Histories of the Internet

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Abstract: *We explore the gap between broad conceptions of the Internet common in daily life and the rather narrow framing of most existing work on Internet history. Looking both at scholarly histories and popular myths we suggest that the expanding scope of the Internet had created a demand for different kinds of history that capture the development of the many technological and social practices that converged to create today's Internet-based online world. Finally, we summarize the papers in this special issue which collectively demonstrate that there is more than one history of the Internet.*

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What is the history of the Internet the history of? That definitional question was at the back of our minds as we began to plan for this special issue and as we coordinated its review process. The six articles that follow all reflect interesting and original answers to that question. Each, we believe, will serve as a model for future scholarship in the area. Before turning to our authors and their answers, let us first explore the question and some of the existing answers that have been posed to it.

The Internet has grown gigantic and amorphous, exceeding the scope of any simple definition. Those of a literal or technical mindset might protest that it remains just what it was back in the 1980s: the interconnected set of local networks hooked together with the TCP/IP protocol. One could, and should, challenge this technical definition by pointing to changes over time in many of the most basic technical aspects of the Internet. Once upon a time TCP/IP served as a bridge between local networks using different protocols. Once upon a time most users with Internet access could communicate only via email gateways. Once upon a time most users relied on terminals or terminal emulators to log onto Internet connected computers rather than running packets directly onto their own computers. Definitions and assumptions tend to crumble under close historical scrutiny.

When inventors and engineers build new technologies, they also embody assumptions about how those technologies will develop. Consider two neologisms of the 1970s—"compunications" and "*télématique*"— that were coined to describe the convergence between telecommunications and computing. In the 21st century, these obsolete terms may appear quaint, but their presence in the documentary record reminds us that the emergence of the global Internet as we know it in 2014 was not a pre-ordained or inevitable outcome of the convergence of communication and computer technologies.[1] Indeed, as the papers in this issue illustrate, many of the engineers and policymakers who built and promoted digital networks were not seeking to build a commercial network of networks that spans the globe: their efforts were primarily local, educational, and experimental. One of the key engineers involved in developing the Internet has argued that if he had known how the Internet would develop, the would not have designed it as he did.[2]

More fundamentally, what the educated public has come to think of as "The Internet" has evolved to encompass not just the hardware and software of the network itself but the mind-bogglingly diverse variety of human activities conducted over it. Televisions, telephones, computers, refrigerators, airplanes, front doors, and cars have been hooked up to the network. Bookstores, cable television providers, electronic retailers, newspapers, travel agents, taxi companies, and record labels have collapsed or

[1] Anthony Oettinger, "Compunications in the National Decision Making Process," in Martin Greenberger, ed., *Computers, Communications and the Public Interest* (Baltimore, MD: The Johns Hopkins University Press, 1971); Daniel Bell, "Introduction," in Simon Nora and Alain Minc, *The Computerization of Society: A Report to the President of France* (Cambridge, MA: The MIT Press, 1981), vii. For an extended discussion of the dynamics of standardization and digital convergence, see Andrew L. Russell, *Open Standards and the Digital Age: History, Ideology, and Networks* (Cambridge University Press, 2014), 161-280.

[2] David Clarke in personal correspondence with Bill Dutton.

reinvented themselves in the face of Internet-based competitors. Apple alone has more than a million different apps available for download by its phones and tablets. Farmers in developing countries are using smartphones to price and sell their goods. You know all those things, of course. They have been beaten into your heads by business gurus, television reporters, and technology writers for the past twenty years. Our sense of what "the Internet" encompasses has expanded consistently through the technology boom, the .com crash, and the apparently inexorable rise of the "tech elite" to cultural and economic mastery during the past decade. This expansion is likely to continue with mobile Internet and the rise of the 'Internet of Things', which is forecast to connect hundreds of billions of things in the coming decade.

In many ways, therefore, this developing wisdom is fundamentally correct. The Internet has come to encompass large chunks of everything. Few ordinary people understand the difference between the Web and the Internet. The favored rendering of today's undergraduates, "internet," encompasses everything online but has no specific referent—hence its reclassification from a proper to a common noun. Does that mean that the history of the Internet has become the history of almost everything digital and of every human activity conducted online? It is the case that digital media, communication and information technologies are increasingly networked via the Internet. But with this broadening of the Internet's scope, how can one hope to write its history?

We are fortunate that our special issue has a broad and multidisciplinary base of scholarship on which to build. For example, the field of Internet Studies has had an obvious motivation to demarcate the scope of the Internet as an object of study. One of us, writing in the introduction to the *Oxford Handbook of Internet Studies*, recently explored the development of competing perceptions of the field. Some participants see the Internet narrowly, as a set of protocols and technologies for the interconnection of computers. Others accept a broad definition, as sketched above, to include the contents of the networks being interconnected, their users, social practices, and skills. Likewise some see Internet Studies as a particular scholarly community founded only in 2000 with the first conference of the Association of Internet Researchers. Others, including the editors of this special issue, see its work as a continuation of much older research traditions around information technology, computer-based networking, work, and community which predate not just that specific scholarly association but the Internet itself.[3]

What Difference Does it Make?

In the early decades of the Internet, few scholars focused on its history. It was a promising innovation, but throughout most of its development was overshadowed by alternative technologies – from videotext to multimedia computers and bulletin boards. It was not until the introduction of the Web browser that the Internet began to spread widely outside the academic world. Since the first decade of the 21st century, it has become so significant to nations around the world that its history has become

[3] William H Dutton, "Internet Studies: The Foundations of a Transformative Field", in *The Oxford Handbook of Internet Studies*, ed. William H Dutton (New York, NY: Oxford University Press, 2013).

increasingly contested terrain. As nations and global organizations focus more explicitly on Internet policy and governance, appeals to the history of the Internet will become even more significant to its future development and use.

Without an appreciation for historical nuance or context, we cannot fully understand the hazards of offering a particular policy position on the basis that it somehow furthers the inherent nature of the Internet. Claims about what the Internet does, what the Internet wants, or what the Internet is have been used to argue for the virtue or inevitability of zero-cost information sharing, the transmission of data packets without regard for their source and type, or to proclaim the advantages of particular approaches to government, corporate structure, or fundraising. Aligning oneself with the soul of the Internet has become a powerful – albeit often flawed – way of advancing one's positions. Nevertheless, arguments about the historical origins and development of the Internet will continue to be a major aspect of debate over technological and policy initiatives tied to its future. It is therefore critical that academics and historians in particular provide insight to the histories of the Internet that are anchored in systematic research and critical analyses.

In these and other realms, when the general public, policymakers, and scholars make claims about the Internet, they are implicitly drawing upon particular versions of Internet history. Historians are familiar with the idea of a "useful past," a particular conception of history that serves a present-day need. Tracing a particular practice back to its prehistory in the ARPANET, or arguing that a certain philosophy was clearly formulated in the creation of the Internet and has guided it ever since, is a way of giving one's self the moral high ground and casting one's opponents as enemies of one of humankind's most successful recent creations. Appeals to the founding principles of the Internet have not always led policy activists to the most carefully researched or scrupulously accurate historical narratives.

This sense of the Internet as a coherent thing with its own culture, operating principles, or values has been entertainingly dismissed by journalist Evgeny Morozov, who complained that "These days, 'the Internet' can mean just about anything." Accordingly, concepts derived from it, like "Internet freedom," "have become all-encompassing and devoid of any actual meaning" because they tie together so many different kinds of technologies, legal and ethical issues, and social practices. [4] Of course all technologies have these multiple dimensions – they are far more than a technical artifact at a particular point in time. However, Morozov's jeremiad illuminates the importance of our goal for this special issue – to provide a deeper and richer context for understanding both the technical basis of the Internet as well as the various social, political, economic, and cultural visions that often become lumped together as "the Internet."

One problem with many narratives is an acceptance, often implicit, of a technologically deterministic process from which the nature of an invention drives one

[4] Evgeny Morozov, *To Save Everything, Click Here* (New York,NY: PublicAffairs, 2012), 17.

technically best path for its future development. However, over the last several decades, a growing body of research on the social shaping of the Internet and related information and communication technologies has generated much evidence of how the pace and nature of the pathways taken by the Internet have been influenced by many actors, including users, making decisions in a variety of specific political, economic and social contexts. Even popular movies, such as *The Social Network*, which conveyed the personal roles of individuals, venture capital firms, and universities in the launch of Facebook, have shown the public that the history of the Internet is socially shaped. We suspect that future appeals to the ideologies, motivations, designs and visions of those inventing the Internet will increasingly need to acknowledge the social dimensions of this 21st century ecology of networked media and communication technologies.

However, neither popular nor scholarly discussion of Internet history has fully acknowledged this challenge, still less overcome it. To take "The History of the Internet" as a frame in the first place is perhaps to commit a category error. Our quibble is not merely with terminology, but also with the conceptual problems that the term "History of the Internet" presents and with the underlying historical developments that the "History of the Internet" encourages us to explain. With this special issue we encourage readers to consider alternative frames, such as "Histories of the Internet" – broadly defined. We suggest that this frame better encompasses stories about the much broader constellation of technologies, institutions, and practices we have come to know as the Internet.

The Canonical Narrative of Internet History

Janet Abbate's 1999 book *Inventing the Internet* has been cited far more often than any other scholarly work on the history of information technology. It is become a classic of its kind: concise, clearly written, and well researched. It charts a progression from early thoughts about packet-switched networks in the 1960s through the creation of the ARPANET, the unexpected rise of email as its first "killer application," Cerf and Kahn's Transmission Control Protocol and Internet Protocol (TCP/IP), and the commercialization of the Internet. The remarkable proliferation of the World Wide Web, still in progress as she wrote, provides the terminus of this core narrative. Abbate is far too careful a historian to enshrine a single incident or individual as the origin point of the internet, yet taken as a whole her book fulfills the promise of her title. It recounts a story during which the Internet is invented.[5]

Abbate's book, when read together with Roy Rosenzweig's influential 1998 essay "Wizards, Bureaucrats, Warriors & Hackers: Writing the History of the Internet," provided a historiographic template for work on the history of the Internet as well as a solid narrative outline into which further work could be slotted.[6] Prior to this Internet history had been represented primarily by a handful of "Internet History Timelines." In comparison, Abbate and Rosenzweig separately presented an astonishingly clear and sophisticated account of the ARPANET and the Internet.

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[5] Janet Abbate, *Inventing the Internet* (MIT Press, 1999).

[6] Roy Rosenzweig, "Wizards, Bureaucrats, Warriors & Hackers: Writing the History of the Internet," *American Historical* Review 103 (1998): 1530-1552.

The same basic story has been told independently by several others. Journalists Katie Hafner and Matthew Lyon covered much of the same ground in *Where Wizards Stay Up Late*.[7] As the title suggests, they tell the story in a somewhat more dramatic way with a greater focus on quirky geniuses and less rigorous attention to institutional and technical developments. Arthur L Norberg and Judy E O'Neill took the ARPANET as one of several case studies of the role of ARPA in funding the expansion of computer science into new research areas during the 1960s and 70s.[8]

Other work filled gaps in Abbate's narrative and provided parallel stories. For example, Thierry Bardini looked at the career of Doug Engelbart, whose research group invented the computer mouse, pioneered interactive user interfaces and networked computer applications, and eventually intersected with ARPANET history. Mitch Waldrop's *The Dream Machine: JCR Licklider and the Revolution that Made Computing Personal* has elements of biography but rambles widely through the early history of networked and interactive computing to put work on the ARPANET into context.[9] Philip Frana looked at Gopher, a precursor to the World Wide Web. The Web's creator, Tim Berners-Lee, wrote a memoir of its creation, and one of his main collaborators contributed to a detailed history of its invention and early use.[10] Abbate herself more recently explored the privatization of the Internet's core infrastructure during its transition from a government-run academic network to a commercially operated one.[11]

The perspective of these Internet histories stuck fairly close to those of the network's creators. They focus on protocols, network backbones, interface, and early applications. The ARPANET's original users, academic computer scientists, and its creators had quite a bit in common. This has not been true of the modern Internet's users, but our perspectives on its history have remained focused on the men who originated it and, as the "greybeards" of the Internet Engineering Task Force, continue to provide technical leadership in the evolution of its protocols.

The Internet which is invented in Abbate's book, and the other works mentioned, is the Internet as understood circa 1994, not the incomparably broader Internet of 2014. Bridging this gulf is not simply a matter of extending Abbate's story further in time, to encompass later episodes such as the browser wars of the mid-1990s or the rise of

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[7] Katie Hafner and Matthew Lyon, *Where Wizards Stay Up Late: The Origins of the Internet* (New York: Touchstone Books, 1998).

[8] Arthur L Norberg and Judy E O'Neill, *Transforming Computer Technology: Information Processing for the Pentagon, 1962-1986* (Baltimore: Johns Hopkins University Press, 1996).

[9] Mitch Waldrop, *The Dream Machine: JCR Licklider and the Revolution that Made Computing Personal* (New York: Viking Press, 2001).

[10] Tim Berners-Lee and Mark Fischetti, *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web by its Inventor* (San Francisco: Harper, 1999). James Gillies and Robert Cailliau, *How the Web Was Born: The Story of the World Wide Web* (Oxford: Oxford University Press, 2000).

[11] Janet Abbate, "Privatizing the Internet: Competing Visions and Chaotic Events, 1987–1995 ", *IEEE Annals of the History of Computing* 32, no. 1 (January 2010):10-22.

smartphones, tablets, and social media. We should not be surprised that historians struggle to account for such diverse and complex phenomena of the very recent past. The wide-ranging chapters collected in *The Internet and American Business*, edited by William Aspray and Paul Ceruzzi and published in 2008, were a deliberate attempt to focus historical attention on the very recent past but cannot account for most of the dramatic Internet-related developments of the early 21st century. The ever-unfolding history of the Internet therefore risks falling into a kind of disciplinary no man's land– too old to be of interest to policy scholars or sociologists but too recent and far too unstable for most historians to feel comfortable working there.

The greatest challenge to historians is that as our understanding of the Internet broadens so too does the range of earlier technologies and practices that lead directly to its development. For example, in explaining the rise of the streaming video Netflix service, which accounts for something like a quarter of North American Internet traffic today and so is inescapably a major part of the Internet as understood in 2014, one would not get very far by examining the history of TCP/IP and its gradual spread over broader networks and faster connections. That was one thread, essentially a technological precondition for the service, but one would also have to dig into the history of video libraries, mail order companies, the rise of cable television and HBO, the development of server farms and cloud computing, practices around the commissioning and syndication of television shows, and the spread of DVD players. None of these things would have been seen as part of the Internet if narrowly defined, and few were seen as related to the Internet as they emerged. Given today's broad definitions of the Internet they all have become part of its history in retrospect.

A similar point could be made with respect to Wikipedia. Wikipedia is today often seen as a crucial part of the Internet. Yet one could hardly expect Abbate, if preparing a second edition of her book, to cover the previous history of encyclopedias from the 1700s onward. The history of the Internet can no longer be responsibly represented as a single narrative.

Popular Discourse

Popular discourse around Internet history has rarely strayed far beyond the apparently simple question: Who invented it? Stories about superheroes try to explain the powers, personality, and actions of their protagonists by exploring a simple childhood "origin story." Stories about technologies tend to make the same technologically deterministic assumption: that identifying a point of origin and a creator will explain its subsequent trajectory. This is true, in different ways, about each of the three widely disseminated stories we consider below.

If Internet history flares into public awareness it is almost always to establish a myth of invention. Indeed, it often seems that any public mention of Internet history will prompt at least one listener or online commenter to crack a joke about Al Gore. The actual historical story has been fairly clearly established: during an interview Gore made a stilted but essentially accurate reference to having taken "the initiative in creating the Internet" during his time in Congress. Gore, as many of the developers of the network

had subsequently testified, was an important political force in securing funding and support for the development of high speed networks.[12] Yet Gore's remark, highlighted by technology journalist Declan McCullagh, was spun by his political opponents into proof of his pompous dishonesty. The episode captures something in the American attitude towards innovation. A politician might be allowed to take credit for the building of a road, airport, or other conventional infrastructure project. However the popular sense of computer technology as a mystical force with its own desires and needs, harnessed by technical geniuses is so strong that to many the idea that a mere politician could play any part in the creation of the Internet seems inherently laughable.

The instrumental role played by the United States government in the creation of the Internet remains a highly politicized topic, and a reminder of the ideological stakes involved in the telling of the Internet's history. During his reelection campaign in 2012 Barack Obama had pointed to the Internet as the product of government research, and thus as proof that public spending could, at least occasionally, be a good investment. Obama's claim appeared modest and incontrovertible to many, but was disputed by others. For example, Gordon Crovitz published an editorial in the *Wall Street Journal* titled "Who Really Invented the Internet?" [13] Crovitz breezily asserted that it was "an urban legend that the Government launched the Internet," instead attributing the invention of the Internet to Vannevar Bush, Tim Berners-Lee, Vinton Cerf (who was, in fact, paid by the American government at the time) and, most startlingly of all, Xerox PARC where "Ethernet was developed to link different computer networks." In Crovitz's interpretation, custom-built for the editorial pages of the conservative *Wall Street Journal*, credit for the Internet properly belonged to "a few business leaders… not the government." As even this compressed version makes clear Crovitz had no idea what the technologies involved actually were, or of the difference between the Internet itself and the World Wide Web.

One of many rebuttals to Crovitz came from author Steven Johnson on the editorial pages of the *New York Times*. In "The Internet? We Built That." Johnson suggested that neither big government not big business could claim parentage of the Internet. Instead he attributed its development to "decentralized groups of scientists and programmers and hobbyists (and more than a few entrepreneurs) freely sharing the fruits of their intellectual labor with the entire world." Peer networks and open source code had laid the underpinnings of the digital world. Johnson's piece was a fine rebuttal to Crovitz, but made for equally unsatisfactory history because Johnson's desire to praise the virtues of peer production led him to omit the decisive factor behind the growth of the TCP/IP Internet: generous and consistent funding from the U.S.

[12] Topics related to Gore's statement are gathered at Seth Finkelstein, "Al Gore 'invented the Internet' – resources," last updated April 28, 2006, available from http://sethf.com/gore.

[13] Gordon Crovitz, "Who Really Invented the Internet," *The Wall Street Journal*, July 23, 2012, A 11.

Department of Defense. As a result, the dueling op-eds, ostensibly drawing policy lessons from the Internet's history, actually did more damage than good.[14]

A third example concerns Shiva Ayyadurai, an expert on Internet publicity whose campaign to rebrand himself as "The Inventor of Email" kicked off in 2011 and has provoked a dramatic succession of exaggerated claims, credulous reporters, retractions, and accusations that a cabal of industry insiders, and corrupt Wikipedia editors are colluding to hide the truth.[15] He has enlisted a small band of supporters, including Deepak Chopra and Noam Chomsky, to endorse his claims. The histories of most technologies feature people who claim made they overlooked inventions years before the better connected or luckier people who made it into the high school history books. One of the most unusual things about Ayyadurai is that he claimed to have invented email in 1980, about 15 years after the first generally recognized electronic mail systems were built. The story he told to reporters was that the well-known ARPANET mail systems of the 1970s had not been email at all, just "electronic messaging." The resulting reports included claims such as "email—as we currently know it—was born" at the University of Medicine and Dentistry in Newark, New Jersey.[16] Ayyadurai's story shifts the origins of email from the elite world of the Cold War military-industrial-academic complex to the familiar and shabby context of state university clerical work. Like Crovitz and Johnson, Ayyadurai honed his pitch to appeal to those with particular political leanings, arguing that resistance to his claim can be attributed to racism, anti-immigrant prejudice, historians in the pay of big business, and a belief that only elite and well-funded institutions can create innovations.

These stories could be dismissed as the simple product of historical ignorance. Yet, bizarre as they are, these fables fill the vacuum between the tightly demarcated story of the Internet as an obscure tool created by and for a privileged group of Cold War scientists and engineers and our lived experience of a much broader Internet, one that has been profoundly shaped by the interests of business yet still remains open to the sudden proliferation of innovations from unexpected sources. Seen in this light, we can arrive at a different explanation of the appeal of the Gore, Crovitz/Johnson, and Ayyadurai anecdotes above: they suggest that a strict focus on the history of TCP/IP networks leaves out meaningful aspects of how this thing we call "the Internet" came to be such an important part of life in the 21st century. They also hint that historians should pay closer attention to technologies and practices – such as many local area networking and electronic mail systems – that evolved on non-Internet computer networks, such as electronic bulletin board systems.

Limitations of the "History of the Internet"

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[14] Steven Johnson, "The Internet? We Built That," *The New York Times* September 21, 2012, available from http://www.nytimes.com/2012/09/23/magazine/the-internet-we-built-that.html.

[15] Thomas Haigh, "Seven Lessons from Bad History: Journalists, Historians, and the Invention of Email", *Communications of the ACM* 55, no. 9 (September 2012):26-29.

[16] Doug Aamoth, "The Man Who Invented Email," *Time* (November 15, 2011), retrieved from http://techland.time.com/2011/11/15/the-man-who-invented-email.

We note three main practical problems associated with overreliance on a narrow conception of the "History of the Internet." First, the category tempts historians toward Whiggism and teleology, the cardinal sins of historiography for which history students are subjected to ritual flagellation. Whiggism (or "Whig history") is often invoked as a derogatory term for histories that celebrate present conditions as the best possible outcome: Whig histories look to the past only to explain progress that has culminated in the present.[17] Since the Internet is today both pervasive and beloved by many, "Internet history" fits all too comfortably with a Whiggish interpretation that tells the heroic story of where the Internet came from and how its virtues were forged. Whig histories of the Internet look to ARPA as a model for the organization of scientific research, to the collaborative organization of Internet standards as a model for international ("multistakeholder") governance, and to the design principles of the Internet's architecture for inspiration for other types of technological innovation.[18] The aversion that historians are trained to feel for this approach to the past sometimes puts us at a competitive disadvantage in interdisciplinary or popular contexts where historical detail is most easily justified with an argumentative framing based explicitly on present-day concerns.

Teleological histories reach into the past for the sole purposes of explaining the present. The very question "Who invented the Internet?" invites teleological responses. They may not have the same celebratory tone as Whig histories, but teleological explanations—and debates over "invention"—tend to ignore missteps and paths not taken, and generally cleanse their neat narratives of contextual factors that are presumed to be extraneous. Because they ignore the messiness of the past, they badly misconstrue its complexity and thus ignore insights from historians such as John Staudenmaier and Kenneth Lipartito who embrace contingency, see failure as historically significant, and study innovation as a social process rather than as a chronology of inventions.[19]

Our second objection to the category of "Internet history" is that it is often too narrowly construed, and unnecessarily exclusionary. Abbate herself sought out information on European networking efforts that paralleled 1970s work on the ARPANET and on the international standards efforts of the 1980s and 1990s behind the X.25 protocol which rivalled the Internet's TCP/IP. Yet "Internet history," as typically

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[17] See for example Ernst Mayr, "When is Historiography Whiggish?" *Journal of the History of Ideas* 51 (1990): 301-309; Nick Jardine, "Whigs and Stories: Herbert Butterfield and the Historiography of Science," *History of Science* 41 (2003): 125-140.

[18] See for example Barbara van Schewick,. *Internet Architecture and Innovation* (Cambridge, MA: MIT Press, 2010); Wu, Tim, *The Master Switch: The Rise and Fall of Information Empires* (New York: Alfred A. Knopf, 2010); A. Michael Froomkin, "Habermas@Discourse.Net: Toward a Critical Theory of Cyberspace," *Harvard Law Review* 16 (2003): 749-873; Gralf-Peter Calliess and Peer Zumbansen, *Rough Consensus and Running Code: A Theory of Transnational Private Law* (Portland, OR: Hart Publishing, 2010).

[19] John M. Staudenmaier, S.J., "Rationality, Agency, Contingency: Recent Trends in the Historiography of Technology," *Reviews in American History* (2002): 168-181; Kenneth Lipartito, "Picturephone and the Information Age: The Social Meaning of Failure," *Technology and Culture* 44 (2003): 50-81.

practiced fails to capture the diversity of non-TCP/IP networks such as Fidonet, Usenet, Minitel, and hundreds of other computer networks that proliferated in Europe, Asia, and North and South America in the 1970s and 80s—electronic computer networks whose users developed formative skills, norms, and expectations about life online. At the same time, "Internet history" largely omits the hulking presence of telecommunications monopolies, and fails to account for the ways that telecommunications technologies, political economies, and user cultures shaped the new, hybrid cultures that emerged with the convergence between two previously distinct sectors and practices—communications and computing—around digital processing and transmission technologies between the 1970s and the 1990s.[20]

The deeply contested and halting processes of telecom-computer convergence provides a good example of what "Internet history" tends to miss. Abbate's classic (like Schmidt and Werle's *Coordinating Technology*) sketches the general outlines of the politics of X.25 and related international standards in the 1980s, but only scratches the surface of the intense and sophisticated strategies deployed by telecom monopolies, national regulators, incumbent firms such as IBM, entrepreneurs and clever individuals of all sorts, and opportunistic niche competitors such as Honeywell and Digital Equipment Corporation. Those involved assumed that it was this strategic battle—rather than the marginal experiments conducted in the TCP/IP Internet—that would determine the future of data communication. The amazing part of the story, of course, is that the Internet pounced from the shadows to devour X.25: it was never designed to be the foundation of a global public and private information infrastructure, and most observers in the 1970s and 80s thought of it as little more than an interesting, and well-funded, American (military) experiment. This fact alone should remind us to pay more attention to what was going on at the center of the action in the data networking scene of the 1970s and 1980s, and not just the developments on the periphery that were more enduring.[21]

"Internet history" also suffers from a third, methodological, problem: it often tends to be too close to its sources. For years, the history of the Internet was largely conveyed by a chronology constructed by Vint Cerf and Robert Kahn.[22] Of course, many Internet pioneers are alive, active, and eager to speak with historians, and their first-hand accounts are valuable. But their personal perspectives cannot tell the full histories. First, they were engaged in distributed and long-term collaborations that limit the ability of any individual to fully account for major innovations. Secondly, they are often too close to describe their accomplishments in an objective way – a process known, euphemistically, as a lack of historical distance. Many museums and historians are eager to interview the pioneers and to publicize their stories. Those involved tend to leave out unsavory or

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[20] See for example Valerie Schafer, *La France en Reseaux* (Paris: Nuvis, 2012); Ignacio Siles, "Establishing the Internet in Costa Rica: Co-optation and the Closure of Technological Controversies," *The Information Society* 28 (2012): 13-23; and Martin Campbell-Kelly and Daniel D. Swartz-Garcia, "The History of the Internet: The Missing Narratives," *Journal of Information Technology* 28 (2013): 18-33.

[21] Russell, *Open Standards and the Digital Age*.

[22] An updated version is accessible at: http://www.internetsociety.org/internet/what-internet/history-internet/brief-history-internet

unflattering aspects of the past—thus encouraging journalists and authors such as Steven Johnson to the dubious conclusion that the history of the Internet is a story of decentralized collegial, open, peer-to-peer innovation. Professional historians, especially those of us who are active in the production of oral histories, know better than to mistake the accounts and memories of interview subjects for the objective and honest truth. Here, as elsewhere, history is being written (or rather narrated, shaped, and blogged) by the victors. To no one's surprise, this history too often flatters them, marginalizes the role of key colleagues, and denigrates the work of their vanquished rivals. This is not to say that observers further removed from an innovation are more objective or reliable. Instead, it is a necessity to rely on multiple sources and to evaluate all of them critically.

These three limitations with the category of "The History of the Internet" – its Whiggism and teleology, its narrow definition, and its lack of historical and critical distance – led us to solicit papers that would shed new light on the historical development of computer networks including but not limited to the Internet.

Towards The Histories of Networking

Our hope for this issue was to find authors who could contribute to our call for capturing the diversity of technologies and experiences that fall outside and across the margins of Internet history as conventionally conceptualized.[23] We settled on "Histories of the Internet" for the title of this special issue of *Information & Culture*, because it invites a wide range of computer-based and related electronic networking technologies (wireless, modems, satellite), network industries (radio, telecommunications, television), politics (the American federalist system, European "national champions," investment policies for developing nations), and network user identities and cultures (Web 2.0, hackers, e-commerce). Even if narrowly defined, the Internet of 2014 could not be understood without reference to a larger ecology of related media, communication and information technologies, and all of their antecedents. Broadly defined, we will need many histories of the Internet to adequately inform and stimulate debate over its history and future.

We note that "information history" has been embraced by this journal as a shared identity relevant to historians working in a number of subfields.[24] We believe that a broad conception of the histories of the Internet likewise has potential as an area of intersection among scholars working in a variety of specialized sub-fields such as communication history, telecom policy, history of computing, radio history, diplomatic history, histories of neoliberalism and capitalism, histories of the Web, and, yes, the history of the Internet as traditionally understood.

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[23] Here we are following the lead of Michael S. Mahoney, "The Histories of Computing(s)," *Interdisciplinary Science Reviews* 30 (2005). See also Michael S. Mahoney (Thomas Haigh, ed.), *Histories of Computing* (Boston, MA: Harvard University Press, 2011).

[24] Alistair Black, "Information History," *Annual Review of Information Science and Technology* 40 (2006): 441-473; William Aspray, "Editor's Note: Changes to the Journal," *Information & Culture* 47, no. 1 (2012).

The six papers gathered here illustrate six different ways in which researchers from these various traditions are beginning to broaden familiar and simplistic "timeline" conceptions of the Internet's history into broader accounts of this history or, as one might put it given the scope and variety of modern conception of the Internet, histories of the Internet. Taken together they point towards a future in which the ubiquity of networking has made Internet history more of a perspective that can be applied to an ever-expanding range of human activities than a specialized topic in its own right, as can be seen in the rise of Internet studies within a variety of disciplines and fields, such as in health and medical sciences.

Our first paper, from Merav Katz-Kimchi, builds on some of the same concerns we raise here to explore popular histories of the Internet. She argues that these historical narratives themselves played a significant role in shaping public attitudes towards the then-novel network during the 1990s, placing its inventors within a much older narrative tradition of storytelling involving heroic engineers conquering both the literal frontiers of the American West and the metaphorical frontiers of emerging technoscience. Christian Oggolder shares this concern with perceptions of the Internet, but in "The History of an Image" he favors a quantitative method drawn from communications research over Katz-Kimchi's literary approach. Oggolder's method is to sample stories about the Internet that appeared in three European newspapers in order to document shifts in the dominant discourse over time and between nations concluding that "the Internet" was constructed in different ways within the media discourses of Germany, Italy, and the United Kingdom.

Joy Rankin's is one of several papers in this issue exploring aspects of the history of networking which originated aspects of today's Internet but do not fit within the traditional scope of "The History of the Internet." She examines the movement "From The Mainframes to the Masses," exploring Minnesota's early adoption of online computer services to provide public school children with access to computers. This story, and others like it, expose the extent to which many of the applications that later came to be viewed as part of the Internet have origins separate not just from ARPANET but from the basic technology of packet-switched networking that underpinned it. During the 1960s and 1970s many more people were accessing large shared computers via terminals and, in some cases, telephone connections than were sending data from one computer to another via ARPANET and other early packet switched networks. Users of timesharing systems developed applications such as electronic mail, multi-player computer games, online chat, file sharing, and threaded discussion systems long before their descendant applications began to send data via TCP/IP. Users experienced these applications in ways very similar to those of later Internet users, engaging in similar behavior and devising similar social practices.

Our fourth paper, by Valérie Schafer, also examines computer networking in educational contexts. In contrast to Rankin's focus on local experiences with networking, Schafer's focus is on the movement between networks at various levels: campus networks, national networks, and regional (European) networks. In "Part of a Whole" Schafer explores the French network RENATER, which emerged in the 1990s from earlier experimental projects. RENATER's designers originally intended to use X.25 and

OSI technologies, but here (as elsewhere) such plans ultimately were put aside as the network's users and technologies ultimately were subsumed within the Internet.

Nadine Kozak's paper provides an elegant example of the convergence in today's Internet for historical streams that once ran separately. In a story that would be hard to make up, a small town mayor in Wyoming is captivated by a late-1980s wave of enthusiasm for the transformative power of computer networking, fiber optics, and the information society. The dissatisfaction of local citizens with their telephone and cable television services was used to justify municipal sponsorship of fiber optic cables to lure new employers to town. Lusk, Wyoming was celebrated in *Wired* magazine and seemed the embodiment of Al Gore's hopes for the transformative power of the information superhighway, yet the network was never functional and its actual goals and applications were never properly thought through. Only after the project failed, and the orphaned network infrastructure was sold to a cable television provider, was it eventually redirected into a method of providing Internet access to the town. Only in retrospect, in fact only in its failure, did Lusk's ill-fated municipal fiber project become part of Internet history.

Our final paper, Kevin Driscoll's "Professional Work for Nothing" sketches the career of a celebrated text, a letter in which the young Bill Gates asked early personal computer hobbyists to stop pirating his software. This narrative has little in common with the established Internet history literature, but rather explores a quite separate origin story for some of the culture and practices of "openness" which are often said to be fundamental to the Internet. The internal contradictions of openness in computer networking spread as the TCP/IP Internet itself spread during the late-1980s and 1990s, a development sketched at the end of Driscoll's paper. The paper's inclusion as part of a special issue on "Histories of the Internet" reflects our conviction that many significant developments that we increasingly associate with the Internet in fact have origins well beyond the scope of a traditional "Internet history" narrative.

Between them, these six papers provide a sense of the ways in which historical work situated with a range of scholarly traditions is helping us to understand the many different social, cultural, and technical streams of development that come together in the modern Internet. There is more than one Internet, and more than one kind of Internet history.