

8 Making Media Work: Time, Space, Identity, and Labor in the Analysis of Information and Communication Infrastructures

Gregory J. Downey

Making Media Technology Work

I work with media all day, every day, as both a researcher and a teacher in a public university, wrestling with questions about our relationship to information and communication technology, both past and present. As a researcher, I proudly identify as a historian and geographer of technology, and my own most detailed case studies so far—in telegraphy, librarianship, and stenography—all have roots in the nineteenth century. But each of those topics also extends tendrils into the twenty-first century: urban bicycle messengers using smartphones recall the telegraph messenger boys of decades past; library catalogers retool their standards and practices to produce metadata for digital libraries accessible over the web; and live closed captioning on cable television is often created through computer-aided stenography. As a teacher, the pattern is reversed; my specialty is addressing the “new media” concerns of the current day, with syllabi on The Information Society, Digital Divides and Differences, and Media Fluency for the Digital Age littering my website, my Facebook page, and my Twitter feed. But each of these new media courses holds at its core a set of historical examples and arguments drawn from old media. This chapter presents my humble attempt to distill and defend the main insight that I’ve drawn from these productive contradictions over the last fifteen years or so: that a wide range of human “information labor,” enabling and constraining the constant circulation of information across a wide range of technological and social contexts, remains crucial to making media technologies work.

That idea of “work” lurks within our relationship to present-day media technologies in a variety of ways. Ask my current undergraduates on the first day of the semester about the “work” they do to find information today, and they will reply that finding information is no work at all. The answer to any brief question of fact is just a Google search away, as likely

(in their minds) to lead to an amateur blog post as to a professional piece of journalism. The explanation for any named but unfamiliar event or idea is as close as the next Wikipedia page, a source they know was shunned by their former high school teachers, but which they suspect is secretly employed by their time-pressed college professors. Questions of a vaguer nature might be posed to their vast social network of friends, relations, and acquaintances through Facebook, as a public “wall” or “status” post inviting the crowd to reply. And any informational product which eludes these three strategies, somehow not available to them instantly as a web-based link to a downloadable digital file, can certainly be delivered in physical form—they still remember “books”—in twenty-four hours or less, if one is willing and able to pay, from the mega-retailer Amazon.com. Often sounding a bit too much like advertising copy, my students regularly inform me that these new tools “free” them from the pesky work of having to travel to the library, having to read through long and turgid books, and having to remember facts and definitions that are only a click away.

Press them further, of course, and they will agree that there is much “work” still to be done once any given bit of information has been supplied by the network. There are exams to study for, papers to write, presentations to compose. This kind of creative labor is easy for them to see, and easy for them to see themselves performing. It is written into the university curriculum as “complex communication” and “critical thinking” (Bok 2007; Booth, Colomb, and Williams 2008). It is the kind of high-status, high-value labor that they are paying to practice and master with their college tuition dollars in the first place. Such labor experiences will provide them with entry into those elite areas of the “space of flows” of the information society (Castells 1996)—what decades of scholars have called the postindustrial bourgeoisie, the symbolic analysts, or the creative class (Bell 1976; Reich 1991; Florida 2002, respectively). With the raw materials of information, gathered from their vast and always-on data, content, and knowledge networks, these students trust that they will end up on the correct side of the digital divide (Eubanks 2011; Norris 2001; Warschauer 2003).

In this trust, many of my students display a narrow understanding of history and geography, which underpins their narrow understanding of their own position and privilege. Media history for them is a textbook teleology of technological advances (from print culture to radio culture to television culture to digital culture) and market redefinitions (from elite audience to mass audience to individual audience), which result in their own ultimate emergence at the top of an information food chain as both target market and content originator (Baughman 1992; Downey 2011;

John 2010; Starr 2004). Structures of media consolidation and content personalization have made it all too easy for them to live within a self-reinforcing informational geography of safe and satisfying answers, an “echo chamber” whether on the political right, the political left, or the political apathetic (Bagdikian 2004; Kovach and Rosenstiel 2010; Jamieson and Cappella 2008; McChesney 2008; Pariser 2011). And their own amateur media activity—whether uploading photos to their social network profile or downloading the latest cultural content outside of intellectual property paywalls—reinforces the fiction that information circulation is driven simply by “play” and that information content is simply available for “free” (Gillespie 2007; Jenkins 2006; Kline, Dyer-Witheford, and de Peuter 2003; Lessig 2010; Vaidhyanathan 2001). No wonder they are unable to see much of the actual work that underpins this media.

How might we as teachers break through this narrow, instrumental, and rather triumphalist understanding of new media infrastructures? The standard strategy of “media literacy” is to demonstrate to students that none of these admittedly extraordinary technologies, Google or Wikipedia or Facebook or Amazon, are able to deliver an information experience that entirely frees the user from further work, especially when one approaches these services with anything more than a trivial question (Fallows 2011; Gillmor 2008; Jenkins 2006; Levinson 2009; Lievrouw and Livingstone 2006; Martens 2010; Manovich 2001). It is easy to Google the name of a well-known corporation, access the Wikipedia biography of a well-known historical figure, discover a Facebook friend of similar interests, or find plenty of competing purchase options on Amazon for a mainstream, bestselling book. But pose a more complicated question on Google, and the search transforms from an “I feel lucky!” first hit success to an information overload of pages and pages of dubious result candidates, computed not simply from the original “PageRank” algorithm whereby sites with lots of links, from sites with lots of links, recursively float higher in the search rankings, but from an increasingly complicated set of contextual variables including the searcher’s own geographic location, query history, and “psychographic” marketing profile (Battelle 2005; Kink and Hess 2008; Morozov 2011). Seek a more contextual summary from Wikipedia of a broad time period in which a historical figure lived, and the “encyclopedia that anyone can edit” reaches the limits of its “no original research” restriction and its lack of professional historian contributors (Hansen, Berente, and Lyytinen 2009; Mangu-Ward 2007; Pentzold 2010; Poe 2006; Rosenzweig 2006). Attempt to define yourself on Facebook using markers other than “Likes” of purchase choices and pop-culture affiliations, and the social network

application programming interface (API) is unable to parse your descriptors (Papacharissi 2009; Watkins 2009).¹ And ask for Amazon user suggestions about a more obscure, out of print text and you may very well fall prey to the “review spam” of paid advertising disguised as customer satisfaction, or the petty squabbling of zealots who give zero stars to any work that suggests a difference of opinion with their immovable, ideological worldview (Auletta 2010; Robinson 2010; Roychoudhuri 2010). Media literacy exercises can be an eye-opening demonstration of the limits of automation in many of these seemingly laborless systems, revealing both the need for users to learn and apply sophisticated query strategies, and the influence of layers of algorithms which combine to produce complex and sometimes contradictory results (Gillespie, chapter 9, this volume).

However, teaching media literacy skills, no matter how effective, still keeps the focus of work on the students themselves. The greater challenge is to convince them that even when tools like Google and Wikipedia and Facebook and Amazon work as intended at the moment they are invoked, behind the scenes and before the fact there actually occurred great amounts of design, organization, production, reproduction, and “repair” labor on the part of many, many others besides themselves (Jackson, chapter 11, this volume). A cursory understanding of the battles between Google engineers and the outside “search engine optimization” (SEO) vendors reveals an ongoing arms race through which the search algorithm is constantly repaired from the inside and then reverse-engineered from the outside, in an environment where dropping off of the first page of a Google search can mean significant and unexpected revenue loss for online retailers (Basen 2011). Similarly, the briefest exploration into Wikipedia article production reveals the power-law division of labor represented by the small number of users who actually write substantive original articles for the site, versus the larger number who merely tweak and reorganize and spell-check and, yes, sometimes vandalize those articles—not to mention the work of algorithms known as “bots” to flag and queue articles for quality and revision (Niederer and van Dijck 2010). For the first time, journalists and scholars are beginning to reveal that social networking sites like Facebook demand constant human content moderation and censorship of photos, videos, and even text speech that violate legal terms of service, zones of personal privacy, and community norms of propriety.² And once one peeks behind the virtual facade of Amazon, it is easy to see the material realities of logistics and fulfillment and customer service, with (high-paid) technology workers keeping server farms running in one region, (low-paid) warehouse workers packing product in another region, and an Internet network of both public

and private delivery services shuttling boxes back and forth from suppliers and customers in between.³ The best outcome for me as a teacher is when students realize that the media literacy skills that they employ in order to effectively use and critically evaluate such web tools are useless without an understanding of the deeper context of how those tools deliver what they promise. In other words, the sporadic information labor of my students as Google, Wikipedia, Facebook, and Amazon users is intimately connected to the ongoing information labor of the many, many behind-the-scenes designers, builders, operators, and maintainers of Google, Wikipedia, Facebook, and Amazon themselves.

As these present-day examples suggest, what I am loosely calling “information labor” here represents a broad diversity. Certainly some information labor reflects the same expectations of my students for their own successful futures: expensive, individual, high-status, high-value labor (or “knowledge work”), as predicted by the post-industrialists, produced by the elite universities, and circulated among the leading transnational corporations (Deuze 2007; Levy and Murnane 2004). Other information labor is collectively organized work outside of a formal organization, aggregated over a network into the so-called “wisdom of crowds” (Kreiss, Finn, and Turner 2011; Shirky 2008; van Dijck and Nieborg 2009). When such labor occurs outside of a formal wage or salary relation, it goes by various names: some have called such labor “gift exchange,” such as in the case of advice provided within online communities; others have termed it “produsage,” if it comes as a consequence of a formal user or customer relationship; or it may be termed “playbor,” if it is considered to have both entertainment value and exchange value (Bermejo 2009; Elk 2011; Kollock 1999). Still more information labor is only a little more expensive than free: contingent labor assembled by the temporary agencies and independent contracting arrangements of digital distributed work online, or emplaced in the sprawling factories of free trade zones, for a wage hopefully considered livable in its local context, but likely considered subminimum in its employing context (Rogers 2000; Benner 2002; Christensen and Barker 1998). And a growing portion of information labor is almost entirely abstracted from human minds and hands, existing as automated, algorithmic labor forever capturing some previous human expertise, judgment, pattern, or intention as replicable and executable code (Gillespie, chapter 9, this volume).

All of these forms of information labor share a crucial aspect, however: users tend not to see it. For one thing, this labor is obscured by the perpetual marketing claims of both the technologies that surround it and the content that flows through it—after all, customers are motivated to buy iPhones

and apps, not the aggregated and morselized labor power of factory workers and developers. Whether through user-friendly interfaces, supply-chain intermediaries, cultural myths of smart technology, or plain old “commodity fetishism” (where a single-minded focus on the price of a good or service distracts us from considering the conditions of production for that good or service), information laborers of all sorts are likely to be hidden, out of sight and out of mind, from those who encounter their products and processes on a daily basis (Downey 2001, 2004b). The clickstream engineers of Google, the volunteer editors of Wikipedia, the outsourced moderators for Facebook, and the logistics army behind Amazon—all must be revealed, situated, and explored in order for us to reveal, situate, and explore our own daily labor with these systems.

Conceptualizing and Exploring Information Labor

What kinds of research interventions, from science and technology studies on one hand, and communication and media studies on the other, can help us with this task of “uncovering information labor” in the classroom? It is helpful to start by putting the concepts of “information” and “technology” in context. After all, the very purpose of information and communication technology is to make information—whether conceptualized as data, content, or knowledge—accessible across space and across time, from one context to another, from one community of practice to the next. But all information and communication technologies also depend, both for their daily functioning and for their overall meaning, on different forms of human labor, each with its own temporal and spatial characteristics as well.

Tools from both history and geography can be brought to bear on the question. All of the contexts and all of the communities in which we might look for information, technology, and labor are necessarily situated geographically and temporally, a condition we can analyze in terms of place, space, and scale. Individual places support or constrain certain kinds of informational activities, which are structured by their users and inhabitants, their natural and built environments, and the social meanings ascribed to them. Places connect through relationships of all sorts—technological, social, political, and economic—into broader conceptual spaces for action, be it the state space of government and military control, the market space linking raw material extraction to component assembly to consumer retail, the cyberspace interface of bodies and technologies exchanging encoded electronic communication, or the imagined space of a cultural or diasporic or aspirational community fragmented across other national, economic,

and technological boundaries. And finally, these spaces are assembled, reassembled and, sometimes, disassembled at both small and large scales simultaneously, with complicated arrangements of power and uneven possibilities for making change (Downey 2007b, 2009).

Information and communication technologies, and the larger media infrastructures within which they are situated, developed, used, and understood, by their very nature exist to transcend history and geography, storing ideas across time and moving ideas across space in an organized and productive manner (Edwards 2003; Star and Bowker 2006; Wright 2007). This work of making information accessible is really about (a) making information useful (or what we might call “realizing its use value”) and (b) bringing that information into motion (or what we might call “putting information into circulation”). Especially in our current, overwhelmingly capitalist, global political economy, these two issues—how a society values information, and how information circulates through a society—are not just connected. In what we might call a dialectical relationship, each concept helps to define the other: to be useful, information must circulate through many minds (and eventually through yours); and to circulate, many minds must judge some piece of information to be (at least potentially) useful. All the agency that we bring to information along the way—whether producing information as a part of work or play, appropriating information as private property, commodifying information for market exchange, offering information up in a creative commons, or claiming the right to information in the public interest—must be understood within this basic structure of value and circulation (Dyer-Witheford 1999; Harvey 2001, 2010; Schiller 1999).

Setting up the parameters of structure and agency in this way gives us a framework for understanding media infrastructures as sites for the performance of information labor, but it doesn't give us any clues as to what to look for when investigating the laborers themselves. Fortunately, recent scholars of technology have established quite clearly that spatial, temporal, and technological circumstances are inevitably part and parcel of social relations and cultural meanings (Nakamura 2002; Smith and Kollock 1999; Turner 2009). Within information infrastructures, for example, the evolving and overlapping categories of computer engineers, scientists, entrepreneurs, and enthusiasts over the last several decades have been revealed to involve profound meanings in terms of lots of “identity” categories—age, gender, class, race/ethnicity, political philosophy, and nationality, for example—especially as the labor practice of computer programming has been professionalized in the capitalist workplace, institutionalized in the college curriculum, implicated in interdisciplinary science, and globalized

in the network economy (Aneesh 2006; Ensmenger 2010; Light 1999; Nelson, Tu, and Hines 2001; Turner 2005).

Thus what starts out as a simple classroom question about “how do you find out what you need to know?” turns out to be a rich and complicated set of related research questions about one’s place in a whole set of extended relationships of information circulation—in other words, a question about “who does what kind of information work, when and where and why?” To explain to our students what is necessary to “make media work,” I believe we must study both information and labor, in both spatial and temporal context, with attention to social relations: (1) how human labor applied to information always takes place in, and depends on, a particular spatial/temporal and political-economic context; (2) how that human labor, and the social relations and cultural meanings attached to it, both enable and constrain the ability of information itself to move from one context to another; and (3) how that circulation of information from one context to another comes full circle to affect the subsequent spatial/temporal patterns, political-economic conditions, social relations, and cultural meanings for further labor.

That can be a lot to juggle in a single research project. But attention to this basic dialectical relationship of change—where labor of a particular sort is mobilized to circulate information, and the circulation of that information helps to alter the parameters of that labor—brings a useful insight. In order to productively categorize, historicize, analyze, and, yes, teach about any “new” media infrastructure (be it the “lightning lines” of the telegraph in the 1840s, the “electronic brain” of the digital computer in the 1940s, the “electronic hearth” of the television in the 1970s, or the “information superhighway” represented by the World Wide Web today) *we must continue to pay attention to the space, time, and social relations of the human laborers who are bound up in that infrastructure as well.*

Jumping Context with Informational Labor

Time, space, and social relations are big categories; demonstrating how to operationalize them in the study of information labor, and why operationalizing them matters to scholarship and teaching, requires some specific examples. In fact, I argue that the very concept of information itself is meaningless without some sort of context—an organizational location, a community of practice, an end-user market, a shared public purpose—within which to construct that information as “data” to be manipulated, “content” to be enjoyed, or “knowledge” to be utilized.

Whether constructed at the scale of data, content, or knowledge, the value of information can only continue to be realized to the degree that the information circulates from one context to the next. This is where labor of some sort is always required—to set information in context, to move information across context, and to reset that information in a new context. I've used the term "jumping context" as a metaphor for these transformations, especially in the case where that shift in context provides a surprising, productive, or contradictory moment for consideration through research and teaching (Downey 2004a).

Let me describe three variations on this theme of jumping context that are drawn from my own research: (1) the case of urban messenger boys in their early twentieth-century encounter with not just electromagnetic telegraph signaling, but also gasoline-powered postal services and voice-carrying telephone services (Downey 2000, 2002, 2003); (2) the case of library technical workers in their mid-twentieth-century encounter with general purpose digital computers for both electronic indexing of materials and online searching for materials (Downey 2007c, 2010a; Eschenfelder, Desai, and Downey, 2011); and (3) the case of real-time stenographers in their late-twentieth-century encounter with minicomputers, microcomputers and laptops in courtroom service, broadcast captioning, and computer-assisted transcription, respectively (Downey 2006, 2007a, 2008, 2010b).

Telegraph Messenger Boys (Early Twentieth Century)

Studying the history of the telegraph from the point of view of its teen-aged messenger labor force might seem, at first, to be a contradiction in terms. The telegraph network was an information infrastructure of wires and repeaters, of sounders and printers, of skilled operator labor and craft lineman labor. As most previous historians understood the telegraph—and as the telegraph firms themselves often tried to maintain—messenger boys were literally outside of the network, unworthy of attention and unable to tarnish the reputation of the "lightning lines" for speed, efficiency, and modernity. And with our focus today on World Wide Web-based networks of news, reference, and sociability that seem to remove all human labor from our Google, Wikipedia, Facebook, and Amazon searches, it is no wonder that we recast the telegraph as a "Victorian Internet" of similar automation and virtuality (Gabler 1988; Standage 1998).

But of course, that contradiction is just the point: this high-tech electromagnetic communication system of its age, existing as a viable business for roughly a century from the 1850s to the 1950s, was actually entirely dependent on human labor for funneling information—data, content,

knowledge—into and out of its material network. That basic insight, and basic contradiction, sits at the heart of any historical work on information labor: look for such labor precisely where system builders, promoters, and proponents assert it isn't to be found, where it isn't supposed to matter, where it isn't supposed to count as part of the "new media" that they are selling (Hughes 1989; Chandler and Cortada 2000).

So this first step of uncovering the information labor of the telegraph messengers is one of situating them within a larger system that stretches over time and space: where and when are they to be found? This question is a fundamentally geographical one, and suggests the first way of understanding the value of information labor: it enables *the jumping of context from one sociotechnical infrastructure to another*, involving changes in technology, environment, or institution. Messenger boys did this in at least three ways:

1. *Jumping context from the virtual to the physical.* While present-day understandings of cyberspace and networked communications might lead us to conceptualize the telegraph merely as a system of virtual communications and connections—enabled through the trinary dot, dash, and delay code, first of trained (mostly male) telegraph operators and later untrained (mostly female) teletypists—the messengers remind us of the transcoding interface between scrawled messages and forms on the input side and printed yellow-tape telegrams on the output side. A materiality of message delivery was necessary on both the front and back ends of this virtual system, with telegraph companies paying regular sums of money for boots and bicycles to outfit their messenger forces for trudging the town and city streets.

2. *Jumping context from the intra-urban to the inter-urban.* This boundary between virtual and physical was not just technological; it was institutional and spatial as well. The telegraph industry as a whole evolved from the gradual merger of regional telegraph firms exchanging intelligence between cities combined with local alarm call box and messenger services that handled subscriber security and delivery services as well as telegram connections within cities. It is impossible to understand this relationship between national and local business partnerships without considering that boundary as one crossed daily by the telegram messengers.

3. *Jumping context from the telegraph to the post office and the telephone.* Through most of the telegraph's history, it was by no means the single consumer choice for message delivery, either within cities or between cities. The government-subsidized postal system was always a competitor, increasingly so with greater frequency of delivery and due to sorting

mechanization and gasoline-powered distribution. And from the late nineteenth century the telephone network both competed and cooperated with the telegraph (sometimes owning it outright), first in local traffic, but eventually in long-distance service. Yet through the long period of technological and process innovation in these various industries, messengers provided a ubiquitous link for calls made to people without telephones, telegrams sent to people through the mails, or postal deliveries sent to someone without a fixed address.

Telegraph messenger boys carried the forms and rules for translating spoken messages into price-per-word telegrams; they parsed the hidden signals on an envelope to determine whether a telegram contained a birthday greeting or a death notice; and they contained the practical street address information necessary to pin telegraph, telephone, and post office networks together. In this way they performed a sort of *protocol labor* within these information, communication, and transportation infrastructures.

The key point linking all of these varied activities of jumping context between virtual and physical systems, across urban and national scales, among public and private institutions—which we might call *transcoding processes*—is that the need for messengers did not decrease with increasing technological sophistication; rather, it increased until the crash of the telegraph post-World War II. The telegraph industry did not merely depend on capital investments in the spaces of offices, wires, and railroad rights-of-way; they also had to invest in messenger employment offices and locker rooms, messenger equipment warehouses and uniform laundries, messenger assembly halls and classrooms. Both within their own buildings, and throughout the wider city as well, creating a physical space to ground the virtual space of the telegraph meant creating physical spaces for the messenger boys.

Library Technical Workers (Mid Twentieth Century)

Studying library technical workers—particularly those involved in such processes as acquiring, cataloging, classifying, indexing, and retrieving works held by the libraries—might seem less surprising than studying telegraph messenger boys. After all, without human care and expertise, libraries are merely warehouses of books and periodicals. Throughout most of the history of the modern library, the very ability of materials to circulate from authors to readers through the library depended on the continuous and visible work of librarians, whether in school, public, university, or corporate settings (Battles 2003; Buschman and Leckie 2007; Cmiel 2009).

As with the telegraph messengers, these workers are engaged in the sort of “transcoding processes” necessary to move information from one socio-technical system to another, especially in the daily flow of patron information requests that must be encoded to query languages in library database systems, or in the interpretation of results lists that must be explained to library patrons. In this way they too deal in “protocol labor,” applying the codes and fields of particular cataloging and classification schemes to both storage and search processes. But their role carries with it more of an intellectual production quality than the telegraph messengers; they are not merely shepherding information back and forth across a virtual and material divide, but are actively adding contextual information along the way, in order to make that transition even possible (Bowker and Star 1999).

However, recent attention to the new media of the “digital library” serves to hide this activity. It is now possible to conduct reference searches through a virtual catalog interface, to query library holdings remotely through networked databases, and even to receive materials in fully electronic form, such as a “born digital” journal article or a scanned book from the Google Print project (Borgman 2000; Darnton 2009; Gorman 2003; Marcum 2001). Again, our present-day notions of how a library functions may blind us to the historical case, where the long and tense introduction of computers to libraries through the 1960s, 1970s, and 1980s is now cast as an inevitable series of progressions from bulky, slow, and expensive-to-update card catalogs to networked, user friendly Online Public Access Catalogs (OPACs); from the expense of original and isolated catalog production work to the shared and distributed labor possible through the Online Computer Library Catalog (OCLC); and from librarians as guardians of reading and culture to librarians as information analysts and consultants.

So the question for this case of information laborers is not so much uncovering that they exist, or uncovering that they matter, as it is uncovering their historical and ongoing value over a long period of technological and economic transformation. The answer is also a fundamentally geographical one (although dealing with time as much as space), and suggests a second way of understanding the value of information labor: as *providing a way for information—cast as data, content, or knowledge—to jump context from one temporal, organizational, or cultural milieu to another*. Library technical services workers enable this in at least three ways:

1. *Jumping context from the past to the future.* Whether library cataloging and classification is done in a centralized or distributed division of labor, with or without the aid of networked technology, the basic contradiction of

the practice is a temporal one: to take an informational product produced in the past (say, a nonfiction book), and describe and define it using the tools and terminology of the present, all in a way that will presumably make sense to a potential reader seeking it in the future. All such decisions must be made imperfectly: there is never enough time or money or even shelf space to perfectly catalog and safely keep every possible item available today for every possible audience of tomorrow.

2. *Jumping context from one kind of knowledge institution to another.* Besides mediating jumps across time, librarians must prepare materials for sensible leaps across institutional (and intellectual) domains. Again, considering the basic nonfiction book, the institution which sponsors its production might be a university, government office, or knowledge business, with public-service or market-success goals for its product; the institution that sponsors its collection would likely be a public or quasi-public library with some sort of overt public service mission (and likely collective public funding) meant to expand the reach of that book beyond its original constituency or market; and with increasing networked cooperation between libraries, what one organization collects is made available for another organization's users, meaning the institution that spurs a book's eventual wide-ranging circulation may be yet another university, government office, or knowledge business. Especially as intellectual and professional domains of knowledge have grown and fractured and specialized over the twentieth century, the need for books produced for one thought community to be accessible and understandable to other transdisciplinary thought communities has only increased.

3. *Jumping context from one set of cultural meanings and expectations to another.* Even if librarians could reliably predict the future needs and intellectual scaffolding of their most likely eventual users—a task in which they succeed surprisingly well, all things considered—there remain two problems. First, books circulate across global cultures where not just language and jargon, but also meaning and category may differ substantially (and often normatively). And second, even within a single cultural community, social attitudes and values change over time; categories like “Third World” in one decade shift to “Developing Nations” in the next, gaining and losing approbation and scorn. If libraries are to remain relevant as tools of knowledge production and circulation, they must not only do their best to produce intelligible cataloging at the entry point of a collected item, but they must also continue to reproduce and repair that cataloging through the life of an item—in fact, the life of an item in the library actually depends on the

effectiveness of its cataloging, because no matter how theoretically valuable it may be, it is only actually valuable if it circulates.

All this labor of moving data, content, or knowledge from one context to another—be it from past to future, from discipline to discipline, or culture to culture—depends on understanding, manipulating, producing, and reproducing further descriptive, contextual information about that data, content, or knowledge. We might call such contextual information “meta-data,” or “metacontent,” or “metaknowledge,” but at any of these scales, the production and reproduction of metainformation for information storage, as well as the effective use of that metainformation at the point of retrieval, are both necessary for preserving not only the sense but also the value of the information from the old context to the new. Thus librarians engage in a particular form of *metainformation labor* that is unique from that of the messenger boys.

This metainformation labor of preparing and preserving books for such leaps of context across time, space, and intellectual community—what we might call *transposing processes*—is fraught with contradiction. Library catalogers are expected to make rapid and hard-to-change decisions about how to organize texts in a way that is meant to serve future populations and needs that cannot reliably be known, balancing the intellectual depth and detail of their work (with greater-quality cataloging thought to bring greater long-term usability) with the very real economic and time cost of that work (with lower-quality cataloging thought to bring greater short-term savings). Lower-quality cataloging might save money in the short term, allowing the purchase of more books out of limited budgets, further pressuring libraries to spend less time (and money) on cataloging. And every new information infrastructure developed to automate or assist these processes—whether print or mechanical or digital—reproduces in a different way these same dilemmas.

Real-time Stenographers (Late Twentieth Century)

My third case involves a more diffuse set of information workers: a group I am calling real-time stenographers. This category grows out of at least four different streams of information labor: (1) office stenography, or the skilled, machine-aided transcription of speech to some encoded and recorded format that can be reconstituted into English text later; (2) courtroom stenography, which further casts that reconstituted English transcription as the official record for civic and criminal legal proceedings, demanding verbatim accuracy; (3) media captioning, which involves the production of a

time-matched textual representation of speech and sound to be displayed along with a movie, video, or audio recording, sometimes even in a different language than the original; and (4) simultaneous language translation, or the ability to listen to speech in one language and simultaneously recast it for a different language audience as a live performance. Real-time stenographers combine the skills and machines of stenographic practice in the office and the courtroom with the outputs and audiences of media captioning and language translation (Robson 2000).

Like the telegraph messengers, real-time stenographers sit at the interface of different sociotechnical systems, and could be said to perform transcoding processes in a very direct way, turning variable, analog, ephemeral human speech into fixed, digital, permanent typed transcript. Theirs could certainly be seen as “protocol labor” in the sense of knowing the fixed terminology and parameters for constructing legal documents. Similarly, the shepherding of a transcript from the initial moment of courtroom production to the eventual moment of use in an appeals process years later, or the one-time live encoding of a television captioning track on a program that might be replayed or repurposed years later for either public rebroadcast or private digital access, can be thought of as a transposing process across time and space. If an audio or video stream is considered the “information,” then producing the text-captioning track associated with it would certainly qualify as “metainformation labor.” But there are also some new categories of information labor that the case of the real-time stenographers suggests.

First of all, real-time stenography represents a case of labor that was “born digital”—it could not have been pinned together from its antecedents without the application of the digital minicomputer to the mechanical stenotype keyboard, starting in the 1960s, in a human-machine symbiosis. What uncovering information labor means in this case is asking: *how has this new form of work been adjusted and adapted to jump context into a variety of different social purposes and economic markets?* Real-time stenography offers a unique example of a set of information laborers being constituted anew out of a number of historical technological and organizational changes, but then jumping context time and time again from one audience of consumers and clients, and one set of political-economic and social relations, to another. In one realm, that of the legal transcript, the audience demands verbatim accuracy between the original speech and its translated, written equivalent, and is willing to allow for delays in delivery in order to ensure perfect reproduction; in another realm, as in media captioning, the audience requires an immediate interpreted translation, and is willing to accept flaws in reproduction for an informational product that is able

to “keep up” with live events. In between are a network of brokers and officials and employers interested mainly in keeping costs and complaints down while maintaining high throughput and, sometimes, profits (a similar set of pressures as the library catalogers face). Real-time stenographers learned to negotiate this complicated set of contexts, audiences, purposes, and demands over a series of particular historical changes:

1. *Jumping context from the defense industry to the legal industry.* The tools of real-time stenography originated in the Department of Defense and its “Machine Translation” projects of the 1960s, in an experiment to use stenographic keyboards and computer dictionaries of words and phonemes to enable instant language translation from Russian to English. Entrepreneurs brought the technology into the courtroom and promised to make “computer-compatible” every new professional court reporter they trained. In this way, the perceived authority of the computer, in an environment where the official courtroom transcript had to be both perfectly accurate and affordable to shrinking public budgets, lent ammunition to courtroom stenographers who were fending off challenges to have their jobs replaced by automated videotape systems. Thus a new labor category whose development was funded by federal research dollars for Cold War security projects spun off as a set of privately owned tools and training opportunities, to be marketed back to the public courts at the local, state, and federal scales.
2. *Jumping context from the administrative realm to the media realm.* Once the real-time stenography equipment moved to the microcomputer, a new audience opened up: television captioning, which got its start in the early 1980s through a much-heralded public-private partnership between the “big three” broadcast networks and a federally funded National Captioning Institute, intended to help Deaf and hard-of-hearing individuals fully participate in the cultural life of the society. As this partnership quickly began to unravel, however, the ability to live caption one of the most sought-after television programs—the evening news—was considered crucial to captioning’s ultimate success. This category of programming straddled the public-private divide as well: seen as the ultimate public-service obligation for broadcast stations by the FCC, news was at this time being reconceptualized by station managers from a “loss leader” to a “profit center” since production costs were so low in comparison to local advertising rates. It was also a new arena for real-time stenographers to claim expertise and utility, quickly expanding from news programs to talk and entertainment programs as well, as new federal laws and growing numbers of cable channels demanded the rapid and inexpensive captioning of more and more

content, whether live or prerecorded, through stenographic means. As a result, this labor shifted from delivering a tangible product to the state (a printed courtroom transcript) through a per-page piecework fee paid for by public tax dollars, to delivering an intangible product to a private broadcaster (a captioning track to be recorded on videotape), through a per-program cost underwritten by advertising. The public-service claims of the profession, however, were renewed and rearticulated in this new context.

3. *Jumping context from the mass entertainment imperative to the individual communication imperative.* The success of real-time stenography with the media captioning audience, its growing reputation as an assistive technology, and the new portability offered by laptop computers allowed the real-time stenographers to jump context yet again, into a new market for direct captioning for Deaf and hard-of-hearing individuals, live and on site, at schools, churches, and conferences. These markets grew rapidly after the passage of the Americans with Disabilities Act in 1990. However, this shift from the courtroom to the classroom rendered the informational object of the real-time stenographer in an entirely different way. Rather than producing the legally binding, verbatim transcript of highly technical but relatively narrow spoken proceedings, these information laborers now had to use much the same skills and equipment in service of an entirely different goal: producing a “good enough” just-in-time transcript of highly variable spoken proceedings, often even summarizing, paraphrasing, and interpreting along the way for reading level, subject knowledge, and language familiarity. Once again, its practitioners and proponents reestablished the public-service claims of the field; however, in this context, captioning was a per-hour personal service, once again often paid for through public tax dollars.

In each of these cases, the real-time stenographers overtly claimed to be serving the public interest by making an important aspect of an audiovisual performance—its textual representation—available in a new way, which increased the accessibility of that performance to a target community. These information workers were trained to understand the protocols necessary to transcode meaning from English speech to phonetic stenoforms to English text. They were also charged with producing a metainformation resource that was attached to that speech (on a magnetic computer disk or videotape) in a way that would be storable, indexable, and searchable so that the speech might be transcoded to different contexts. And in doing so, no matter what the actual political-economic relationships that enabled their training, equipment, and wages, they cast themselves as defenders

of the public record, making courtroom proceedings accessible to future claims of appeal; or as defenders of media justice, making entertainment products accessible to disadvantaged audiences; or as defenders of social justice, making personal education and political participation in a hearing world possible for nonhearing citizens. We might call this *accessibility labor*.

All three of these realms are examples of what we might call *translation processes* in a broad sense, because in each case they involve not just moving information unaltered from one set of technical codes to another (like in telegraphy), nor just creating the contextual environment for information to circulate from one institutional or intellectual context to another (like in librarianship), but a sort of recasting of the very meaning of the information content in the first place. Real-time stenographers in the courtroom must reflect pause and nuance in the official record, but they must also take care to strike portions of the record deemed inadmissible, and to “clean up” the slang or shorthand of a lawyer or judge, all the while preserving the words of witnesses for possible future appeal. Real-time stenographers on television must adapt written scripts and speedy verbal delivery to the very limited time and space of the television screen, taking care to judiciously drop words, phrases, and even sentences when the flow becomes too fast (and when the commercial break looms). And real-time stenographers in the classroom or conference hall, often serving Deaf or hard-of-hearing individuals directly, must balance all those same needs with those of clarity and understanding—which might require not just transcription, but also editorial intervention and personal knowledge of the client’s needs and wants.

The Difference that Labor Makes to Information infrastructures

As I hope my brief description of these three historical research cases shows, when we study media infrastructures from the point of view of the information laborers, we can begin to identify and analyze different kinds of context-jumping categories: the protocol labor that allows transcoding across sociotechnical infrastructures, the metainformation labor that allows transposing across decades and institutional contexts, and the accessibility labor that results in translating from a majority community of meaning to a marginalized one. These categories are certainly not the only ways to understand the work that these information laborers do, but I think they provide a nice place to start—one that privileges the spatial metaphors of movement and circulation which are necessary to any conception of informational value.

These same kinds of context jumping are important to seek out in our modern media infrastructure. Google survives on the collaborative production of metainformation by the anonymous millions of weblinkers and clickstreamers; Wikipedia thrives only as long as legions of volunteer editors practice protocol labor as they learn and share conventions for structuring different kinds of pages and writing encyclopedic forms of prose; our every entry, selection, and deletion on Facebook involves decisions that make our personal media either more or less accessible to friends, family, coworkers, and advertisers; and the work necessary to keep Amazon.com profitable can be understood as involving all the many protocols, metainformation, and accessibility practices necessary to bridge the both the digital and the physical divide.

There's a final reason for wanting to focus on the information laborer throughout media technology history, however. Just like with any category of work, a combination of historical circumstance, social expectation, political-economic power, and demographic difference all come together to make some groups more likely than others to be found as laborers in any particular information infrastructure. At the same time, often the meanings we ascribe to information technologies themselves are circulated back and forth with the meanings that we ascribe to the information laborers who work within these technologies. Tracing those individuals whose work lives (and recreation lives and home lives and citizen lives) get bound up with our technological infrastructures shows us both something about how we value those technologies and something about how we value those individuals. And especially in information infrastructures, with their intrinsic value wrapped up in movement across space and time, *uncovering the spatial and temporal relations of labor helps us to simultaneously uncover these social relations of labor* (Dear and Flusty 2002; Giddens 1990; Graham and Marvin 1996; Harvey 1982; Orr 1996; Peck 1996; Wheeler, Aoyama, and Warf 2000;).

Again, consider the telegraph messengers. What's most striking about these workers is not necessarily their ubiquity within this technological infrastructure, or their longevity over a century of infrastructure change and evolution. The most striking thing about them is that they remained young, school-aged boys and teenagers throughout most of this period. Their demographic age, coupled with the contemporary cultural meanings of childhood and adulthood, combine to create an important analytical category of *maturity* that was bound up with this group's information labors in a number of important ways. In the early twentieth century, messengers became a symbol of both the worst excesses of child labor exploitation and

the greatest hopes for vocational education, particularly in the site of their greatest concentration, New York City. The telegraph industry was obliged to perpetuate a myth of messenger advancement, rationalizing the employment of school-age children by claiming that such work provided the skills and connections that would bring a young boy into the world of national commerce. Eventually both the city and the industry reached a material compromise in order to continue to legitimize this fiction, creating a part-time public school on the Western Union premises for its messenger boy labor force. Such educational activities only ended once the figure of the telegraph messenger made a decisive move along the maturity scale from child to adult, in taking on a public identity of labor union participation that was soon followed by work rules limiting the job to those eighteen years old and over. While other social constructions of class, gender, and ethnicity were certainly at play as well in this story of the messenger's movement from "boy" to "man," the opportunity to view this particular information laborer through the lens of maturity helps connect the messenger to similarly positioned youth cultures in the early twentieth-century information revolution, from newsboys to ham radio operators to nickelodeon patrons.

Or consider the library technical workers. Here, although questions of class and education and ethnicity also loom large, it is the analytical category of *gender* that moves to the forefront. Librarianship has long been "feminized" in four senses of the word: its demographic overrepresentation of women, its managerial overrepresentation of men, its relative lack of high status and salary, and its stereotyping as "women's work." But starting in the late 1960s, library workers of both sexes began to question and critique such conditions, as the ideas of a new national women's movement took hold within professional librarianship. What's striking from the perspective of information labor is that this period also represented the entrance of computer-based automation and networking systems into U.S. libraries, especially the first computer-readable catalog format (MARC) and the first cooperative cataloging network (OCLC), both of which drastically altered the spatiality and temporality of library catalog production. The new "push-button library" demanded a new attention to the kind of metainformation discussed earlier, and it was largely women library workers who produced, reproduced, and used that metainformation on behalf of both authors and readers. In this case, what was most striking from the historical record was the disconnect between librarians' own extensive professional discussions of two intensely argued topics—sexual discrimination and information automation—which were almost never considered at the

same time. A century-old legacy of librarianship seen as a gendered combination of behind-the-scenes “housekeeping” work and before-the-public “nurturing” work continues to affect these discussions today.

Finally, let’s revisit the real-time stenographers. Here, too, gender issues are a long thread in the history of stenographic work, as are issues of professional versus clerical identity construction in the twentieth-century office. However, the analytical category that ends up being the most interesting as this information labor jumps context is that of *disability*, which we should remember is less an absolute medical condition and more a socially constructed condition of resources and expectations (for example, in a society with fewer demands on personal mobility or a greater commitment to public transportation, would a person who uses a wheelchair to get around be considered “disabled”?). The real-time stenographers had made a series of movements toward professionalization during their decades-long history. From their first association with the minicomputer in the 1970s, the claim was that becoming “computer-compatible” was the route to respect, status, and job security in the face of videotape automation threats. Then in their movement to the world of entertainment captioning, speed and accuracy under the time and space demands of the broadcast were valued, and a notion of public service for Deaf and hard-of-hearing viewers (as well as English language learners) appeared. Finally, with the movement of these laborers into the meeting rooms and lecture halls of direct service provision to individual Deaf and hard-of-hearing clients, real-time stenographers found themselves lobbying Congress on behalf of disability communities for media justice accommodations—a professional role wholly different than the one they claimed just two decades earlier. Today, with the very real possibility that personal, mobile, and automated audio transcription and translation devices (such as Google Translate or Apple’s “Siri” voice-operated search tool) might provide a new round of technological fixes for Deaf and hard-of-hearing users, real-time captioners may have to pivot once again, away from the space and time of disability accommodations.

How might our understandings of contemporary media infrastructures change if we were able to reveal not just the forms of information labor that support them, but also the spatialities and temporalities within which they work, in connection with the positionality and power relations of the information laborers themselves? Might we think differently about our first screen of Google results if we conceptualized all of our own searches as little bits of useful labor helping to produce the metainformation behind the Google PageRank algorithm itself—and its personalized search and advertising results based on whether it knows (or guesses) that we are young

or old, White or Black, struggling or affluent, urban or rural, employed or unwaged? Or might we evaluate that Wikipedia article differently if we knew that statistically, it was likely to have been written by someone from a strikingly similar (or dissimilar) social class, educational background, ethnic experience, and political orientation as our own? How might it matter if we find that the demographic and economic groups most using Facebook are culturally and professionally quite distinct from the behind-the-scenes content monitors and persuasion experts that mold their experience? And does it matter that the low prices of my Amazon Kindle e-book are subsidized, in part, by the low wages of contingent warehouse workers during the holiday season, shipping printed versions of the same book to more traditional customers? We'll never know unless we can get behind the human-machine interface of all of these systems, unless we can really explore the labor conditions of the online infrastructure, unless we can seek out and enter the spaces of work performed by others that enable the nonspaces of nonwork performed by ourselves.

Less a Conclusion Than a Call to Action

I'm convinced that the historical examples of the telegraph messengers, the library technicians, the real-time stenographers, and many, many others still have much to teach us about the information labor embedded within our latest new media infrastructures today. Thinking about the way information labor helps put data, content, and knowledge into circulation—enabling owners, consumers, and publics to realize value from that information—opens up a rich metaphor of informational context, and the labor required to “jump” information productively from one context to the next. Sometimes information demands transcoding across different sociotechnical systems by mastering the protocols of both—programmers porting video games to new hardware systems or clerical workers reentering data for new software systems come to mind today. Sometimes information requires transposition from one intellectual community or audience market to the next, with the metainformation linking and tagging—and both the work of amateur bloggers in recirculating news items, and the work of LinkedIn members recommending each others' resumes qualify here. And many times, information requires a more complete translation, across not only differing technological protocols and differing metadata contexts, but also differing sites of meaning and expectation, for the purposes of accessibility in the public interest. The work of professional science journalists in reinterpreting complicated research findings for the nightly news audience,

as well as the work of partisan political activists spinning the latest government figures for the voting public, are contemporary examples.

But the historical exploration of information labor offers us more than a set of rich case studies; it offers us a connecting thread for tracking change and constancy across time. The “long twentieth century” has brought a seemingly perpetual effort to render greater amounts of data, content, and knowledge into automated systems in order to replace the communication function of individuals who are seen as merely manipulating data in a scripted way, and thus adding more cost than value—a “scientific management” strategy that scholars have tied to the early twentieth-century “control revolution” where new information technologies became such a powerful tool of management’s “visible hand” over the market (and over labor) (Beniger 1986; Braverman 1974; Chandler 1977). Such automation efforts were clear in the case of the telegraph messengers (installing teletype units directly in corporate offices), the library technicians (schemes to catalog and index books directly from computer analysis of the text), and the real-time stenographers (continuing attempts to perfect voice recognition software in all environments and with all speakers). Today such efforts to automate away the need for information labor are increasingly complemented by efforts to outsource that information labor, whether to globally distant contingent subcontractees, or to web-dispersed volunteer crowds.

At the same time, our period has been one of utopian schemes to valorize and uplift labor through information and communication technology, at least for some. Such projects strive to make both available and intelligible greater amounts of data, content, and knowledge to those precious individuals who are seen as developing analytical content in a creative way, and thus adding more value than cost to the circulation of information—the postindustrial knowledge worker or “creative class” strategy. Such hopes only ever existed as myth for the messenger boys, a sort of “uplift by osmosis” claim that walking the halls of business would open one’s door to an industrial career. But for the library technicians, the digital database tools of the 1980s were supposed to transform them into “information analysts.” And for the real-time stenographers, becoming “computer compatible” during that same period promised a shift from merely producing the courtroom transcript to managing the flow of legal information. Such promises are still made today, where smartphones and Twitter feeds are now advertised as generic business intelligence and marketing tools that can give every knowledge worker a competitive edge.

History teaches that both deskilling and uplift are imperfect, contingent, and contradictory processes, at best. And geography teaches that the

landscape resulting from these imperfect, contingent, and contradictory processes is both vast and uneven. Certain aspects of human communication at both low levels and high remain uncomputable or unstandardizable; and each new round of technological achievement to automate or augment intellectual work simply shifts the problem to a different scale (up or down). As a result, workers formally or informally engaged in complex information labors—transcoding, transposing, and translating, helping to keep both information and metainformation circulating productively across multiple contexts for multiple purposes—are continually re-embedded in each new round of the knowledge infrastructure.

After engaging in this work for a little over a decade, I think it's more important than ever before to keep "uncovering" this information labor. After all, in our present-day political-economic environment, we've seen the culmination of a decades-long strategy not just to ignore the contribution of labor, but also to cast labor as a drag on the economy, rather than as the economy's creative engine. Neoliberal strategies of regulatory rollback and privatization rollout have shredded what was once a functioning safety net for all workers (all the more necessary in times of rapid technological change), and eliminated many of the keystone public jobs for public workers (along with the high-quality benefits, pensions, and wage floors with which all businesses were obliged to compete). Yet these very same neoliberalization proponents preen as they declare themselves to be the true "job creators."

Such contradictions are not new. Promotional advertisements for young, male telegraph messengers in the 1920s cast the telegraph monopoly as a progressive welfare capitalism organization. Promotional advertisements for female library workers in the 1960s and 1970s juxtaposed them with the same digital technology meant to eliminate their jobs. And business press images of home teleworkers in the 1980s (often with women shown unproblematically managing a small child in the background) fed directly into the construction of a remote real-time stenography labor force for captioning a booming universe of twenty-four-hour cable television channels. The frustration comes when these same laborers are demonized for any organized efforts across space and time to address their working conditions, improve their career prospects, or bring public attention to the value of their work.

As teachers and researchers within knowledge-producing institutions, I think this all points to an ongoing, scholarly imperative. We need to keep uncovering, analyzing, and explaining the intertwined spatial, temporal, social, and technological contexts of information labor, as we continue to

attempt to both train our students and to understand for ourselves how media infrastructures emerge and evolve, persist and perish, from their birth as “new media” to their obsolescence as “old.” It’s an easy trick to simply ask “Where is the labor?” to get such a conversation going—and that’s a trick I’ve employed myself many times in both the classroom and the conference hall when I didn’t yet have a roadmap to understanding a particular new media phenomenon. But asking the question is only the first step.

As for me, I find hope in the fact that many of the workers implicated in today’s world of digital information labor, as both professionals and amateurs, are drawing on the examples of the past to mobilize in service of a new, collective goal: uncovering labor’s place in society as a whole. In this widespread, decentralized, and raucous effort—involving Facebook-organized occupations of both Wall Street and Main Street, Twitter-fed and YouTube-broadcast sit-ins at public campuses and state capitols, and social and economic justice blogs on the web—activists both seasoned and new are demonstrating well that the same information/communication technologies that allow for greater fragmentation, casualization, control, and devaluation of labor can themselves be used to calculate and reveal the presence, importance, and impact of labor in new ways (Nichols 2012; Sagrans 2011; Yates 2012).

Notes

1. See also Jose Antonio Vargas, “The face of Facebook.” *The New Yorker*, September 20, 2010.
2. Brad Stone, “Concern for those who screen the Web for barbarity.” *The New York Times*, July 18, 2010.
3. David Streitfeld, “Inside Amazon’s very hot warehouse.” *The New York Times*, September 19, 2011.

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Chapter 8

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Chapter 9

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