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SINGING DATA OVER THE PHONE: A SOCIAL HISTORY OF THE MODEM

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Introduction

The modem is a singularly powerful symbol of late-20th century personal computer networking. Operating at the junction of computing and communication, the modem was a device that both defined and defied boundaries during the early history of the net. Amid the rapid deregulation of U.S. telecommunications during the 1970s, modems enabled thousands of far-flung microcomputer enthusiasts to exchange data and ideas over standard telephone wires. As PC ownership grew more commonplace during the 1980s, the modem became a mark of distinction, differentiating the everyday home computer owner from the small but growing telecomputing vanguard.

Despite the technical and cultural significance of the personal computer modem, the device received scant attention in the scholarly literature of the 1980s and 1990s. Early theoretical work in internet studies seldom mentioned the modem except to illustrate the basic apparatus required for participation.¹ And yet, among all other devices, it was the modem that drew internet communication out of the office and the research lab and into the intimate domestic space of the home. With the benefit of historical distance, this paper takes up the modem as its central object of study, listening in on the social, technical, and political resonances that can be heard amid the hiss and buzz of the modem's song.

The present historiography draws on an unusual collection of literature and electronics culled from the informal archives of retro-computing homepages, swap meets and eBay auctions. As the modem migrated from telecommunications arcana to consumer product, it was discussed in a variety of technical journals, hobbyist magazines, how-to books and electronic FAQs. Likewise, the industrial organization, design, and marketing

¹ For example, the word "modem" is absent from in the indices of both *Cyberspace/Cyberbodies/Cyberpunk* (1995) and *Cultures of Internet* (1996), two anthologies of early theoretical work on the cultures of computer networks. Mike Featherstone, *Cyberspace/Cyberbodies/Cyberpunk: Cultures of Technological Embodiment* (London: Sage, 1995); Rob Shields, *Cultures of Internet: Virtual Spaces, Real Histories, Living Bodies* (London; Thousand Oaks, Calif.: Sage Publications, 1996).

of modems changed with the mass diffusion of networked personal computing during the 1980s and 1990s. Surviving devices from this period, along with the floppy disks, cassettes, manuals, and other ephemera with which they were originally sold, provide an additional set of primary sources for this project.

A modem is an instrument of mediation placed in-between two otherwise dissimilar systems. This paper is similarly organized around three interrelationships transformed by the modem: sound and data, experimentation and standardization, and time and space.

Sound and data

Unlike iconic consumer electronics such as the Sony Walkman or the Apple Macintosh, our collective memory of the modem is principally aural rather than visual.² These sound-making devices facilitated computer-mediated communication by assigning pitches to streams of data, an unexpectedly musical approach to the encoding and transmission of digital information. Indeed, the sound of two modems synchronizing at the start of a call, better known as the “handshake,” remains one of the few enduring sonic symbols in internet history, a source of nostalgia and lingering mystery.³

By transforming the discrete signals of a digital circuit into continuous waves of sound, the modem set loose the user’s data from within the machine. As sound, data could be transmitted over a telephone line, broadcast on radio or TV, recorded to tape, inscribed on a vinyl record, or played out into the air. Alongside paper tape and punched cards, these new media promised faster and more reliable transmission and storage of digital information. For early PC owners frustrated at the proliferation of incompatible systems, the modem promised a solution; a gateway for the free exchange of data. Of course, to realize their promise, modems needed to learn to sing the same songs.

Experimentation and standardization

As with all new communication technologies, the development of the PC modem was characterized by a tension between experimentation and standardization.⁴ Early PC modems were designed primarily to enable the use of home tape recorders as an alternative to paper tape readers. These tape-interface modems, distributed in the form of do-it-yourself kits, were largely incompatible with one another despite the best efforts of leading figures in the hobbyist community to promote a common standard.⁵ As

² We do not currently possess a sonic equivalent to the word “icon.” Neither the Greek word for sound, *íchos*, nor the Latin, *sonus*, evoke the same combination of memory and familiarity as icon.

³ Alexis C. Madrigal, “The Mechanics and Meaning of That Ol’ Dial-Up Modem Sound,” *The Atlantic*, June 1, 2012, <http://www.theatlantic.com/technology/archive/2012/06/the-mechanics-and-meaning-of-that-ol-dial-up-modem-sound/257816/>; Oona Räisänen, “The Sound of the Dialup, Pictured,” *Absorptions*, November 17, 2012, <http://www.windytan.com/2012/11/the-sound-of-dialup-pictured.html>.

⁴ Martha Lampland and Susan Leigh Star, eds., *Standards and Their Stories: How Quantifying, Classifying, and Formalizing Practices Shape Everyday Life* (Ithaca, NY: Cornell University Press, 2008).

⁵ In 1976, the editor of *Byte* magazine convened a meeting of eighteen engineers from different microcomputer firms to work on a common approach to tape backup. The resulting standard, known colloquially as the “Kansas City standard” after the location of the meeting, was briefly adopted by a

hobbyists began to use modems like Lee Felsenstein's "Pennywhistle" to connect their microcomputers to the telephone network, however, they turned to the standards published a decade prior by AT&T Bell Labs.

The Bell standards were field-tested and favored reliability over speed. One (possibly apocryphal) saying among Bell engineers was that modems implementing the 300 bits-per-second Bell 103 standard would work over barbed wire. For interactive computing and teletype applications, this speed was acceptable but for users exchanging increasingly large programs, it quickly grew tiresome. As the AT&T network was gradually opened through a series of FCC decisions and Congressional actions, a new market for consumer telecommunications was created. In response, entrepreneurial modem makers began to compete with one another with proprietary protocols and faster speeds.⁶

Fragmentation among modem standards reflected a fragmentation in the PC industry at large. Whereas the emergence of the "IBM clone" in the mid-1980s led to a set of *de facto* standards in personal computer design, innovations in the design of modem protocols were negotiated first in the marketplace and second in the bureaucracy of the International Telecommunications Union (ITU). As a result, the baseline standard for modem-to-modem telecommunication continued to rise from 300 bps to 2400 bps and up. Although these speeds seem universally slow in comparison to the broadband connections available today, for users of the period, the purchase of a new modem yielded a profound and immediate change in the experience of telecomputing.

Time and Space

The modem represented a meeting point between the novel and legacy systems of personal computing and telephony. While the PC provided each user-programmer with a self-contained "mirror world" all to themselves, interconnection with the telephone network created a leaky border through which the lone denizens of many mirror worlds might meet.⁷ This process of interconnection and computer-mediated communication provoked a pair of new spatial and temporal imaginaries: virtual and translocal.

The best known imaginary is that of the virtual. Consistent with cyberpunk science fiction, the virtual imaginary positions the modem as a gateway to an immaterial no-place, "cyberspace." In a non-fiction book about the federal crackdown on young modem users, science fiction writer Bruce Sterling referred to cyberspace in terms of telephony: "the 'place' where a telephone conversation appears to occur."⁸ The modem's song, therefore, opened a portal through which personal computer users might leave their desks and venture out to this placeless place.

handful of firms before being abandoned in the early 1980s. Virginia Peschke, "BYTE's Audio Cassette Standards Symposium," *Byte*, February 1976.

⁶ USE OF THE CARTERFONE DEVICE IN MESSAGE TOLL TELEPHONE SERVICE, 13 F.C.C. 2d 420 (1968).

⁷ David Gelernter, *Mirror Worlds, Or, The Day Software Puts the Universe in a shoebox...How It Will Happen and What It Will Mean* (New York: Oxford University Press, 1991).

⁸ Bruce Sterling, "Hacker Crackdown: Law and Disorder on the Electronic Frontier," June 19, 2008, <http://www.gutenberg.org/files/101/101-h/101-h.htm>.

A less-storied, though equally widespread imaginary concerned a persistent awareness of geography. In contrast to the virtual, this translocal imaginary was animated first by the quotidian constraint of long-distance calling fees. Before bringing their modems to life, users were obligated to consider the per-minute cost of dialing a particular number at a particular time of day. For many, a fascination with space carried over to their online activities in the form of weather bulletins, local news feeds, webcams pointed out of windows, and requests for “a/s/l?”. Rather than open a doorway onto a new virtual space, the modem facilitated connection among thousands of otherwise remote places.

Conclusion

For the population of computer users who accessed the net in the pre-broadband era, the modem was a gateway—metaphorical as well as material—between the worlds of personal computing and telecommunications. The intense symbolic weight of the PC modem was evident in the idiomatic expressions of the day. Users referred to themselves as “modemers,” their activities as “modeming,” and the imagined spaces they inhabited as “the modem world.” A close study of the modem renders the early internet with a new fidelity—drawing out particular harmonies and dissonances among the institutions, technologies, policies, and people that produced the foundation of today’s social computing environment. By re-calling the modem world, this paper encourages us to think about internet history along the borders between old and new, near and far, fast and slow.

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