

An abstract geometric design on the right side of the cover. It features a vertical teal line that intersects with a horizontal purple line. Below these, there are several black lines forming a diamond-like pattern. At the bottom, a thick red line runs diagonally across the page. The design is composed of various colored lines and shapes, including a teal circle at the top and a red circle at the bottom.

Media Technologies

Essays on Communication,
Materiality, and Society

edited by
Tarleton Gillespie
Pablo J. Boczkowski
Kirsten A. Foot

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1 Introduction

Tarleton Gillespie, Pablo J. Boczkowski, and Kirsten A. Foot

Beyond the Plateau

This volume is both an invitation to those scholars who have undertaken the study of media technologies and a provocation to the broader fields and traditions in which they work. We believe a productive plateau has been reached, wherein distinct intellectual trajectories originating from disparate fields have gathered around a common purpose: to understand media technologies as complex, sociomaterial phenomena. In much of contemporary scholarship, media technologies are no longer treated as things that simply happen to society, but rather as the product of distinct human and institutional efforts. They are not seen as emissaries of revolution or harbingers of imminent disaster, but as constructs richly etched with the politics, presumptions, and worldviews of their designers. They are not necessarily fulcrums of change in people's lives, but protruding bits of material culture that incorporate into and sometimes press upon the lived practices of their users. They are not gleaming icons of the new, but have specific historical trajectories as individual objects and as the residue of societal ambitions.

Still, though social researchers¹ of media and of technology should, by now, be able to easily enjoy fruitful exchanges of ideas, efforts to engage in substantive conversation have too often been constrained by two impediments. First, in communication and media scholarship, the overwhelming focus has been on texts, the industry that produces them, and the viewers that consume them; the materiality of these devices and networks has been consistently overlooked. News, in the study of media, has been typically construed as paragraphs on a page, rather than the page itself; the headlines are examined, but not the newsboys who shout them, the teletypes that clatter them out, or the code that now renders them into clickable hyperlinks. This has made it difficult to examine media not merely as messages that affect minds, but as social relations by other means, an engagement

of people through information and through things, that happens to use words, sounds, and images as social currency.

When media scholars have turned their attention to the technology involved, they have rarely attended to “the tightly-interwoven relationship between the material and the symbolic” (Boczkowski and Lievrouw 2008, 967). Instead, explicitly or by omission, they have tended to cling to the assertion that the technology is neutral with respect to the communication being undertaken—or have leapt to its opposite, to seductive and often naïve forms of technological determinism, proclaiming the things themselves as ushering in dramatic change.

The turn to digital, networked media technologies has begun to move this literature past this first impediment. But the field of communication and media studies has always been a distinctly heterogeneous intellectual space, stitched together as a loose patchwork rather than emerging as a family tree from common roots of inquiry. So when communication and media scholars’ attention turned to the digital, it happened in many places and for many reasons, with an intellectual response that was far from cohesive.

Social psychologists interested in interpersonal communication and collaboration began exploring computer-mediated communication in the 1990s. While this research has made important advances in understanding the mediation of cognition, conversation, and group dynamics (see Kalman et al. 2006; Kraut et al. 1998; Parks and Floyd 1996; Walther 2011), it has been more interested in using the technology as a convenient opportunity for plumbing the complexity of human communication per se than in problematizing the technology. During the same period the study of mass media also shifted its attention to digital media and the Internet (Chaffee and Metzger 2001; Morris and Ogan 1996; Newhagen and Rafaeli 1996; see also Walther, Gay, and Hancock 2005). More often than not, this work borrowed conceptual and theoretical lenses developed in earlier studies of traditional print and broadcast media: media effects (Metzger 2009; Shah, McLeod, and Yoon 2001; Walther 2011), uses and gratifications theory (Althaus and Tewksbury 2000; Papacharissi 2012), and audience studies (Baym 2000; Silverstone and Hirsch 1992). Critical political economists, who cut their teeth on the highly concentrated media industries, posited the nascent digital industry as simply continuing or exacerbating this oligopolistic control (Bagdikian 2004; McChesney 2004). Media ecologists began to fasten the “information revolution” onto their histories of broad, media-driven social change (Kittler 1999; Levinson 1997); cultural studies scholars championed “cyberculture studies” as an emergent interdiscipline (Silver 2000; Silver and Massanari 2006).

So, while many scholars in the field of communication and media studies do now address information technologies, most have done so in ways that enact, either explicitly or by omission, a deterministic understanding of technology as one of the following: the intervening variable that explains a measurable change, the historical catalyst that explains a social shift, or the tool with which passive audiences can finally succumb to or resist the tyranny of mass culture.

There have been exceptions to this tendency. Raymond Williams, back in 1974, urged us to look beyond claims that media change our world, for “behind all such statements lie some of the most difficult and most unresolved historical and philosophical questions. The questions are not posed by the statements; indeed they are ordinarily masked by them” (9). Roger Silverstone (1994) later noted the “double articulation” of communication technologies as being at once a tool for conveying meaning, and a meaningful thing in its own right. Both of these analyses, though focused on television, proved influential for scholars of the digital technologies to follow. And all along, cultural historians were revealing communication technologies as the product of social forces and specific contexts, whether they be electricity (Marvin 1988), radio (Douglas 1987), the telephone (Fischer 1992), television (Williams 1974; Spigel 1992), computer systems (Edwards 1996), or the Internet (Abbate 1999) and the web (Turner 2006).

By the late 1990s, information technologies were becoming a more embedded part of social practice, and more and more central to the circulation of news, entertainment, and public discourse. Although social researchers were not always quick to respond, there were calls, from scholars and funders, to study Internet technologies and their social impact. For media scholars, it was the rapid technological change that seemed to most warrant explanation: the texts and genres of new media have been difficult to analyze, in part because they are so prolific and so evanescent. This helped to foreground the material technology over the symbolic content. And although both stakeholders and commenters too often wrapped these technologies in breathless hyperbole, their overstated proclamations themselves may have helped make it so apparent that more nuanced social, political, cultural, behavioral, and historical understandings were required. In response, some communication and media scholars—eager to get a handle on these new artifacts and practices, but troubled by the way the socio-technical was so often bracketed, reified, or entirely overlooked—began to look for intellectual resources elsewhere.

A more nuanced debate about the impact and complexity of the material artifact had been going on in sociology, history, anthropology, and

philosophy of technology, particularly under the rubric of science and technology studies (STS). This comparatively smaller but vibrant domain of inquiry was also in part a response to the very same notions (technology as neutral, technology as revolutionary) evident in communication and media studies, but focused on public and political understandings of technology. To counter these assumptions, STS scholars took as their central concern the ways that materiality, practice, and politics are necessarily entangled. In contrast to most work in communication and media studies, STS scholars debated the ramifications of the material without oversimplifying it, and posited these sociotechnical ensembles as situated historically and in specific social and political contexts.

However—and here we reach the second impediment that has hindered efforts to engage in substantive conversation—until recently, STS-based scholars have largely overlooked media technologies. Perhaps because they had to justify themselves to colleagues studying the “hard” sciences, and to scientists and engineers skeptical of their entire undertaking, STS scholars have preferred studying those technologies perceived to be important, serious, historic, substantial—particularly those involved in industry and engineering, knowledge production, the military, and transportation. There has been no STS-based analysis of the Internet or the World Wide Web on par with Latour’s (1996) experimental French train systems, Winner’s (1980) bridges, Vaughan’s (1997) space shuttle disaster, or Pinch and Bijker’s (1984) bicycles.

The attention STS scholars have paid to information technologies has tended to focus on the computerization of work practices and environments. Most prominent among this work, which many of the contributors to this volume see as formative intellectual predicates for their own scholarship, are the “social informatics” approach championed by Rob Kling (1996), the early work of Lucy Suchman (1987) within the field of Computer Supported Cooperative Work (CSCW), the attention paid to information practices and infrastructures by Geoffrey Bowker and Susan Leigh Star (1999), Steve Woolgar’s (1991, 2002) “configured user” and “virtual society” projects, the use of activity theory by Bonnie Nardi and others (Nardi 1996; Kaptelinin and Nardi 2006) to examine systemic contradictions in the cultural-historical trajectories of technologies, and Andrew Feenberg’s (1991, 1999) critical theory of technology.

Over the course of the last decade, this ideational meeting point, between communication and media studies on the one hand and science and technology studies on the other, is where fruitful intellectual exchanges have emerged. Theoretical perspectives originating in STS, particularly the social

shaping of technology and actor network theory, have been taken up by communication and media studies scholars working on digital media. Some STS scholars studying information and computer technologies (ICTs) began tying their work to communication and media studies to better attend to the symbolic dimensions of these tools. In the annual international conference of the STS field, the Society for the Social Study of Science (4S), attention to new media has grown over the past decade from a panel here or there to multiple streams of presentations, preconference events, and even keynotes. In the communication and media studies journals and conferences that attended to new media, the theoretical vocabulary of STS began to take hold.

These are the routes through which social researchers of media technologies have reached the current plateau of an emergent community of scholars with some common insights and aims. They have fended off the slippery presumption of technological determinism and legitimated media technologies as a worthy object of scholarly analysis. They have made the case that the study of media technologies, to be compelling, must contextualize the technology historically, culturally, and systemically, and explicate the social, material, and temporal dimensions of how technologies are produced, deployed, configured, and used. They have grappled with the conceptual changes made salient by digital, networked media: decentralization of production, ubiquity of access, the disintegration of the mass/interpersonal distinction, the resurgence of the amateur, the modularity and opacity of software, the fluid shape of networked knowledge, and the laterally connected practices of social meaning. They have brought the intellectual tensions between structure and agency, control and resistance, and change and stasis—so fundamental to social and cultural theory of the last century—to the fluid technological landscape of this one. Leaders from this community, many now mid-career, have made inroads in convincing their home disciplines of both STS and communication and media studies that nuanced social research into media technologies is a relevant part of the broader disciplinary aims. As editors, our primary purpose for producing this volume was to provide some conceptual paths forward for future scholarship within this community and beyond.

Though terminology and angle of approach may differ, similar directions are being pursued in recent work in media and cultural studies (Bruns 2008; Gitelman 2006; Jenkins 2006; Varnelis 2008), in the ethnographies of digital cultural practices (Ito et al. 2009; boyd 2010; Gray 2009; Baym and Burnett 2009), in the materialist turn being explored in cultural theory (Berry 2011; Galloway 2004; Gane and Beer 2008; Packer and Crofts Wiley

2011; Parikka 2012), in game studies (Bogost 2012; Monfort and Bogost 2009; Taylor 2006), in debates in media theory and elsewhere on the concepts of “mediation” and “mediatization” (Couldry 2008; Lievrouw 2009; Mansell 2012; Silverstone 2005; Wajcman and Jones 2012), in the scholarship on information policy (Benkler 2007; Cohen 2012; Lessig 1999; Nissenbaum 2009; Zittrain 2008), and in critical information studies (Dourish 2004; Edwards 1996). This volume builds on and extends facets of the intellectual project of each of these works.

But what should come next? There have been some suggestions as to how to move forward from this plateau, how to most fruitfully extend contemporary inquiry into media, technology, and society. These fall into three categories. Some propose to identify key dynamics of new media, meso-level qualities sufficiently common to all media technologies that, extracted from their specific contexts, can be held up as defining characteristics, or at least distinctive ones. These conceptual vocabularies—numerical representation, automation, modularity, variability, transcoding (Manovich 2001); accessibility, peer-to-peer, value at the edges, aggregation (Ito 2008); network, information, interface, archive, interactivity, simulation (Gane and Beer 2008)—provide scholars ways to pin a social consequence to a dynamic, rather than to a particular tool or to “new media” in their entirety. At the same time, these terms can easily become unmoored and dizzying as they proliferate.

Others propose a more diligent attention to the complexity of new media technologies, shedding old analytical frameworks that prove too constrictive. Lievrouw and Livingstone (2006), for example, propose to replace a linear understanding of traditional media with a heuristic that has predictable components, but does not presume beforehand how those components are related in any given context:

We do not specify *a priori* any set relationship among the three component processes of infrastructure. Where the mass communication tradition has spent decades struggling with and, more recently, unpacking the linear relationship among production, text, and audience (i.e., production makes texts which have effects or impacts on audiences, consistent with the sender-message-receiver model of communication), in new media research no such linear assumption is necessary . . . it is precisely the dynamic links and interdependencies among artefacts, practices and social arrangements that should guide our analytic focus (3).

Tools designed to examine “mass media” or “mass society” will no longer suffice; the “multiple, shifting configurations” (5) of the network provide a more appropriate metaphor.

In his recent work, Sterne (2012) offers a different take on the complexity of media technologies, proposing that we “modulate the scale of our analysis of media somewhat differently. Mediality happens on multiple scales and time frames. Studying formats highlights smaller registers like software, operating standards, and codes, as well as larger registers like infrastructures, international corporate consortia, and whole technical systems” (11).

Finally, some social researchers of media and technology argue that it is not sufficient to merely acknowledge complexity, that scholarship has an obligation to work toward conceptual frameworks that enable more robust analyses. For example, Boczkowski and Lievrouw (2008) propose not just to recognize a perennial tension between determination and contingency, but also to note that the tension plays out differently in different contexts: “future work might address the particular conditions that may tilt the balance towards determination or contingency, or the specific mechanisms and processes that ‘harden’ sociotechnical configurations under certain conditions, or make them more malleable in others” (966).

In producing this volume, we do not seek to map all the intersecting scholarship on media technologies, or to merely showcase the new and exciting work happening at its cusp. Instead, we want to propose new questions and pathways, where scholars of media technologies might want to go next, given not only the theoretical exchange now occurring but also what the shifting media and information landscape now makes possible and, arguably, requires or even demands of us. We hope the volume can be a starting point for just that.

How This Collection Came to Be

This volume began with Margy Avery, a senior acquisitions editor at MIT Press. She sought us out as dialogue partners about the streams of work she had observed at recent STS and communication and media conferences, and suggested that we develop a scholarly collection that mapped the intersections of communication and media studies, and science and technology studies. One model she proposed was a collection she had helped develop a few years earlier, Pinch and Swedberg’s 2008 volume, *Living in a Material World: Economic Sociology Meets Science and Technology Studies*. But soon after embarking on the project, we had to acknowledge that the approach taken by Pinch and Swedberg would not work with our own fields. While economic sociology is a specific domain of inquiry housed within the field of sociology, communication is a field unto itself, and one with sprawling subfields and somewhat porous boundaries. Were we to attempt to address *all*

the ways in which ideas in STS intersect with the field of communication, much less all the ways it conceivably might, we would need to incorporate journalism studies, bibliometrics, sociolinguistics, political economy, management and organization, the rhetoric of science, education, and so on.

Instead, we wanted the collection to identify and enliven the key conceptual challenges for scholars devoted to the study of media and information technologies across the fields of communication and media studies and STS. Soon we latched on to a different model: Bijker, Hughes, and Pinch's landmark 1987 collection, *The Social Construction of Technological Systems*. More than representing the Venn diagram overlap of two fields, that collection articulated an emerging intellectual project that grew from those fields, and in some ways called that project into being. Since its publication, that collection has served as a benchmark for that intellectual project as it has moved forward. All three of us have found value in Bijker, Hughes, and Pinch's collection (often known as the "school bus" book because of its stark, two-toned cover) for how it opened up for us a new space of inquiry. We have sought to craft a collection of essays and commentaries, which, when read together, offer similarly provocative and agenda-guiding insights that may inspire others to break new conceptual ground in the social research of media and technology.

We began by inviting potential contributors whose scholarship we knew already spoke both to and about these fields and the intersections between them, who had made important empirical contributions in this arena, and who offered conceptual tools and insights that transcend their respective empirical cases and illuminate potential paths forward in the study of media technologies. Though we tried to err on the side of editorial restraint, to allow contributors to develop essays that sprang from their own thinking and that made the contribution they most wanted to make, we did make one stipulation: that each step back from the particulars of their work and methodological interests to reflect on underlying areas of conceptual concern that build from or speak to theorizing media technologies.

However, we did not want to enlist such accomplished scholars and then ask them to labor alone to produce essays that would merely share adjacent pages. One of the reasons the Bijker, Hughes, and Pinch volume is so strong is that it emerged from a face-to-face workshop designed to push the sociology and history of technology forward; the individual essays, though exploring quite different theoretical avenues, read like a coherent conversation when taken together. So it was extremely important to us that our collection develop a similar coherence. Toward that end we would need to engage in focused dialogue together, at each stage of the volume

development process, about the ideas and gaps in the work we had read and the work we had produced.

This effort took a number of forms. First, contributors provided a short abstract of the essay they planned to develop. These abstracts were circulated with the entire group, and became objects of discussion between the contributor and one of the editors. The contributors then produced three-thousand-word sketches of their essays, which also were circulated, in anticipation of an intensive day-long workshop (preceded by a substantially less intensive dinner) that took place just before the 2011 4S conference in Cleveland. There, at the Great Lakes Science Center overlooking chilly Lake Erie, we worked in pairs to swap feedback on the essays we were preparing, then met in groups organized around commonalities among them to identify connections and oversights. As editors, we also provided the contributors with a concept map of eleven meso-level concepts we felt live in and across the fields of communication and STS, and asked them to draw where their essays were situated in relation to these concepts. These impromptu visualizations became another opportunity for discussion of what the entire collection had in common. We continued and expanded these discussions in a lively and well-attended roundtable at the 4S conference itself.

Following the Cleveland conference, the contributors developed drafts of their essays. We editors discussed how the essays might speak to each other, and decided on the two groups of four that form the two main parts of the collection. The contributors then peer-reviewed each of the other essays in their part. We saw this as important for two reasons: first, each author enjoyed the benefit of several sets of talented eyes during the writing process; second, seeing the other three essays helped contributors to sharpen their own. All of the drafts and the comments were made available to the entire group. A draft of this introduction was also posted to the group, where feedback and criticism were solicited.

In addition, it was important to us to tie these essays to a longer legacy of scholarship. We therefore invited four scholars who have had a deep impact on the social, cultural, and historical study of media technologies to each serve as discussants for one of the parts of essays we have assembled. We did not want these to be afterthoughts, pasted onto the volume. The discussants were urged to not only comment on each essay in their part but to also illuminate points of intersection among them, and to relate the problems probed in the essays to other veins of thought.

We asked a great deal of the participants in this volume, and we are deeply grateful not only for what they delivered but also for the willingness and good spirits they offered along the way. The overarching goal of

all of this editorial orchestration, this great taxing of our colleagues and friends in which we engaged, was to produce a volume that would gather the scholarship under a single umbrella while giving back to that scholarship a set of dialogical provocations that might serve the field well by providing fertile starting points for the next wave of scholarship.

In our efforts to collect this work, articulate vexing problems, and find common threads in scholarship on media technologies, we have crafted two sets of essays and commentaries that we believe illuminate some useful paths forward. The first addresses materiality and the mediation that produces and embeds new forms of knowledge and expression; the second addresses the practices and meanings that maintain the sociomaterial formations that are media technologies by animating, building, translating, and repairing them. This is not to say that these are the only two possible directions. The volume reveals both some common assertions and some rich diversity and disagreement. But it does attempt to hold a focus on these two thorny sets of issues, showing how they are vital to understanding media technologies but also fundamental to the study of communication and society. Thus, what started as a mapping exercise about the past and present turned into a more programmatic attempt to chart future pathways in the study of this domain of inquiry. Revealing where we have been motivated reflections on where we might go next.

Part I: The Materiality of Mediated Knowledge and Expression

At the most fundamental level, media technologies are about the linkages between the symbolic and the material. That is, all technologies have a symbolic dimension, but media technologies have distinctive, material capabilities to embed, transform, and make accessible symbolic content such as news stories, novels, movies, and songs. How to best characterize the relationship between these two dimensions has been a longstanding concern of scholarship about media technologies. The four essays in part I offer different, yet related ways to account for those linkages at the intersection of communication and media studies and STS.

In chapter 2, Leah A. Lievrouw examines the causal connections between the symbolic and the material in the making and circulation of media technologies. Calling the scholarship thus far an “unfinished project,” Lievrouw begins by unpacking the strong rejection of technologically deterministic views in both communication and media studies and STS, in order to question the persistence of causal accounts in social constructionist views. She calls for a renewed emphasis on “mediation” as a way to overcome

the limitations tied to the lingering of social constructivism. Mediation, defined as “an ongoing, articulated, and mutually determining relationship among three components [artifacts, practices, and social arrangements] of communication technology infrastructure and three corresponding processes or modes of change [reconfiguration, remediation, and reformation, respectively],” affords an explanatory stance that better balances the material and the symbolic. In a formulation that echoes Latour’s (1991) claim that “technology is society made durable,” Lievrouw notes that “the real power of the intellectual connections between STS and media studies will ultimately be theory that moves beyond ‘determinisms’ to capture the multifaceted complexity of technology as *communication* made durable.”

Chapter 3 by Pablo J. Boczkowski and Ignacio Siles complements Lievrouw’s argument by noting that most of the existent scholarship on media technologies has exhibited a silo mentality, focusing on either the material or the content dimension, and on either the production or the consumption dimension, but rarely both, and almost never all four. Some studies look at the making of media content, but ignore issues of materiality and reception; some focus on the uptake of new artifacts, but pay scant attention to how this uptake might be shaped by the content they carry. Arguing that this silo mentality has presented significant limitations in accounting for the interpenetration of materiality and content, and production and consumption, in the “life cycle” of media technologies, Boczkowski and Siles call for a more cosmopolitan perspective. They argue that this perspective “seeks to create new opportunities for reimagining established approaches and for conceiving new modes of inquiry.” To this end, the authors offer suggestions in the theoretical, methodological, pedagogical, and design domains of scholarly practice on media technologies.

In chapter 4, Finn Brunton and Gabriella Coleman provide a different entry point to some of the issues addressed by Lievrouw and Boczkowski and Siles in their attempt to “get close to the metal.” Brunton and Coleman focus on infrastructural dynamics as a problem for media studies. Their emphasis on infrastructure, practices, and users echoes Lievrouw’s call for mediation as the mechanism that brings these disparate elements together. By looking at these three elements, and the ties that bind them, Brunton and Coleman encounter “the multiple, sometimes contradictory and sometimes coexistent experiences that obtain on the network infrastructure.” They propose ways to escape the “misplaced concretism” and the “collapse” of multiple perspectives into one. Those who can successfully navigate the networks using a technical expertise that permits them to reside closer to the material and farther from the purview of network

operators—their examples include network sysops, Anonymous hackers, and spammers—have no such illusions about the hardness or inaccessibility of the material strata. Albeit different in intention and emphasis, Brunton and Coleman’s position resonates with Boczkowski and Siles’s proposal for a cosmopolitan sensibility in the study of media technologies, though Brunton and Coleman prefer to emphasize multiplicity.

Geoffrey Bowker starts in chapter 5 where Brunton and Coleman end by taking up the issue of multiplicity not only as a descriptor of what has been but also, most important, of what might be when we think about the future of our own modes of knowledge expression. Bowker focuses on the embodiment and circulation of (scientific) knowledge, and the implications for how this knowledge is generated and appropriated. Here he reflects on the limitations that the dominance of the single-authored journal article, as both a content genre and a material artifact of sorts, has had for knowledge practices in the contemporary context. By historicizing how this dominance came to be and remaining mindful of the manifold options ahead of us, Bowker calls for imagining alternative forms of scholarly publication that might better suit our networked, data-intensive knowledge landscape. By calling attention to “the dangers of the mass production of knowledge,” Bowker believes that “the promise of this moment is that we can deliberately produce ways of knowing and ways of expressing knowledge that open rich futures.”

Part I closes with sharp and textured responses by Jonathan Sterne in chapter 6 and Lucy Suchman in chapter 7. Recounting the history of different causal formulations in the study of media technologies, Sterne interrogates the centrality of materiality in the chapters in part I and reminds us that, while we may clamor against social constructionism now as insufficiently material, it is instructive to remember that constructionism itself was clamoring at the excesses of positivism. He concludes with astute observations about how questions of causality continue to animate attempts to articulate the relationship between materiality and constructivism. Suchman draws on her own intellectual trajectory and recent research to reflect on the positions proposed in chapters 2 to 5, and contends that developing adequate frames for the ways in which media and technologies configure each other remains a necessary and worthwhile aim.

Part II: The People, Practices, and Promises of Information Networks

The story of stabilization is fundamental to the social constructivist understanding of technology, whereby once-contested technologies seem to settle into some comfortable frame of understanding. But this narrative arc is

a matter of perspective. In contrast to stabilization processes, what may be remarkable about technology as a social achievement, and of media technologies in particular, is that they must be maintained, that their contested meanings persist and thrive, that they are the fragile residue of constant activity, and that they must be made and remade in every instance. Their seeming stability is itself a social accomplishment and an important myth to preserve in the face of a reality in which they require constant handling, ongoing repair, and regular upkeep of their public legitimacy.

Perhaps our stories about media technologies are a bit like our commonplace understanding of glass. Glass, as most understand it, can be shaped because it is malleable when it is first heated, before cooling into its familiar, solid, clear form. But from the benefit of a longer view, we just might be able to perceive that even cold, hard glass remains a liquid, constantly but slowly changing—its stillness in fact an illusion, its clarity in fact a trick. Each of the essays in this part tries on this phase shift in perspective, seeing technology as in motion, as maintained, as in process, as remaining contradictory, as held together time and time again through the minute, unobserved practices of the many.

For technologies that often appear to function instantly, automatically, even magically, it may be that the hardest and most important story to tell is about the real people who make them possible, narrate them into significance, repair them when they break, and tinker with them when they need to change. But this phase shift in perspective requires a concerted effort to look beneath the technology at the human underbelly of the sociotechnical system. The essays in part II each invite us to do so. Beneath the artifacts and within the networks are people attempting to construct, maintain, and ultimately disassemble material things. The way they make, remake, and unmake media technologies has lasting consequences for the artifacts and for their users.

Gregory J. Downey begins chapter 8 with a call to recognize all manner of “virtual workers” who help make information move in what feels like frictionless ways. We are seduced by the ease of Google search or the speed of our ATM to believe that these are simply networks of computers responding to our requests at lightning speed. When our query to the library database serves up a multitude of results, we too often forget the immense work required to classify, sort, arrange, and connect library resources—digital ones just as much as those on library shelves. Downey wants to draw our attention to the “informational labor” that allows information, situated in a particular time, space, and institution, to “jump context.”

Using as historical examples librarians and archivists, telegraph delivery boys, and the real-time stenographers who caption media programs, transcribe court proceedings, and translate speeches, Downey highlights how each helps information move across space or time, from institution to institution, or from one semantic context to another. The flow of information is in fact a product of human labor, pushed forward by the hands of these invisible workers. An analysis of information networks that overlooks these kinds of labor fundamentally misunderstands how these systems work and further reifies the invisibility of their efforts. It also may miss the way that these laborers, working at key transactional points in the flow of information, have historically been aware of and politically active around key sociocultural tensions, tensions that matter for the users for whom the information is designed.

In chapter 9 Tarleton Gillespie focuses on a more contemporary moment of disappearance but raises a complementary set of questions to Downey's analysis. He calls for sustained attention to the place of algorithms in the public information landscape. These tools, from search engines to recommendation systems to the organization of social networking sites, render information unto users according to human, but now automated, criteria. He argues for unpacking these systems, not just as artifacts with politics, but also as new knowledge logics that are displacing more editorial modes of information legitimation. This is vital in the face of our embrace of these tools as sites for public discourse, the seductive calls for new insights through "big data," and the turn to using these systems to both curate and govern the contours of public speech.

Gillespie articulates six dimensions of the political valence of algorithms. Together, these are intended as a heuristic for how to consider the values behind what information is included in the database and what these systems attempt to know about their users; for how algorithms impose oblique but human-generated evaluative criteria and how they present their results under a rubric of objectivity that legitimates their intervention; and for how algorithms tangle with but may also shape users' information practices, sometimes providing a terrain for political contest, but also mirroring back to users calculated snapshots of themselves as members of taste publics or participatory communities. In these ways, the algorithm, presented as a cleanly mechanical offer of results simply returned in response to query, in fact shapes, curates, and legitimates knowledge and the publics who engage it.

In chapter 10, Christopher M. Kelty suggests we also must attend to the political ideologies that travel with these technologies. Computers and information networks were born amid strident debates about political

freedom, and for many of their designers and public champions, they are icons of those ideals, so much so that our notions of freedom have developed and changed around them. To do justice to this tangle of the material and the inspirational, Kelty proposes that we tease out the complexities of these notions of freedom and liberty that swell unexamined in the ad campaigns of manufacturers and in the eager chatter of fans, journalists, and critics.

For Kelty, the way to do this is to return to the claims made by some of the Internet's founders, particularly in the "man-computer symbiosis" envisioned by J. C. R. Licklider and the "augmented intelligence" pursued by Douglas Engelbart. Here, in their visions for the future of computational technology, competing ideals of freedom were served up and negotiated. Revealing the contours of their beliefs, Kelty suggests, will inform modern political philosophy and add depth to the claims made by new media scholars about the political imaginaries that animate new media. But, Kelty warns, we must understand how information technology designers are thinking about political freedom, because thinking about freedom as something that can be delivered by a technology, or designed into it, changes the meaning of freedom itself.

In attempting to think about media technologies, social researchers tend to focus on their beginnings: the context in which they were developed, the moment they were released, their early adopters. Perhaps too much is made of the initial decisions, the early controversies, the first implementations as the most crucial constitutive choices (Starr 2004) defining the technology and the practices that will coalesce around it. This myopia is suspiciously aligned with both the marketing of technological novelty and the planned obsolescence of gadgets. Steven J. Jackson argues here, in chapter 11, that despite this "productivist bias," it may be just as important to unearth what it is that keeps a technology going, who makes its continued use possible, how it changes over many iterations, and how it ends. To look, as Downey also does in this volume, to the labor involved in the maintenance and the dismantling of things, reveals not only invisible work, but also another source of innovation and change happening well outside of the R&D department of the software giant or the garage of the amateur inventor. Change often comes in the moments of breakdown, and in the myriad responses to it.

But Jackson's aspirations here are greater. He posits an entirely different frame of mind around technology, what he calls "broken world thinking." If we were to see technologies not as dazzling sparks that shoot off into the lived world, but as fragile achievements constantly needing repair to

survive, this might shift our focus from the politics of artifacts to a more sober attention to the wondrous and persistent attention and care people pay to things they hold quite dear.

In their commentaries, chapters 12 and 13 respectively, Sonia Livingstone and Fred Turner each engage in creative reflection, making intriguingly different arguments about what the essays in part II have in common and about the emerging scholarship around media technologies they signal. Both Livingstone and Turner tie insights from these essays to longstanding concerns that have animated the study of media more broadly. Livingstone reminds us that thinking about users and audiences remains critical to understanding our contemporary media environment. Each of the essays, she argues, is concerned about users, but implicitly frame them in different ways. Calling out these assumptions, and putting users politically front and center, even if they are not the analytical object, is a gesture vital to the examination of new media technologies as a part of public life. Turner considers whether the classic media studies concerns about representations, their commercial aims, and the worldviews they deliver still matter when scholarship seems more interested in the shape of networks and the politics of software. His closing reminder is that although networked culture may seem to have left behind the stodgy concerns for “mass society” that shaped twentieth-century scholarship about media, perhaps it has powerfully brought those fears to fruition, accelerating and normalizing them, and building its own worldviews not into the representations it constantly churns, but into the social and technical infrastructure itself.

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There may be no way to comprehensively or exhaustively map all the intersecting work of social researchers of media and technology. We certainly do not accomplish it here. But the heterogeneity of the scholarship is its highest virtue. We hope that every one of the chapters in this volume, and the dialogue among them, will serve as foundational starting points for a new set of questions going forward. We hope that readers of this volume exploring issues around media technologies can light upon one of these chapters, and find in it a careful consideration of a thorny problem in the field, a breadth of understanding of the contours of that problem, and a provocative insight to chase. We also hope that this volume affords social researchers of media and technology the impetus to move their own inquiries beyond the obligatory rejection of technological determinism (and beyond an uncritical embrace of social constructionism)—and to begin reclaiming the centrality that understanding media technologies should have in the fields of communication and STS and beyond.

Note

1. We have chosen in this introduction to refer to “social researchers” of communication and media and of technology as a way to negotiate both whom we mean to refer to and whom we do not. The scholars we have in mind make their intellectual home in a number of fields, including sociology, communication, anthropology, science and technology studies, history, philosophy, cultural studies, and information science. Although we are joined by an interest in the way that media technologies emerge from and reshape social practices, meanings, and institutions, to aggregate us under the term “sociology” would exclude too many people. At the same time, those of us who intermingle with scholars with technical expertise, be they in computer science, engineering, or information systems, often use the tag “social,” to distinguish ourselves from those who focus on the technical. So, rather than have to repeatedly say, “the social, cultural, historical, economic, and institutional” and “as opposed to technical” every time, we used the shorthand term “social research” to encompass this.