was relegated to the slower routes of the Internet. By using this and several other examples and micro-case studies, the fourth chapter of the book explores “what do daemons do” on the Internet, the technical details successfully demonstrating that these devices are profoundly imbued with policy value. In particular, they shed new light on a lesser-known aspect of the net neutrality issue, that of the industry developing the equipment that *de facto* enacts net neutrality violations; to be effective, the author argues, net neutrality regulation has to encourage the

development of daemons that abide by its rules, an especially tricky issue for devices that have many legitimate applications but only a few regulation-violating configurations (p. 133).

While arguably the technology, and secondarily the business models and regulatory strategies, had taken center stage in the previous chapter, the fifth chapter examines what the author labels as “feelings about daemons,” and in a subsequent pun, “suffering from buffering.” The chapter interestingly looks at five different commercials that articulate a range of feelings associated with flow control, to examine user reactions when faced with the experience of delay on the Internet, and how ISPs play with these reactions to sell particular facets of their products (speed, stability, bandwidth ‘weight’...) Daemons exert an uneven influence on the Internet, as the P2P networks example shows alongside others; thus, the author warns, this influence “will continue to demand critical attention, since they likely will not be in the service of everyone equally” (p. 157).

Given their technical capabilities, their status of vital cog in the strategies of important actors in the Internet industry, and the powerful imaginaries surrounding them, can one fight Internet daemons, and how? The sixth chapter of the book attempts an answer to this question by examining – via the case study of techno-activism practices enacted by the Swedish-born portal The Pirate Bay – how daemons-based optimization can be challenged via algorithms that are, in turn, able to elude traffic management. The case of TPB shows how the conditions of transmission have become a key arena of controversy over the Internet, and how these infrastructure-conducted battles deeply influence Internet culture.

The seventh and final chapter turns to policy. Given that Internet daemons influence in such substantial ways the functioning of flows on the “network of networks,” can the public be made more aware of what they do in the backstage, and of its political value? In short and to paraphrase the author, if daemons govern or co-govern us, can they be governed in turn? This chapter once again draws from a case study, that of Canadian online gamers and how they protested against a net neutrality breach, to examine what can publics do about daemons governance (both governance *by* daemons and governance *of* daemons). An interesting, broader lesson argued by the author in this chapter is that Internet publics “need to be more aware of themselves,” and those who have the “privilege” to be able to fight for a right to Internet service would do well to demand that their experience be universal (pp. 207-208).

Fenwick McKelvey’s book is an engagingly-written and timely endeavor, well-served by its evocative metaphors and use of theory and concepts. If I had one thing, not to regret, but to suggest to the author as he no doubt will further build on this work, it would be to engage in a more substantial dialogue with the Internet governance community and in particular with those researchers that seek to bridge it with science and technology studies. While some notable references of the IG field are present and mobilized in the book (like Chris Marsden, Milton Mueller and the ‘STS-meets-IG’ pioneer Laura DeNardis), current efforts to look at Internet governance via a STS lens – which this book very much does *de facto* despite positioning itself more as a media studies/digital culture endeavor – are multi-faceted and increasingly lively and include several studies of “governance by infrastructure” (from the Domain Name System to encryption technologies). It seems to me that the interaction between this community and the “daemoniac media studies” subdiscipline the author is

creating would be mutually beneficial. In any case, this is a book not to be missed by all readers who are interested in the “politics-at-large” conducted via Internet infrastructure, and how they affect our lives as Internet users, consumers, and last but not least citizens.